

Chapter 14

The Environment

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COTSWOLD WATER PARK FAUNAL REMAINS IN THEIR REGIONAL CONTEXT

by Claire Ingrem

Introduction

The recovery of significant quantities of faunal remains from four individual sites, Warrens Field (Chapter 3) and Longdoles Field (Chapters 4-6) at Claydon Pike, Somerford Keynes (Chapter 9), and Thornhill Farm (Jennings *et al.* 2004), has allowed for detailed analyses and investigations of the various aspects of human-animal interactions at the site level. In this section, these results are integrated with those from contemporary sites in the Upper Thames Valley and southern Cotswold region, to formulate a picture of the development of animal husbandry regimes and land use from the middle Iron Age through to the late Roman period.

Pre-middle Iron Age

Animal bone dating to earlier periods is fairly scarce, however a few sites have produced small assemblages which provide an indication of animal husbandry practices in the region prior to the middle Iron Age. At Gravelly Guy (Mulville and Levitan 2004) animal bone recovered from late Neolithic and early Bronze Age features was dominated by the remains of cattle with pig the second most numerous species. Similarly, the small sample from Neolithic deposits at Barton Court Farm (Wilson 1986) produced an overall abundance of cattle and pig, a pattern considered characteristic of the late Neolithic of southern Britain (Tinsley and Grigson 1981). The high proportion of pig to sheep at sites dated to this period may reflect the exploitation of regenerated woodland which followed the clearance of forests during the early Neolithic (Smith *et al.* 1981). A small assemblage of animal bone dated to the early Bronze Age was recovered from the site of Spratsgate Lane, Somerford Keynes and although none of the fragments were unidentifiable to species, the predominance of large sized mammal suggests again that cattle were the most frequent taxa (Ingrem unpublished).

Middle Iron Age

The samples available from middle Iron Age deposits are fairly small but it is clear that the

assemblages recovered from the three gravel islands (1-3) in Warrens Field at Claydon Pike contain a high proportion of cattle and sheep/goat, as do middle Iron Age deposits from the site of Spratsgate Lane, Somerford Keynes (Ingrem unpublished). A similar general pattern of species representation has been recognised at other contemporary Upper Thames Valley sites, suggesting that environmental conditions were suited to both cattle and sheep/goat husbandry. The small middle Iron Age assemblage recovered from Thornhill Farm displays a particularly high ratio of cattle and horse and whilst there is little doubt that cattle played a major role in the economy, poor preservation, in combination with sample size, may have deflated the frequency of caprines and similar size animals.

This high frequency of cattle contrasts with the pattern generally seen at Iron Age sites in Wessex where assemblages tend to be sheep/goat dominated: at Danebury caprines comprised 70% of the assemblage (Grant 1984b). It has long been suggested that this is a reflection of differences in the local environment; the chalk downlands of Wessex being ideal for sheep farming whereas the lush pastures of the Thames valley gravels are more suited to large-scale cattle rearing (Maltby 1996, 20). Interestingly, caprines are more numerous than cattle in the small assemblage of animal bone recovered from Guiting Manor Farm (Clark and Chapman unpublished), a site located on oolitic limestone in the northern Cotswolds, implying that animal husbandry practices were indeed dictated by the local environment. At Gravelly Guy (Mulville and Levitan 2004), cattle are only three-quarters as abundant as sheep/goat; this site is located on the second gravel terrace of the Thames and the lower abundance of cattle may therefore reflect its slightly higher position and dryer landscape. The low frequency of pig contrasts with evidence from earlier periods but is also usual for sites of this period (Hambleton 1999, 46). As pigs compete with humans for grain (Harris 1997) their scarcity could reflect a concentration on arable production. In addition, an increase in the amount of arable land under cultivation may have required the removal of woodland thereby reducing the amount of available pannage, particularly close to settlements.

The suitability of the local environment for providing high quality grazing for cattle and suffi-

cient water to maintain large herbivores implies that it would have easily met the requirements of equids with their ability to survive on poorer fodder and in drier conditions (Clutton-Brock 1992, 20). However, except in areas of particularly high quality mixed grasses, they need to range over large areas and remain in relatively low numbers (Clutton-Brock 1992, 20). The relatively high proportion of horse at Cotswold Water Park sites and presence of sub-adult animals renders it highly probable that breeding took place locally. It has been suggested that equids were not generally bred at occupation sites during the Iron Age rather than feral animals were periodically rounded up (Harcourt 1979, 158). In light of the earlier evidence for the intensification of arable production, it seems unlikely that feral equids would be afforded grazing on the fertile valley soils but instead roamed less productive areas, higher up the valleys. Alternatively, it is possible that some communities specialised in horse breeding (Grant 1984b, 522), a suggestion supported by evidence at Rooksdown (Powell and Clark unpublished), Hampshire where the remains of male and female horses ranging in age from foetal to neonatal were recovered. In such a scenario, high quality grazing would need to have been set aside to ensure an adequate supply of high quality fodder and it may be that, as the predominance of adult horses suggests, their value as working animals providing traction and transport (Maltby 1996, 23) was sufficient to warrant this.

Mortality profiles of cattle and sheep/goat from Claydon Pike Warrens Field (Chapter 3) are also typical of other Upper Thames Valley assemblages; the scarcity of very young and very mature animals indicative of a mixed economy in which cattle and sheep/goat were raised primarily for meat but also for secondary products. At Gravelly Guy, where 40% of cattle were slaughtered between 8 and 30 months the preponderance of prime meat animals was interpreted as indicating a move towards a meat economy, the adult group representing animals that had reached the end of their working/milking lives. Similarly, at Spratsgate Lane, evidence for the cull of bull calves in the first autumn or winter is suggestive of non-intensive milking. A mixed-husbandry strategy also appears to have been employed for caprines; at the Warrens Field site indicated by the culling of immature animals to provide good quality mutton, and the keeping of adults to provide secondary products. Similarly, at Gravelly Guy a peak in mortality occurs at 6-12 months followed by the regular slaughter of adults peaking toward 4-6 years. It has been suggested (Sykes, Chapter 3; Hambleton 1999) that the absence of foetal and neonatal bones could signify the practice of a transhumant strategy whereby animals were grazed away from the settlement at the lambing/calving season. In light of evidence for neonatal cattle and caprines at Spratsgate Lane and the possibility that poor conditions for bone

preservation may equally explain their absence, this must remain speculative.

There was no evidence for hunting or fishing at Warrens Field, Claydon Pike where wild animals were represented solely by a single specimen belonging to buzzard/kite. Present day habitat preferences of these birds (Heinzel *et al.* 1998, 84, 94) hint to at least some deciduous woodland remaining close to the site. Scarcity of wild animals is usual in assemblages of this period, suggesting that hunting took place only on a small scale. This is evidenced by the assemblage from Gravelly Guy which contained just a few red and roe deer specimens and five heron bones, possibly from the same bird. Two wildcat specimens were also recovered. Although rare in the Iron Age, wildcat have been recorded from a few sites, including Danebury, which leads to the suggestion that cat domestication originated at this time (Harcourt 1979). Other animals present in small numbers at Gravelly Guy include goose and fish, the last being represented by a few bones, mostly from a single skeleton, that were not identified to species.

Late Iron Age/early Roman period

Two of the sites discussed earlier in this volume produced animal bone assemblages dating to the late Iron Age/early Roman period: Longdoles Field, Claydon Pike (Chapter 4) and Neigh Bridge, Somerford Keynes (Chapter 9). In addition, the nearby site at Thornhill Farm (Jennings *et al.* 2004) also produced an assemblage of this date. Despite some inter-feature variation in taxa representation at the Longdoles Field site, aggregated results indicate the predominance of cattle followed by sheep/goat, horse and pig, a pattern characteristic of other Upper Thames Valley sites (Hambleton 1999). The frequency of cattle increases at both Longdoles Field, Claydon Pike and Thornhill Farm is in line with the national trend, which has been associated with the effects of Romanisation (King 1978; 1991). However, as discussed by Sykes (Chapter 4) the frequency at the Longdoles Field site does not reach those seen at 'typical' Romanised settlements and the increase may simply reflect a continuing regional specialisation. Dating of the deposits from Somerford Keynes was less coherent with the animal bone assigned to the broader categories of late Iron Age/Roman and Roman but again, a high proportion of cattle is apparent. The frequency of horse is significantly higher in deposits assigned to the late Iron Age/Roman period than in the purely Roman deposits, consequently cattle and caprines appear more numerous in the later. Pig on the other hand, becomes twice as numerous in the Roman deposits, a pattern mirrored at the Claydon Pike sites. A similar increase in the frequency of cattle and pig was noted at Gravelly Guy, but here caprines continue as the major taxa throughout its Roman occupation. A high frequency of pig is another

feature associated with the process of 'Romanisation' but again levels at the sites mentioned above remain more suggestive of 'native' sites.

Gravelly Guy, with its predominance of caprines may have been less suited to cattle husbandry than the lower-lying settlements of Claydon Pike and Somerford Keynes. In contrast, sheep/goat were poorly represented in the assemblage from Thornhill Farm. Poor preservation and recovery strategy are likely to have been major factors affecting taxa representation at this site but there is little reason to doubt that cattle were the mainstay of the economy. Caprine frequency at Somerford Keynes is in-between that at Thornhill Farm and Gravelly Guy suggesting the existence of slightly different farming strategies, each probably most suited to maximising the return from the available land. As Levine (2004) points out, the high frequency of cattle and horse at Thornhill Farm is probably also due to local environmental conditions. Both taxa require a considerable supply of water and both site location (close to the Upper Thames floodplain) and the high frequency of Scarabaeoid dung beetle indicate that some of the surrounding land is likely to have been wet and marshy. On wet sites, sheep are prone to foot rot and there is evidence for the presence of the snail *Lymnaea truncalula*, the host of sheep fluke, in early Roman deposits at Thornhill Farm. It would therefore not be surprising if large-scale sheep farming was considered non-viable on low-lying sites.

The considerable drop in the average age of slaughter evidenced at the Longdoles Field site with over half the cattle culled before reaching 15-26 months of age points to the importance of meat production. The preponderance of adult females indicates that it was mainly surplus bullocks that were slaughtered for meat, females being kept to provide milk. At Thornhill Farm, Levine (2004) also notes the large proportion of cattle slaughtered before reaching adulthood and although ageing data for cattle from late Iron Age/Roman deposits at Somerford Keynes is slightly ambiguous, results again suggest that meat production was important. There may have been some variation between the age of slaughter at individual sites, cattle at Somerford Keynes appear to have been culled at the slightly older age of 18-30 months (although this might be to some extent, reflect the mixing of late Iron Age and Roman material).

In contrast, caprines were kept to an older age at both Longdoles Field, Claydon Pike (32% surviving into adulthood) and Somerford Keynes, indicating the increasing importance of manure and wool production. Meat production was probably still the primary objective at this time despite a move towards an increasing emphasis on secondary products. Interestingly, data from purely Roman deposits at Somerford Keynes shows the majority of the caprine population survived into adulthood, clear evidence that secondary products (milk, wool,

traction and manure) had become more important over time. Caprines at Gravelly Guy display a more marked kill off of animals aged between 2 and 3 years during the Roman period suggesting that here, raising animals for meat production was important. There is evidence for cattle and sheep breeding at Thornhill Farm in the form of neonatal and subadult remains although at the Longdoles Field site the only definite evidence for animal rearing on site came from foetal bones belonging to pig.

As would be expected for an animal kept primarily to provide meat, the majority of pigs at sites discussed here, appear to have been culled prior to maturity. At Gravelly Guy, the emphasis on sub-adult animals during the Iron Age suggested a specialist interest in the best meat animals, unsurprising given their high fecundity and status as providers of meat and hides, as there would have been no advantage to keeping pigs alive to an older age.

Scarcity of immature equids remains and the sex profile of the large sample from Thornhill Farm led Levine (2004) to discount the possibility that equids were bred at the site. Instead it is suggested they may have been managed as semi-feral herds, as occurs today with the New Forest ponies. This need not rule out the possibility that some degree of selective breeding was practised, as suggested by the 100 mm increase in withers height at the Longdoles Field site. Interesting, about a third of the horses at Gravelly Guy were juveniles and there is evidence for one very young animal, strongly suggesting that horses were being bred at some sites in the region. Two species of equid *E. caballus* and *E. asinus*, were identified at both Thornhill Farm and the Longdoles Field, Claydon Pike site and the possibility has been considered that hybrids of the two were also present (Levine 2004). All equids are likely to have been valued primarily as working animals; evidence for partial disarticulation and butchery marks at many sites suggests that at least some horses provided meat and hides but this may have occurred after an animal had reached the end of its working life. Certainly, the fact that horse bones were generally less comminuted suggests that they were not processed for food in the same manner as cattle.

Hunting appears to have continued on a small-scale. Although a range of wild animals was present at Longdole's Field, only weasel, quail and pigeon are likely to represent animals deliberately caught for their fur/feathers and meat. A few bones belonging to red and roe deer were found at Gravelly Guy and Somerford Keynes and the later site also produced a duck bone. Other than a single heron bone, no wild mammal remains, nor those belonging to bird or fish, were recovered from Thornhill Farm. A wider variety of wild animals was recovered from Iron Age deposits at Barton Court Farm including cat, red deer, fox, duck, and a few fish bones belonging to pike, eel and cyprinid.

During this period several sites produced a small numbers of bones belonging to domestic fowl including Claydon Pike Longdoles Field, Somerford Keynes, Barton Court Farm and Gravelly Guy. This is not unusual, domestic fowl bones have been found at contemporary sites although the earliest authenticated find is from late Iron Age deposits at Danebury (Coy 1984). At Gravelly Guy, the scarcity of bones belonging to domestic fowl led to the suggestion that the settlement was not particularly Romanised (Mulville and Levitan 2004). A few bones belonging to domestic duck and goose also came from the Longdoles Field site at Claydon Pike, taxa present at Gravelly Guy but where it is not known if the remains belong to domestic or wild forms.

Roman activity during the 1st/2nd to 3rd centuries

Longdoles Field, Claydon Pike was the only one of the four sites to produce animal bone assigned specifically to the 2nd and 3rd centuries AD (Chapter 5). As in previous phases, aggregated results indicate a slight but consistent increase in cattle at the expense of both caprines and pig. This trend is also visible in the small assemblage from the 1st- to 2nd-century Roman house at Barton Court Farm where it was suggested (Wilson 1986) that such changes reflect the continued effects of the Roman economy, a topic discussed in some detail earlier in this volume by Sykes (Chapter 5).

Changes in the mortality profiles of cattle and caprines are also apparent. At the Longdoles Field site, caprines were slaughtered at a slightly older age than in the preceding period, with 75% of the population surviving past 1-2 years perhaps indicating an increased dependence on wool and manure. Growing importance of secondary products is also reflected by cattle mortality, which shows an increase in the number of adult animals and a decrease (from 50% to 35%) in the proportion of cattle slaughtered by 15-26 months, a trend also seen at Barton Court Farm. By comparison to the earlier periods a much higher percentage (64%) of the adult cattle at the Longdoles Field site were male, which is interesting considering that an abundance of prime-aged females has been noted in Roman towns (Maltby 1994). This suggests that females were preferentially selected for urban provisioning whilst oxen and bulls were retained on rural sites, most probably for use in traction. A shift in the sexual composition of the herd could explain the increase in cattle size noted at the Longdoles Field site, although the other domesticates also increased in size at this point, indicating that other factors may be responsible. It seem likely that new animal breeds appeared in this period, but whether they were imported from the continent or selectively bred from native stock is difficult to ascertain. Certainly animals were now bred on site, as is indicated by the presence of foetal/neonatal cattle and caprine bones.

All the changes seen at Longdoles Field, Claydon Pike probably represent a post-conquest increase in production and commercialism, with the development of urban markets and a standardisation of rural-urban provisioning. At Barton Court Farm, the comparatively small sample recovered from 1st-2nd-century deposits led Wilson (1986) to consider the possibility that animals were kept in reduced numbers, perhaps due to an increase in arable land at the expense of pasture. An increase in the amount of arable land necessitated by the post-conquest rise in population (P Dark 2000, 82), has also been used to explain the decline in the frequency of pigs and increasing emphasis on cattle. The removal of woodland would have reduced the pasture available to pigs whilst the need for strong draught animals could have dictated the decision to retain male cattle and import or breed larger animals. Sheep/goat manure, higher in nutrients than that of cattle, would have been valued as fertiliser to improve the soils of the river gravels and may explain the keeping of caprines to an older age, and the increase in numbers evidenced at the Longdoles Field site.

An increased frequency and range of wild taxa was recovered from Longdoles Field with red deer, roe deer, hare, badger, fox, field vole, mole, duck, coot, grey heron, dunlin, snipe, blackbird, song thrush, crow and eel all represented. As Sykes (Chapter 5) states, 'this is clear evidence for the uptake of hunting, fowling and fishing'. The proportion of domestic fowl also increases to 3% and it has been suggested that this widening of the resource base resulted from a post-conquest change in dietary preferences, especially since hunting and the consumption of domestic birds are thought to have been traits of the Roman lifestyle (King 1991). According to Millett (1990), the uptake of hunting probably has more to do with a change in the social structure, the new elite having time to hunt and a desire to display wealth.

Late Roman activity

Longdoles Field, Claydon Pike also provides evidence for the continuation of on-site animal husbandry into the late Roman period and the intensification of trends started in earlier periods (see Chapter 6). The average age at death of cattle and caprines continue to rise indicating a concentration on secondary products; predominance of male cattle also suggesting definition of the agricultural economy and rural-urban provisioning systems. Similar patterns are exhibited by the 3rd-5th-century villa deposits from Barton Court Farm, where Wilson (1986) proposes that production concentrated on cereals, followed by domestic animal meat, dairy, hides, wool, game and fish. The possibility that salted beef was produced at the Longdoles Field site is hinted at by the high density of scapulae, many of which exhibit butchery marks indicative of smoking or brining.

The most notable change at Longdoles Field, Claydon Pike is the presence of foetal and sub-adult equid specimens which provides clear evidence that equids were now raised on site. This is not so unusual in the Roman period although horse breeding does not appear to have been ubiquitous; despite the increased frequency of horse in the small sample from Thornhill Farm and Barton Court Farm there was no evidence to suggest on-site breeding. The scarcity of butchery marks at the Longdoles Field site and the frequency of complete and articulated remains led Sykes (Chapter 6) to suggest that horses were treated differently to the other major domesticates. The recovery of an articulating hind limb, which appears to have been deposited complete with flesh, and the general abundance of hind-limb bones found both here and at contemporary sites, hints at some form of 'ritual' deposition.

The continued increase in the range and frequency of birds suggestive of a broadening dietary spectrum can also be seen in 3rd–5th-century deposits at Barton Court Farm where the numbers of domestic fowl increase and domestic duck and geese appear along with a wide range of wild birds, of which at least dove and plover were probably eaten. The presence of freshwater fish, perch, pike and eel suggest the small-scale exploitation of local waterways and the inclusion of fish in the diet.

Conclusion

Animal husbandry practices in the Cotswold Water Park and surrounding area appear to have developed in response to local environmental conditions and the pressures exerted by socio-economic forces. Although, displaying a different pattern to that seen at Wessex sites during the Iron Age, sites in the southern Cotswold region may have followed individual trajectories, in response to immediate environmental conditions. Since Neolithic times, cattle appear to have been kept in considerable numbers and despite the replacement of pig by caprines during the Iron Age, continue as the dominant species at most sites throughout the Roman period. In spite of the abundance of cattle in pre-Roman deposits and suitability of the local environment for cattle farming, their frequency does not increase to the levels reached at many settlements during the Roman period. Hence, whilst many of the changes in animal husbandry follow the nationwide trends generally attributed to the socio-economic influences of Romanisation, there are hints that these were essentially native sites. The post-conquest changes in the age, sex and size of domestic animals are therefore probably multi-causal in origin but appear to reflect the widespread agricultural intensification associated with population expansion. As a result, wooded areas were probably turned over to ploughland as greater areas of land were taken into arable production.

THE ENVIRONMENTAL ARCHAEOLOGY OF THE COTSWOLD WATER PARK

by Mark Robinson

Introduction

The Cotswold Water Park comprises an area extending about 20 km westwards primarily along the northern side of the River Thames from its confluence with the River Coln at Lechlade almost to Kemble south of Cirencester. In places, it is over 5 km wide, and is a low-lying area, much of which, before the onset of the major gravel extractions which created the Water Park, was First Gravel Terrace of the Thames and its tributaries. The Cornbrash Limestone of the lower slopes of the Cotswolds rises to the north, the Roman road of Akeman Street running westwards along the Limestone to Cirencester (see Fig. 1.3). There are some exposures of Oxford Clay between the Limestone and the First Terrace, while there is an area of the higher Second Gravel Terrace to the north from Lechlade. To the south of the Thames are further gravels, then Jurassic geology including Oxford Clay. The First Terrace is crossed by the Coln and various streams which drain from the Cotswolds into the Thames. The terrace is also dissected by shallow palaeochannels which in places resulted in the formation of islands of gravel terrace surrounded by broad areas of floodplain, but elsewhere the expanses of terrace are more extensive and the palaeochannels are narrow. There are some higher areas of Oxford Clay and Second Gravel Terrace between the Coln and the Thames.

The modern soils of the First Terrace range from the brown calcareous loams of the Badsey Series to the gleyed loam soils of the Kelmscot Series where drainage is impeded (Jarvis 1973). The floodplain has a soil of gleyed alluvial clay and experiences inundation some winters. Occasional severe floods extend onto parts of the gravel terrace. However, as will be outlined below, major hydrological changes have occurred to the floodplain during the Flandrian.

Much archaeological excavation has been undertaken in the area of the Cotswold Water Park over the past 25 years, particularly in advance of gravel extraction but also related to road-widening along the route of Ermin Street, which runs south-east from Cirencester across the Park (Fig. 1.2). The largest of these excavations was at Claydon Pike, at the eastern end of the Park, which is the main subject of this volume (see Chapters 3-8). However, important results were also obtained from the nearby site of Thornhill Farm, published separately (Jennings *et al.* 2004). Smaller excavations which are considered include Neigh Bridge, Somerford Keynes (Chapter 9), Whelford Bowmoor (Chapter 10) and Stubbs Farm, Kempsford (Chapter 11), and Latton "Roman Pond", Shorncote Quarry and Kempsford Multi-Agg Quarry (Mudd *et al.* 1999; Brossler *et al.* 2002; Barclay and Glass 1995; Digital section 8.4). It is not possible to obtain a complete

Flandrian environmental sequence for the Park from these sites but it is possible to show aspects of change and to obtain a more detailed picture for the Roman period.

Glacial environment

The First Gravel Terrace was laid down during the cold conditions of the Late Devensian and largely comprises limestone derived from the Cotswolds. Just before the end of the Late Devensian, river flow of the Thames became confined to fewer, more deeply incised channels and part of the terrace was reworked, lowering the surface level (Robinson and Lambrick 1984). Some of the shallower channels crossing the gravel terrace ceased to flow, leaving swampy hollows with still-water pools. That this change occurred under cold conditions was shown by the presence of seeds of *Betula nana* (dwarf birch) in organic marl in one of the shallow palaeochannels between two of the gravel islands at Claydon Pike. It is a low-growing arctic/highland-moor shrub. The overall picture of the Late Glacial (Late Devensian) landscape of Claydon Pike, which is probably applicable to the remainder of the Cotswold Water Park area, was of tundra conditions. The landscape was open, with a sparse herb cover to the gravel surface and some areas of dwarf birch scrub up to 1 m high. There were many small bodies of water fringed with sedges and *Chara* sp. (stonewort) grew in the deeper pools in the palaeochannels.

Early prehistoric environment

Climatic amelioration was suggested by the replacement of *B. nana* seeds by those of a tree species of birch in peat above the organic marl in the palaeochannel. This deposit possibly corresponded to the start of the Flandrian around 10,000 BP. Unfortunately other evidence for the early to middle Flandrian environment of the Cotswold Water Park was lacking. Pollen analysis of organic sediment from a palaeochannel on the floodplain of the River Leach to the north of Lechlade, which was dated to 9510±120 BP (Birm-1169), gave evidence of a landscape which was largely open but in which pine and tree birch were becoming established (Crabtree 1985, 46-8). However, the presence of some pollen of *Juniperus communis* (juniper) and *B. nana* showed that the Late Glacial vegetation had not entirely disappeared.

Evidence from elsewhere in the Upper Thames Valley suggested the development of complete tree cover and woodland succession on the floodplain and First Gravel Terrace (Allen and Robinson 1993, 135-8). By 6540 BP (Flandrian II), alder-dominated woodland was established on the floodplain, while oak and possibly lime woodland, with a hazel understorey, grew on the First Terrace. Pollen evidence from Daisy Banks Fen, Barrow Hills, near Abingdon, suggested lime and elm predominated

on the Second Gravel Terrace, with oak and hazel also present, at 4350-3750 cal BC (circa 5240 BP)(OxA-4559), shortly before the Elm Decline and the start of the Neolithic (Parker 1999, 260-3).

Further downstream, the valley floor of the Upper Thames Valley experienced much Neolithic activity. Neolithic tree-throw holes on the floodplain at Drayton, with evidence of burning, appear to have been related to clearance (Robinson 1992a, 50-51) and at Barrow Hills, major clearance occurred in the early fourth millennium cal BC and conditions remained relatively open thereafter (Parker 1999; Robinson 1999a). However, Drayton, for example, experienced episodes of clearance and regeneration. The picture that has emerged of the landscape on the gravels of the Middle and Upper Thames throughout the Neolithic is of a mosaic of clearings of various sizes set against a background of old woodland. Clearances were not necessarily permanent even when associated with major monuments such as the Drayton Cursus, indeed it is possible that most became overgrown with scrub or returned to woodland (Robinson 1999a, 272). There was certainly some Neolithic activity around the area of the Cotswold Water Park, for example there is a later Neolithic monument complex including a cursus on the Second Gravel Terrace to the NW of Lechlade and the Buscot Wick Cursus lies to the south of the River Cole near to its confluence with the Thames (Barclay *et al.* 2003, 190-213). Evidence of possible Neolithic impact on the environment within the area of the Cotswold Water Park was limited to undated tree-throw holes with signs of burning at Shorncote Quarry (Brossler *et al.* 2002, 41-2) and Stubbs Farm, Kempford. Neolithic flints are known from the area and Neolithic and Bronze Age ring ditches were excavated at Shorncote Quarry, Somerford Keynes (Barclay and Glass 1995). Neolithic activity in the area does, however, seem to have been less than further downstream in the Upper Thames Valley.

An organic deposit in a palaeochannel of the Thames at Buscot Lock, about 5 km east of Claydon Pike, formed under woodland conditions similar to those in the Water Park during the Neolithic (Robinson and Wilson 1987, 31-2). A radiocarbon date of 2900-2300 cal BC was obtained from an alder log within the sediments. Pollen and macroscopic plant remains suggested dense alder woodland alongside the river. The deposit contained many fruits of *Tilia cordata* (small-leaved lime), an insect-pollinated tree which does not produce large quantities of pollen. When differential pollen productivity is taken into account, the pollen can be interpreted as showing lime-dominated woodland on the drier ground. This appears to have been the major woodland type on better-drained soils over much of Southern England and the Midlands in the later Mesolithic and the Neolithic (Greig 1982). The terrestrial insect fauna from the Buscot deposit was characteristic of ancient woodland. Bones from Buscot gave evidence of some of the larger wild mammals which

lived in the woodland, including red deer and the now-extinct wild cattle, the aurochs.

Human activity was also occurring at Buscot. The bones from Buscot included a human femur and bones of domestic cattle. Pollen of *Plantago lanceolata* (ribwort plantain) and seeds of *P. major* (great plantain) suggested that there were small open areas, while Scarabaeoid dung beetles from the genera *Geotrupes*, *Aphodius* and *Onthophagus* were probably feeding on the droppings of domestic animals. Light-demanding thorn shrubs, such as *Prunus spinosa* (sloe) and *Rhamnus catharticus* (purging buckthorn), which were represented by their seeds, probably fringed the clearings. Crop remains were absent from Buscot but gathered woodland food plants, particularly hazel nuts, were utilised alongside cultivated cereals during the Neolithic (Moffett *et al.* 1989).

The degree of clearance on the gravel terraces and floodplain of the Upper Thames Valley during the early and middle Bronze Age remains uncertain. Many of the ring ditches which have been excavated further downstream from the Water Park tend to contain a layer of fine sediment above their primary silting, which has been interpreted as resulting from a long stable grassland phase (Robinson 1992a, 53). There is evidence for large permanent open areas on the Second Gravel Terrace at the monument complexes of Barrow Hills, near Abingdon and the Devil's Quoits, Stanton Harcourt (Robinson 1999a, 272-3). However, some areas of floodplain certainly retained their tree cover into the Bronze Age, for example parts of the lower Windrush floodplain (Robinson 1999a, 273). Within the area of the Cotswold Water Park, a cremation associated with a ring ditch at Shorncote Quarry, Somerford Keynes contained a tuber of *Arrhenatherum elatius* (onion couch grass), a grass of abandoned arable land and ungrazed pastureland which has often been found in Bronze Age cremations (Robinson 1995). A few cereal grains were also present in cremations from this site. Other parts of the Water Park remained wooded until the late Bronze Age, for example Latton "Roman Pond" (Scaife 1999).

Clearance was probably complete in the main valley of the Upper Thames downstream of the Cotswold Water Park, although clearance was still taking place on the floodplains of some of the tributaries, in the late Bronze Age (Robinson 1992a, 53). Agricultural intensification seems to have been occurring on the gravel terraces during this period. The pit alignments at Butler's Field, on the Second Gravel Terrace to the north of Lechlade (Boyle *et al.* 1998, 13-18) and in the Water Park at Somerford Keynes Cotswold Community (OA 2003) were perhaps features of the division of the landscape for agriculture. Around Latton "Roman Pond" oak-lime-hazel woodland was being cleared at about 1376-929 BC (NZA-8579) although some oak-hazel-alder woodland and scrub remained (Robinson 1999b; Scaife 1999). There was also evidence for

persistence of some woodland in the late Bronze Age at Shorncote Quarry on the First Gravel Terrace (Robinson 2002). A well, dated to 1110-811 cal BC, in a Bronze Age settlement, became overgrown by trees of *Acer campestre* (field maple) following its abandonment, although insect evidence suggested some grazed grassland as well as mixed woodland in the wider catchment.

Even though the area of the Cotswold Water Park was perhaps not fully cleared until the end of the late Bronze Age, progressive clearance and agricultural intensification were causing a change in the hydrological regime of the floodplain of the Upper Thames (Robinson 1992a 55; 1992b). The floodplain soil showed a greater similarity to the soil of the First Gravel Terrace and there was only a thin covering of soil over the floodplain gravel until the Iron Age. During the Neolithic and much of the Bronze Age, the water table of the floodplain was low and little or no flooding was taking place (Robinson and Lambrick 1984). However, the water table rose in the late Bronze Age. This was manifest within the Cotswold Water Park at Latton "Roman Pond" (Robinson 1999b, 497-500). The "Roman Pond" proved to be a shallow Pleistocene palaeochannel in the top of the First Gravel Terrace. The gravel bed of the channel showed involutions characteristic of tree-throw holes which cut a thin mineral soil overlying the gravel. These features were overlain by fen peat, the base of which was dated to 1376-929 cal BC (NZA-8579). The palaeochannel had probably been dry throughout most of the Flandrian and trees grew in a terrestrial soil on its bed. A rise in water table in the late Bronze Age resulted in the death of the trees and subsequently the formation of peat.

Iron Age environment

By the start of the Iron Age, around 650 BC, the gravel terraces and floodplain of the Upper Thames Valley, in all probability including the Cotswold Water Park, presented a fully agricultural landscape. At Claydon Pike, the houses and enclosures of the middle Iron Age settlement of Phase 1 (c 3rd – 1st century BC) were situated on three gravel islands separated by tributary palaeochannels (see Chapter 3). There was an extensive area of First Gravel Terrace to the north-east of the settlement, while the tributary palaeochannels opened into a broader area of floodplain to the south. Palaeoenvironmental evidence was limited by the lack of waterlogged sediments but mollusc evidence suggested dry open conditions on one of the islands. The floodplain was not as wet as the palaeochannel at Latton and fen-peat formation did not occur. Neither was there any evidence of flooding, although a particularly low-lying area of floodplain downstream at Yarnton, which comprised the bed of a shallow Late Devensian channel, experienced the onset of seasonal flooding in the Iron Age (Robinson forthcoming).

The bones and charred plant remains showed the occupants of the settlement were using the products of a mixed agricultural economy. Cattle and sheep were the main domestic animals, followed by pig and a few horses. Spelt wheat predominated amongst the cereal remains but hulled barley was also present. There was a little chaff of emmer wheat and a single rachis internode of free-threshing wheat but these need have been no more than minor components of the wheat crop. A few grains of oat were more likely to have been from wild oats growing as weeds. The domestic animals and crops were very much the familiar range known from the Iron Age of the Upper Thames Valley, for example the settlement on the Second Gravel Terrace at the Ashville Trading Estate, Abingdon (Jones 1978; Wilson 1978), indeed they are the usual domesticates for much of Southern England during the Iron Age (see Ingrem above). As at Ashville, the kill-off patterns for the cattle and sheep suggested the importance of secondary products from these animals. The weed seeds were interpreted as mostly being from crop-processing waste and gave useful information on the cultivated soils. The occurrence of *Galium aparine* (goosegrass) suggested some of the crops were autumn-sown, while that of *Rumex acetosella* agg. (sheep's sorrel) is characteristic of circumneutral soil over the higher areas of gravel terrace and the presence of *Eleocharis* sp. (spike rush) would suggest that cultivation extended onto soils experiencing at least spring waterlogging. All these aspects were also shown by some of the Iron Age weed assemblages from Ashville.

The interpretation of Iron Age and Roman charred crop and weed assemblages in an attempt to establish whether a settlement was an "exporter" or "consumer" site for grain has become a contentious issue, Stevens (2003) challenging some of the already contradictory views of Hillman (1981), Jones (1985) and van der Veen (1991). Their arguments will not be reviewed here in relation to Claydon Pike but it is still possible to make some useful comments on the Iron Age charred remains beyond the taxa grown and the weed ecology. Firstly, the assemblages from Claydon Pike were dominated by weed seeds and chaff rather than grain, so represented processing waste (see Chapter 3). As hulled cereals, spelt wheat and six-row hulled barley would probably have been traded as ears, spikelets or, in the case of the barley, grain still enclosed in the lemma and palea. If grain were to be subjected to pit storage, it would be essential that it had not been de-husked, otherwise grain damaged in the process would rot. (Grain storage pits were present on some Iron Age settlements on the Second Gravel Terrace, such as Gravelly Guy, Stanton Harcourt and Ashville, but are generally absent from the lower-lying sites, including Claydon Pike.) Therefore, the results suggest that grain was being de-husked and cleaned on the site but they do not indicate whether it was grown locally. Secondly, the

concentration of remains was very low in comparison with that found on some of the larger settlements with storage pits on the Second Gravel Terrace. The average concentration of remains from the middle Iron Age samples at Claydon Pike was 1.5 items per litre whereas the concentration for Ashville was over 9 items per litre (chaff was not quantified) (Jones 1978). Either the Claydon Pike settlement was only processing grain on a small scale or the products of the later stages of grain processing were neither being used for fuel nor burnt as waste but were, for example, being fed to domestic animals. It is entirely plausible that cultivation plots on the First Gravel Terrace supplied all the cereal needs of the settlement, even if the raising of domestic animals was a more important activity.

The middle Iron Age settlement at Thornhill Farm was of similar character to the middle Iron Age settlement at Claydon Pike, although the area of uninterrupted gravel terrace was more extensive because the shallow palaeochannels which formed extensions of the floodplain were narrower (Jennings *et al.* 2004). Although the middle Iron Age evidence was limited, waterlogged macroscopic plant remains suggested very open conditions, with nutrient-rich disturbed ground around the settlement. Charred cereal remains were absent but only one sample floated for charred remains could be attributed with certainty to the middle Iron Age. Very small quantities of cereal remains were recovered from a small middle Iron Age settlement at Shorcote Quarry (Pelling 2002). Cattle and sheep predominated amongst the animal bones from both Thornhill Farm and Claydon Pike.

The overall impression of the middle Iron Age landscape of the Cotswold Water Park is one of an open agricultural landscape which was perhaps primarily used for the raising of domestic animals but with arable fields on the drier ground being cultivated for crops including winter cereals. Doubtless some areas retained woodland which was exploited for structural purposes and fuel but its extent is uncertain. The relatively high water table, especially on the floodplain, would have ensured good growth of grass in summer while parts of the First Gravel Terrace would have been well-enough drained for successful cultivation and the overwintering of animals. It was perhaps significant that the Claydon Pike settlement was at a junction between the floodplain and the gravel terrace. It is thought likely that arable activity on the Water Park sites was not as great as on some of the settlements further downstream such as the Ashville Trading Estate.

Late Iron Age/early Roman environment

Major changes occurred at Claydon Pike during the early 1st century AD (see Chapter 4). Settlement was concentrated on a gravel island to the south of the area of floodplain, at Longdoles Field. Occupation of the Phase 2 settlement lasted for

about one century, from c AD 25-125. The settlement comprised penannular ditched enclosures although some linear boundaries were added towards the end of the phase. Some of the ditches were waterlogged and good environmental evidence was available for this phase. The evidence of pollen and Coleoptera suggested that the landscape during this phase was predominantly heavily-grazed grassland. Any woodland was distant from the site, although it is possible that there was oak woodland beyond the river gravels. The waterlogged seeds suggested marshy pasture on the lower-lying parts of the site, with tussocks of the *Juncus effusus* group of rushes. The pasture in the vicinity of the enclosures seems to have experienced overgrazing and damage from trampling, in places being churned into mud enriched with dung with weeds such as *Juncus bufonius* (toad rush) and *Chenopodium rubrum* (red goosefoot). Scarabaeoid dung beetles, such as *Aphodius granarius*, were particularly abundant. The seeds and pollen also gave a hint of dry calcareous grassland growing on the unoccupied gravel islands. The same range of domestic animals was represented by bones as was recorded for the middle Iron Age. However, the presence of the marsh snail *Lymnaea truncatula*, which is the intermediate host of the sheep liver fluke, would have made conditions more suitable for raising cattle or horses rather than sheep.

The carbonised plant remains comprised the same crop species as in the middle Iron Age, with weed seeds and chaff again predominating. The charred weed seeds as before included species such as *Rumex acetosella* agg. (sheep's sorrel) and *Sherardia arvensis* (field madder) which would be appropriate to well-drained soil on the gravel terraces. However, the concentration of remains had fallen to 1 item per litre. A little waterlogged chaff of spelt wheat was also found.

Very similar results to those from Phase 2 of Claydon Pike were obtained from the late Iron Age phase of Thornhill Farm (Periods B and C). Waterlogged macroscopic plant remains, charred plant remains, molluscs and insects were all analysed from the enclosure ditches of the settlement. Conditions were very open, with grassland predominating. There were again many waterlogged seeds of ill-drained pasture with rush tussocks while Scarabaeoid dung beetles, such as *Aphodius granarius*, were so abundant as to suggest a particular concentration of domestic animals around the settlement. The concentration of charred remains was lower than at Claydon Pike and, unusually for a site of this date, the great majority of the carbonised seeds were not of arable origin but appear to have been derived from coarse herbage. The only crop identified with certainty was spelt wheat. The settlement area itself seems to have been drier than the settlement at Claydon Pike, with weeds of various disturbed or waste-ground habitats. There was evidence from woodworm beetles for the presence of timber structures on both

settlements but there were few other settlement-associated insects. Another site in the Cotswold Water Park, Kempsford Multi-Agg Quarry, on the First Gravel Terrace, had ditches of late Iron Age / early Roman date which held waterlogged sediments. These too contained seeds of plants of damp pastureland, such as *Potentilla anserina* (silverweed).

The primary and possibly the sole purpose of the 1st-century AD settlements at Claydon Pike and Thornhill Farm appears to have been the management of grazing in the valley bottom. Indeed it is possible that Thornhill Farm was an outlier of Claydon Pike. It is probable that the heavily-grazed pasture with ill-drained tussocky areas in the floodplain hollows covered several square kilometres of the valley bottom. Such an interpretation would be consistent with the layout of the enclosure ditches. Given the presence of the snail *Lymnaea truncatula* at both sites, the settlements probably shared an emphasis on the raising of cattle or horses. The occupants of the settlements certainly used cereals and it is possible that they were grown on the higher areas of gravel terrace. The weed assemblages were similar to those from the middle Iron Age settlement at Claydon Pike, including the presence of species characteristic of autumn-sown cereals. However, the very low concentration of cereal remains at Thornhill Farm was used to suggest that cereals had been imported from elsewhere.

It has already been argued that there was some degree of specialisation of settlements in the Upper Thames Valley during the middle Iron Age, with settlements on the floodplain and First Gravel Terrace concentrating on pastoralism, while the settlements on the Second Gravel Terrace and higher terraces concentrated on arable cultivation. The rising water table and the increasing extent of flooding, such that much of the floodplain was experiencing seasonal inundation by the end of the Iron Age, would probably have encouraged such specialisation. An increasing wetness and a reluctance to reduce floodplain grazing in the wetter months resulted in the development of overgrazed marshy pasture with rush tussocks and areas of nutrient-rich mud elsewhere in the Upper Thames Valley, including Port Meadow and Farmoor, during the middle Iron Age (Lambrick and Robinson 1988, 65-71). High proportions of Scarabaeoid dung beetles likewise showed the grazing pressure on these sites.

What is unclear about the settlements of Claydon Pike and Thornhill Farm is their relationship with other settlements in the region, especially on the drier ground to the north. If they were subsidiary grazing settlements, they would probably have been supplied with their grain needs from a parent settlement on the higher ground. If, however, they were independent settlements, it is much more likely that they would have grown some cereals even if domestic animals were traded to purchase, for example, metal items.

The period covered by Phase 2 of Claydon Pike and Periods B and C of Thornhill Farm extended from the late Iron Age to well beyond the Roman conquest of Britain in AD 43. The Roman fort at Cirencester would have been contemporaneous with the second part of Phase 2 at Claydon Pike. While it is plausible that the garrison of Cirencester obtained supplies from Claydon Pike, the environmental archaeology of Phase 2 remained Iron Age in character. The various horticultural crops which were Roman introductions to Britain and found from the subsequent Roman phases of the site were absent. The arable weeds of Mediterranean origin which arrived in Britain shortly before the Roman conquest, such as *Agrostemma githago* (corn cockle), were also absent.

The Roman environment of the 2nd and 3rd centuries AD

A major re-organisation of the layout of the settlement at Claydon Pike occurred in the early 2nd century AD (see Chapter 5). The circular enclosures of the previous phase, on the gravel island at the Longdoles Field site, were replaced by large rectilinear ditched enclosures, aisled buildings and a ditched trackway. The layout of the Phase 3 settlement lasted until the early 4th century, albeit with numerous modifications. A wide range of palaeoenvironmental evidence was available both from the settlement and from some of the outlying ditches. The pollen from Phase 3 suggested that the landscape remained as open as in Phase 2, with some distant oak woodland. However, there was evidence from macroscopic plant and insect remains to suggest that some of the boundaries on the site were lined with osiers and ash trees. The main environment suggested by the pollen, macroscopic plant remains and insects from the outlying ditches was species-rich hay meadow belonging to MG4 or MG5 of the National Vegetation Classification. Such grassland is characterised by a distinctive flora including *Ranunculus acris* (meadow buttercup), *Rhinanthus minor* (yellow rattle), *Leucanthemum vulgare* (ox-eye daisy) and *Centaurea nigra* (knapweed), which were represented by their seeds. On the wetter areas of the floodplain, this grassland seems to have graded into fen meadow. There was no evidence for extensive areas of disturbed or cultivated ground outside the settlement. It is thought probable that seasonal flooding was occurring on at least the lowest part of the floodplain at Claydon Pike during Phase 3 but there was no evidence of flooding extending onto the gravel islands.

The settlement area itself seems to have been drier than in Phase 2, which was perhaps due to the Roman ditch system. The ditched boundaries within the settlement appear to have been lined with trees and hedgerow shrubs. Those areas of the settlement that were not bare ground mostly supported weed communities of disturbed and

neglected ground. In comparison to the previous phase, there was a great increase in the proportion of *Anobium punctatum* (woodworm beetle) and various other synanthropic beetles which occur in indoor habitats and in accumulations of organic material such as old straw and haystacks. These results very much support the archaeological evidence for the presence of timber buildings. There was plenty of evidence from the waterlogged macroscopic plant remains for the importation of plant material, particularly hay. Some of the hay showed a floristic association with the vegetation of the wetter parts of the floodplain yet there were also seeds of species from well-drained hay-meadow communities.

One waterlogged deposit contained cereal straw and chaff of *Triticum spelta* (spelt wheat), along with seeds of weeds strongly tied to arable agriculture, *Agrostemma githago* (corn cockle) and *Scandix pecten-veneris* (shepherd's needle). However, charred cereal remains were very much more abundant. The average concentration of charred remains was ten times greater than in Phase 2, with an average of 11.2 items per litre. One pit contained 117.5 items per litre and a sample from an oven contained 221.6 items per litre. The charred assemblages were dominated by chaff from the de-husking of spelt wheat and there was a wide range of weed seeds. As previously, spelt wheat and hulled *Hordeum vulgare* (six-row hulled barley) were the main grains. Any oat grains could have been from wild oats growing as weeds. It is possible that *T. dicoccum* (emmer wheat), which was represented by a significant quantity of chaff, was grown as a crop in its own right but it is also possible that it was growing as a minor component of the spelt wheat crop. There was a very slight presence of chaff of free-threshing wheat but it is thought to have been growing amongst the cereal crops. Oven 2103, which probably belonged to the later 3rd or early 4th century AD, had probably been fuelled on the de-husking waste of spelt wheat. Over 90% of the cereal remains from the oven were glumes of hulled wheat. It is possible that the oven had been used both for the parching of spelt wheat, to facilitate de-husking, and the parching of sprouted spikelets as part of the malting process. The oven probably represented a centralised cereal-processing facility for the settlement.

The charred weed assemblages included the same species that were found in the middle Iron Age that were argued as suggesting that at least some of the crops were autumn sown and the areas of cultivation ranged from well-drained circumneutral or calcareous soil to soil experiencing at least spring waterlogging. A characteristically Roman aspect of the weed assemblages was the first appearance in Phase 3 of *Anthemis cotula* (stinking mayweed), which is typical of heavy calcareous soil. This phase had a higher proportion of charred seeds of grassland plants, including hay-meadow species such as *Rhinanthus* sp. (yellow rattle). Some of the

weed seeds could have been from burnt hay rather than from cereal-processing waste.

Remains of other possible field crops from this phase included *Linum usitatissimum* (flax) and *Vicia faba v. minor* (field or celtic bean). Only single seeds of each were found charred, but neither crop usually comes in contact with fire during processing, so they will be under-represented in charred assemblages. It is not possible to ascertain the importance of either crop, although water-logged seeds and capsules of flax were also found. The First Gravel Terrace would probably have been well-suited to flax cultivation.

Cattle, sheep, pig and horse were again represented by bones and the sheep parasite *Melophagus ovinus* was identified. Scarabaeoid dung beetles indicated that domestic animals grazed in and around the settlement but they were only about a third as abundant as in the previous phase. Some grazing was probably occurring on the grassland being cut for hay. Indeed, the traditional management of Upper Thames Valley hay meadows was for the hay to be cut in late June or early July and the aftermath grazed from August until early spring, unless prevented by flooding (Baker 1937).

Whereas the environmental archaeology of the Phase 2 settlement at Claydon Pike was of Iron Age or "native" character, the Phase 3 settlement showed a fully Roman character. The increase in the proportion of synanthropic beetles related to a greater intensity of occupation has already been mentioned, although those beetles introduced by the Romans which are associated with the large-scale storage of processed grain were absent. There was also a proliferation of horticultural crops, most of which were Roman introductions, including:

Brassica sp. (not nigra) ?cultivar (cabbage etc)
Coriandrum sativum (coriander)
Prunus domestica (plum)
Apium graveolens (celery)
P. avium (cherry)
Anethum graveolens (dill)
Pyraster pyraster (pear)
 ?*Satureja hortensis* (savoury)

All these fruits, flavourings and vegetables could have been grown in plots within the settlement area. *Buxus sempervirens* (box) and *Pinus pinea* (stone pine) were possibly grown for ornamental or ritual purposes, although the cone of *P. pinea* could have been a Mediterranean import. The bones also suggested a more varied diet, with both fish and bird being eaten alongside the domestic mammals that were consumed in the earlier phases. Shell of marine oysters was present.

It is clear that at least one of the major activities of the Claydon Pike settlement was the management of hay meadow on the floodplain and gravel terrace and the collection of the hay at the settlement. Evidence from a Roman roadside ditch at Thornhill Farm, about 0.75 km to the west, suggested that the hay meadow extended at least

that far. The scale of hay production seems greater than would have been needed for use as fodder for domestic animals overwintered within the settlement, given the decline of Scarabaeoid dung beetles in comparison with the previous phase. One possible interpretation of the site would be that Phase 3 of Claydon Pike was a depot concerned with the production of hay, possibly for supply to the civil administration, although there is no direct evidence for this. This area of the Cotswold Water Park would have been particularly suitable for the production of hay. The rise in water table would have reduced problems from early summer drought while the underlying gravel would have prevented permanent soil waterlogging. The vulnerability of the grassland to damage by overgrazing when the ground was seasonally waterlogged, as occurred during Phase 2, would have been removed by this change of management. The establishment of towns such as Cirencester would have resulted in a major demand for fodder.

Various other agricultural activities also occurred at Claydon Pike. Cereals could have been grown on the higher areas of the gravel terrace at least to supply the needs of the occupants of the site. The dung-beetle evidence showed that some domestic animals were being kept locally and a likely management regime of the meadowland to prevent the development of coarse, tussocky herbage would be the grazing of the aftermath. It is possible that the site generated a surplus in animal products beyond its own needs (see Chapter 16 for wider discussion).

Other Roman settlements of similar date to Phase 3 of Claydon Pike have been excavated in the Cotswold Water Park but not much palaeoenvironmental evidence is available from them. Small quantities of charred crop-processing remains, including spelt wheat and hulled barley, were found at Neigh Bridge, Somerford Keynes (Chapter 9), Whelford Bowmoor (Chapter 10) and Stubbs Farm, Kempford (Chapter 11). *Quercus* sp. (oak) seems to have been the main fuel used at Somerford Keynes. There was no reason to believe the sites were other than mixed farming settlements.

Some aspects of the Romanisation shown by Phase 3 of Claydon Pike were shown by other sites in the Upper Thames Valley and beyond. It seems that no later than the third century AD, the diet of the inhabitants of the Upper Thames Valley had become very Romanised, with the consumption of spicy, oily food (Robinson 1992a, 58). Exotic fruit were being eaten, including plum and cherry, both of which appear to have been Roman introductions to Britain, although well-suited to local cultivation (Moffett *et al.* 1989, 246). The meat component of the diet also became more varied. Domestic fowl bones were present on most sites and marine oyster was being imported into most settlements in the region. Wild birds and fish were also being consumed. The exotic horticultural crops were even being used on low-status sites such as Farmoor (Lambrick and

Robinson 1979, 127). Leaves of box were also found at Farmoor. The increase in beetles which flourish in various habitats associated with buildings, including the woodworm beetle, occurred on other sites and was probably a result of a greater intensity of occupation on the gravels (Robinson 1992a, 58). The centralisation of cereal de-husking using corn-driers is also a feature of many settlements.

Where Claydon Pike differed from other settlements on the Upper Thames Gravels was the apparent emphasis of the site on the production of hay. Claydon Pike was not the only site in the Upper Thames Valley with evidence for the management of grassland in the region as hay meadow. A sample from an early Roman well at Farmoor contained a component of cut hay (Lambrick and Robinson 1988) and it is possible that the use of hay was a practice introduced to the region by the Romans. However, no other site has the scale of evidence as Claydon Pike and no similar site is known from outside the region.

Despite the evidence from some aspects of material culture, there was little in the environmental archaeology of Phase 3 at Claydon Pike to suggest that it was of high status. The cone of stone pine is the one possible exception. Most discoveries of stone pine in Britain have been from towns, military sites and large villas (Kislev 1988).

Late Roman environment

In the early 4th century AD, occupation became confined to the eastern end of the settlement at Claydon Pike and a small villa was constructed, which defines the beginning of Phase 4 (see Chapter 6). The main villa building was later surrounded by two successive enclosure ditches. Agricultural enclosures were located to the west. The villa remained in use until at least the end of the 4th century AD and possibly did not fall into disuse until the early 5th century AD. As for the previous phase, a wide range of environmental evidence was available from Phase 4.

The pollen results suggested that grassland continued as a major aspect of the landscape throughout the late Roman period. The background presence of ancient woodland remains low while the macroscopic plant remains suggested that there were ash trees growing along some of the boundaries. There was a trace of pollen from hay-meadow plants, such as *Rhinanthus* sp. (yellow rattle) and *Centaurea nigra* (knapweed), but there was no evidence of hay brought to the site. A rise in the proportion of Scarabaeoid dung beetles suggested a significant presence of domestic animals around the site and it is thought likely that more of the grassland was being grazed than in Phase 3.

Both the waterlogged macroscopic plant remains and the insects gave evidence that part of the villa enclosure was overgrown with stinging nettles and other coarse herbs, such as *Malva sylvestris* (common mallow). There was no reduction in

beetles associated with structural timbers, other indoor habitats and accumulations of decaying organic material, showing that the intensity of occupation of the villa remained high. The waterlogged remains included small quantities of crop-processing remains, including flax as well as cereals. The concentration of charred remains, at 5.7 items per litre, was only half that of the previous phase but charred remains were still consistently more abundant than from Phase 2. There was a higher proportion of grain than in the Phase 3 samples but chaff and weed seeds were also well represented. A similar range of weed seeds was present as in the previous phase. The bones likewise suggested that the same range of domestic animals was being kept and that secondary products retained their importance.

Most of the same horticultural crops that were used in the previous period were also present in Phase 4 at Claydon Pike. Two additions were *Fragaria vesca* (wild strawberry) and *Foeniculum vulgare* (fennel). There were also interesting records of Brassica species. Both *B. nigra* (black mustard) and another Brassica cultivar, possibly *B. oleracea* (cabbage), were identified. Insect remains suggested two other economic activities which could have taken place at the villa. Several examples of worker honey bees were found, raising the possibility of bee-keeping. The occurrence of flowing-water beetles from the family *Elmidae* in a rectangular tank cut below the water table suggests that fish might conceivably have been brought from the river to the tank for live storage. The late Roman villa was perhaps primarily concerned with the grazing of domestic animals. Much of the floodplain was probably experiencing flooding but would still have been suitable for grazing. There was no evidence that flooding extended onto the gravel island, on which the villa was situated, during the late Roman period. It is possible that the villa had a mixed agricultural economy and some higher ground was used for arable.

Limited palaeoenvironmental evidence was obtained from other sites in the Cotswold Water Park for this period. In general, the evidence was of increasing wetness on the low-lying areas of these sites. At Whelford Bowmoor, late Roman peat developed above some early Roman ditches (see Chapter 10). The results from Phase 4 of Claydon Pike show many similarities with the Barton Court Roman Villa near Abingdon (Miles 1986 fiche 6-9). This site too was involved in mixed farming, although flax cultivation seems to have been more important than at Claydon Pike. The Barton Court Villa showed all the aspects of Romanisation shown by the villa at Claydon Pike, including, for example, the use of horticultural crops. Although both sites had faunas of synanthropic beetles including minor pests of stored food products, neither site had any examples of the serious insect pests of stored grain. These beetles, which were introduced by the Romans, are associated with

larger-scale storage of processed grain and have been recorded from villas in other regions. Roman villas are uncommon on the gravels of the Upper Thames Valley and small settlements laid out alongside droveways were more usual. The settlements on the edge of the floodplain tended to concentrate on the raising of domestic stock and the exploitation of floodplain grassland (Robinson 1992a, 57). By the late Roman period, flooding was extending over the full area of the modern floodplain. There had been a few early Roman attempts at cultivation on high areas of the floodplain, for example at Yarnton (Robinson forthcoming) and Drayton (Robinson 1992b, 203) but both these were abandoned and the ploughsoils were sealed beneath Roman alluvial clay.

Post-Roman environment

Earlier Saxon evidence was lacking from the Cotswold Water Park sites. Evidence from sites further downstream suggested that an open agricultural landscape remained on the gravel terraces following the end of the Roman period but that floodplain alluviation largely ceased (Robinson and Wilson 1987, 59-62). Alluviation resumed in the late Saxon period and continued into the early medieval period. Alluvial sediment of this date filled the tops of Roman ditches around the gravel islands at Claydon Pike (Chapter 7). Analysis of molluscs from the alluvial sequences has shown that much of the floodplain changed from being pasture to hay-meadow in the late Saxon or early medieval period (Robinson 1988). Alluvium containing hay-meadow molluscan faunas was found overlying Roman ditches at Claydon Pike, Thornhill Farm, Somerford Keynes and Stubbs Farm, Kempsford. Similar alluvium filled the top of the Latton "Roman Pond" (Robinson 1999b, 499-500). Alluviation in the Upper Thames Valley largely ceased in the late medieval period but flooding of the floodplain has continued to the present day.

Although settlement did not continue at Claydon Pike beyond the end of the Roman period, waterlogged deposits were found in a late medieval well cut through the late Roman ruins in the Longdoles Field site (see Chapter 7). Pollen evidence suggested that the medieval landscape was more open than the Roman landscape, with any woodland, scrub or hedges being very minor or distant features. Pollen, waterlogged seed and insect evidence all pointed to an environment of hay meadow. The seeds of a mixed meadowland flora included:

Ranunculus cf. *Acris* (meadow buttercup)
Plantago lanceolata (ribwort plantain)
Rumex acetosa (sorrel)
Leucanthemum vulgare (ox-eye daisy)
Primula cf. *veris* (cowslip)
Centaurea nigra (knapweed)
Rhinanthus sp. (yellow rattle)
Leontodon sp. (hawkbit)

This meadowland could have belonged either to *Alopecurus pratensis* – *Sanguisorba officinalis* flood meadow (MG4) or *Cynosurus cristatus* – *Centaurea nigra* meadow (MG5) of the National Vegetation Classification (Rodwell 1992). Both of these categories of grassland only retain their species composition if shut up in late winter/early spring, mown in June or July and the aftermath grazed. The occurrence of Scarabaeoid dung beetles suggested that some light grazing was occurring, which could have been the grazing of the regrowth. There is much documentary evidence for hay meadow on the floodplain of the Upper Thames Valley well into the 20th century, supplying the needs of animals kept in byres over winter and in the towns. It has now largely disappeared as a result of fertiliser application, ploughing and re-seeding and herbicide use. Traces of ridge and furrow on the higher area of gravel terrace at Thornhill Farm, however, showed that at least some medieval cultivation was occurring in the Water Park area (Jennings *et al.* 2004).

Conclusion

The environmental archaeology studies in the Cotswold Water Park have shown major changes brought about to the vegetation and landscape over the past 10,000 years. The climatic amelioration at the end of the Devensian Glaciation was initially responsible for driving the changes, with the stabilisation of river channels re-working the floodplain gravels and the abandonment of shallower channels. Warming also caused the replacement of tundra vegetation with open woodland and woodland succession. Major human impact began in the Neolithic, with small-scale and probably temporary clearance. Although major permanent clearances probably began earlier further downstream in the Upper Thames Valley, an open organised agricultural landscape had been created by the Iron Age. The human-induced changes, however, had their unintended consequences. A rise in water table during the Bronze Age and a subsequent onset of flooding has been attributed to the effects of tree clearance in the catchment (Robinson and Lambrick 1984). The mixed farming settlements of the middle Iron Age were replaced in the 1st century AD by a more specialised settlement at Claydon Pike concentrating upon grazing the low-lying grassland. However, the increasing wetness resulted in damage to the grassland by overgrazing. Political factors were probably responsible for the early Roman re-organisation of the Claydon Pike – Thornhill Farm area (see Chapter 16) but it resulted in a better management of the valley bottom in relation to the increasing wetness. Hay was produced on the lower-lying areas and cereals were probably grown on the driest part of the First Gravel Terrace. Romanisation resulted in the arrival of various exotic horticultural crops. The late Roman change

at Claydon Pike from an establishment concerned with the collection of hay to a small villa undertaking was again probably political (see Chapter 17). The abandonment of this villa was due to the ill-understood events which caused the collapse of Roman Britain, rather than any local environmental factors. However, late Saxon agricultural revival, with increasing cultivation of the Cotswold slopes, caused soil to be eroded into the river system and extensive alluviation occurred on the floodplain (Robinson and Lambrick 1984). The cessation of this alluviation was possibly one of the effects of the Black Death, when large tracts of the Cotswolds which had formerly been cultivated were turned over to sheep pasture. The floodplain and lower areas of the First Gravel Terrace became, from the

late Saxon period onwards, highly productive hay meadow, very much taking advantage of the beneficial aspects of the seasonal flooding.

Many of the developments shown in the Cotswold Water Park follow the general pattern shown further downstream. On present evidence, there seems to have been less alluviation on the floodplain, in the Roman period, above Lechlade than below. However, the one feature which stands out is the management of the large area around Claydon Pike for hay meadow by the early to mid Roman establishment of Phase 3. This was possibly the result of the proximity of the area to Cirencester, although no such evidence has been obtained from the vicinity of Dorchester, a major town on the gravels of the Upper Thames Valley.