

A brief history of Port Meadow and Wolvercote Common and Picksey Mead, and why their plant communities changed over the last 90 years

A. W McDonald

Summary

A multidisciplinary approach to landscape history enabled the examination of botanical, hydrological and agricultural data spanning some 4,000 years. The results showed Bronze Age humans affecting the vegetation by pasturing cattle on the floodplain extending from Yarnton to Oxford. In the Iron Age pastoralists were over-grazing Port Meadow and, between the sixth and ninth centuries, part of the floodplain was set aside for a hay crop whilst the aftermath or second grass crop continued to be shared as pasture. By Domesday floodplain meads were the most expensive land recorded in this survey and Port Meadow was established as common land belonging to Oxford. Having discussed the soil and water conditions on the floodplain and its potential effect on the plant communities, the management history of Port Meadow with Wolvercote Common is followed by that of Picksey Mead. Finally, the plant communities are discussed. Those established in 1981/2 are compared with data sets for the early 1920s and for 1996-2006. Changes in the species composition between sites are due to different management regimes and those over time and within sites are attributed to changes in the water-table.

Introduction

The Oxford grassland comprises common pasture and mead situated on alluvium over limestone gravel. It is unusual for its four thousand years of management history and evidence for the effect this has had on the vegetation. Sited in the upper Thames valley, within three miles of Oxford City centre, Port Meadow (325 acres/132 ha) and Wolvercote Common (75 acres/30.4 ha) (Figure 1 and Figure 2) are known locally as the Meadow, even though they are pasture¹. In contrast, Picksey Mead, meaning the island of Pic - a 6th century farmer (Gelling 1953/4) (115 acres/46.6 ha) (Figure 3), is of similar antiquity but has been managed as a hay-mead since the 10th century and probably earlier. (Picksey is so named in this study to commemorate an early name for the 19th century Pixey Mead, now found on Ordnance Survey Maps.) Rights of intercommoning were registered under the Commons Registration Act 1965. This was an ancient agricultural system in which two or more settlements share the products of the land not under cultivation for arable crops, e.g. Port Meadow and Wolvercote Common, which was pasture shared by Wolvercote, Binsey and Medley and also mead shared by Wolvercote, Yarnton and Begbroke.

The antiquity of these grasslands is shown by archaeological and documentary evidence (Lambrick & McDonald 1985, Hey 2001). 'Round Hill' shown on Port Meadow on modern Ordnance Survey maps, for example, is a remnant of one of several Bronze Age barrows situated along its eastern boundary on the edge of the River Thames floodplain. At this time pastoralists grazed cattle on the floodplain, and so kept it clear of trees, but lack of flooding and its associated water-logged deposits, means that there is no evidence for the character of the Oxford grassland at that time.

¹ Traditionally, pasture = land (sometimes but not always referred to as 'the waste') grazed by animals throughout the summer, usually cattle but by sheep in the uplands; mead = flood-plain land cut for hay and then grazed; meadow = land either used for pasture or mead.

In Yarnton, however, trackways to and from the floodplain suggest that pastoralism was established on the floodplain in the Middle Bronze Age when continuing water-logged conditions preserved biotic evidence indicating grassland with a mixture of grasses and herbs, including species which can be found on Port Meadow and Wolvercote Common today (Hey 2001, Robinson this volume).

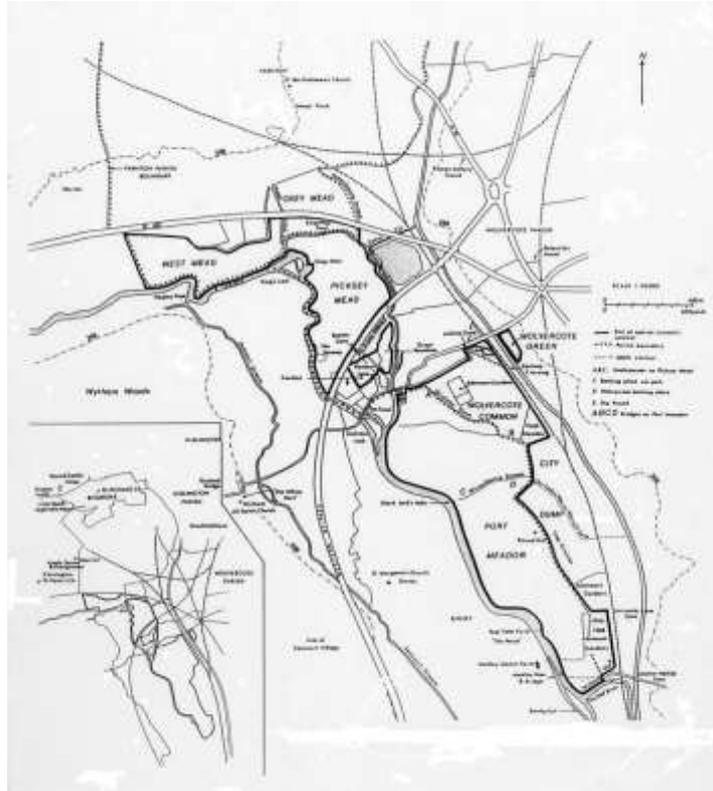


Figure 1. The Oxford grassland showing the location of Port Meadow, Wolvercote Common and Picksey, Oxy and West Meads. Oxford is to the south-east.



Figure 2. View over Wolvercote looking over Wolvercote Common towards Port Meadow, with Cumnor and Wytham hills beyond.



Figure 3. View over Picksey Mead looking north from the foot of Oxford's western by-pass.

By the turn of the first millennium A.D., the Thames valley had become, biologically, a diverse landscape. Some elements of woodland on the hill sides had been converted to grassland by pasturing sheep but the landscape provided the essentials for a settled

farming community with its tribal units and complicated systems of communal land tenure (Vinogradoff 1892, Laing 1979, Taylor 1981). As the population grew during the Iron Age the grassland was ploughed for arable, and winter rainfall which had run off the grassland causing flooding in the valley now included soil from freshly-ploughed soils which was deposited as alluvium on the floodplain (Robinson & Lambrick 1984). Archaeological evidence also confirms the continued use of the Meadow during the Iron Age when three small settlements, and their associated animal enclosures, were in use at the same time or in succession to each other until the floods forced the people to live on higher ground (Lambrick & McDonald 1985). Archaeological evidence for hay-making under Roman rule in the second and fourth centuries near Farmoor (Lambrick & Robinson 1988), might suggest that the contrasting land-use of pasture and mead on the Oxford grassland may also have been established as early as the Iron Age, but the history of their management and environmental archaeology so far indicate that the introduction of hay making to part of the Oxford grasslands at least, did not occur until the sixth century. They remained the same in essence from then until the 21st century (McDonald 2007, Robinson this volume).

Records in the Domesday Book (1087), show that in the early Medieval period the King owned the land and feudal villeins (tenants), sharing land belonging to the Lord of the Manor (held from the King), practised an agricultural system that was used throughout England and beyond. An allocation of the 'ridge and furrow' arable land had with it the right to graze the common pasture and to cut hay and graze the common flood-meads. Indeed, floodplain meads were the most valuable land recorded in the Domesday Book because their hay enabled the farmers to keep cattle and horses alive over the winter (Morris 1978, Crossley 1990, McDonald 2007). Mead management was tightly controlled and plots of land called mowths or lots were allocated by the luck of the draw, thus ensuring that each farmer received a fair share of both good and bad hay. Records of the tokens used to show ownership of the mowths are sparse but similar symbols were in use in lowland England, the Orkneys and northern Europe (Brian 1999).

Over the last thousand years there have been periods when sharing the common land was a problem. Enclosure of estates and the accompanying extinguishment of common rights gave power to the landowners to manage their own land, to the detriment of their tenants, so the King brought in the Statutes of Merton (1235) and Westminster (1285) to control enclosure/encroachment of the commons, particularly by the Lord of the Manor (Richardson 1978). Loss of the common pasture, Port Meadow, for example, which had begun when King Ethelred gave the Island of Binsey to the Monastery of St. Frideswide in the 11th century, continued into the 19th century when the Freeman and the Duke of Marlborough both sold land to the canal and railway companies, despite the 1235 and 1285 Acts. The Oxford grassland is currently protected in two ways, firstly as common land, under the Commons Registration Act 1965, and secondly, as a Site of Special Scientific Interest, under the Wildlife and Countryside Act 1981. Picksey Mead, as MG4 flood-meadow (see below), and Port Meadow, due to the presence of Creeping Marshwort (*Apium repens*), are protected under Annex 1 of the European Union Habitat and Species Directive (Jefferson this volume), and the Meadow is also a National Heritage Site. Provided that the general public plays its part in alerting the authorities to any plans

for untoward management or enclosure proposals, this common land should be safe for the future (McDonald 2007).

Influences such as the effect of flooding by the adjacent river Thames, grazing and cutting can change the species-composition of this floodplain grassland. For example, in the late 18th and early 19th centuries, when the level of the Thames was raised for navigation purposes, and for the needs of Wolvercote and other mills, the river broke its banks and summer flooding changed the flood-mead vegetation (no species mentioned) (Stapleton 1893). Similarly, the continuing use of common grazing rights is responsible for the plant species growing in the pasture and mead today. It is fair to say that their management has fluctuated from intensively managed swards, with many weedy species of plants (as in the Iron Age and Modern Periods on the Meadow), to rarely grazed grassland when trees may have invaded the floodplain (Robinson & Lambrick 1984). It was not until the 20th century that a comparison of botanical data collected in the 1920s (Baker 1937), 1981-2 (McDonald 2007) and 1996-2006 (McDonald & Lambrick 2006), could show the detailed changes in species-composition of the grassland discussed in this paper.

Soil and water conditions

The Oxford grassland (Figure 4) lies on the upper Thames floodplain consisting of limestone gravel of varying thickness, deposited at the end of the last Ice Age, over Oxford Clay. These alluvial soils vary from *circum* neutral (pH 7.4) on Port Meadow to acid (pH 5.5) on Picksey Mead with fluctuations from neutral to acid in both areas (McDonald 2007). Flooding occurred over the last 10,000 years but was not important for the Oxford grassland until, in the early Bronze Age, pastoralists found the Meadow suitable for burying their relatives in the Meadow's flood-free grassland. In the Iron Age and Medieval Periods, flooding occurred only in winter. When the uplands were ploughed, soil surfaces eroded from fields ploughed in the autumn, were carried by flood-water and deposited as alluvium along the Thames valley floor (Robinson & Lambrick 1984).

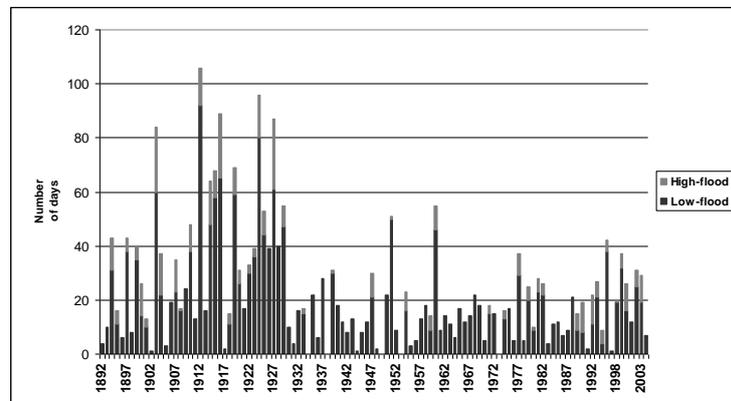
The importance of alluvial soil was apparent on Port Meadow when the Oxford Archaeological Unit dug three narrow trenches through Bronze Age and through Iron Age ditches. At the base of the earlier Bronze Age trenches there was no alluvium and the gravel was the tawny colour of freshly cut Cotswold stone showing that there was no water-logging and that the pasture during the Bronze Age may have been similar to that in the northern, higher part of the Meadow today (Lambrick & Robinson 1988). In contrast the Iron Age ditches showed gleyed alluvial soil (indicating water-logging) containing biotic remains of weedy pasture similar to the Moist Pasture growing in Port Meadow in 1981 (Lambrick & McDonald 1985). It is likely that Picksey Mead was first farmed as part of the common pasture on the floodplain stretching between West Mead, Yarnton, and Port Meadow, in the Bronze and Iron Ages, and possibly into the 6th century when it became Pic's island. The Saxons recognized that collecting hay in early summer, and storing it over winter, enabled them to feed stock when grass was not growing. Opening it again to common pasture in the late summer made use of the aftermath or second grass crop. Environmental evidence shows that Oxey Mead was set aside as a hay-crop by the mid-Saxons (Robinson this volume). Perhaps Picksey Mead was set aside at same time.

This traditional management of meads produces a different effect on the composition of the grassland than that of pasture. Over the centuries a specialized suite of plant-species has established. They grow tall and set seed before the hay is cut towards the end of June/early July and are accompanied by their own set of invertebrates as well as more common ones. Continuing use of meads produces sufficient organic material which accumulated in the alluvium to form a “floating” meadow which Clarke (1954) suggested “rolls and reverberates when jumped upon” but I have felt such activity only once, recently, when the mead was very wet!



Figure 4. The geology of the Thames floodplain (pale yellow). Note that the Thames flows to the north of Wytham Hill. Pasture on the gravel islands (pale orange) within the floodplain provides suitable sites for Bronze Age barrows and Iron Age settlements on Wolvercote Common (1) and Port Meadow (2), whereas Picksey Mead (3) is a floodplain hay-meadow or mead.

Figure 5. The number of days the river reached high and low-flood levels at Godstow Lock tail-water, 1892 – 2003 (Thames Water).



Records of the height of Godstow lock tail-water can be used to suggest flooding events on the Meadow (Figure 5). In the late 19th and early 20th century floods were very variable, lasting from one day to more than three months at a time. After Medley Weir was removed in 1931 until c.1952, there were fewer than ten flood-days in some years and increased flooding thereafter (Figure 5). At low-flood level water would lie in the Marsh, extending up to Round Hill and, at high-flood level and above, a flood would advance northwards until all but the highest part of the Meadow was covered in water (McDonald 2007). The top-soil is well-structured and free-draining so long as the water-table falls below the interface between the alluvium and gravel. This allows the top-soil to dry out completely during the summer months which favours plant-growth. Waterlogged conditions and the lack of oxygen normally associated with flooding are not a problem during the winter when the plants are dormant but in summer when flooding is accompanied by higher temperatures and sunshine, toxic conditions arise in the soil-water which kill the plants. Water-availability for plant growth in spring and early summer and an aerated root zone during the growing season are important because they influence the species-composition of floodplain

grassland, particularly on the Meadow which has a drop in elevation of one metre from north to south (Figure 6) (Gowing & Youngs 1997).

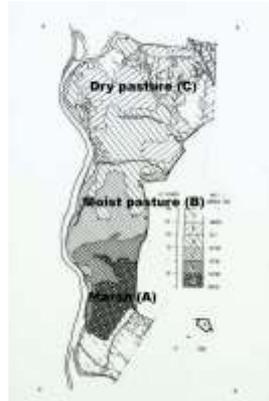


Fig. 6. Inundation zones on the Meadow. The Marsh is in the lowest (darkest hatching) part of the Meadow.

Management History

Port Meadow with Wolvercote Common (common pasture).

There is a gap in the knowledge of the Oxford grassland between the Iron Age and the 11th century when the Domesday Book (1087) describes the way England was partitioned and farmed. Land used for arable crops or for hay was measured in customary acres, whilst woodland and pasture were measured in furlongs. Normally, there would be 480 customary acres of arable (shared amongst four yardlands) in a one hide estate, which was a fifth part of a five-hide manor such as Wolvercote, Yarnton and Begbroke. Unusually, the Domesday Book refers to Port Meadow as ‘the burgesses of Oxford have pasture in common outside the wall rendering 6s 8d.’ (Burgess was a Norman name for a Freeman, replacing the earlier name, Portman, for those who could trade freely in Oxford.) The fact that ‘pasture in common’ is mentioned in the Domesday Book suggests that this is well established management of land which is the same as, or at least similar to, the pre-Roman system in England described by Vinogradoff (1892). The common pasture was shared by neighbouring villages; in this case Oxford Freemen shared the grazing rights with the commoners or manorial tenants of Wolvercote, Binsey and Medley (whose rights were attached to their arable land). The system is based on customary law and common grazing rights are referred to as intercommoning because, for example, the animals belonging to Wolvercote farmers were allowed to graze Port Meadow and the Freemen’s animals were allowed to stray over onto Wolvercote Common. Between Michaelmas (29th September) and Lady Day (25th March) the landowner (of Wolvercote Common) was allowed to graze sheep on the common land provided that sufficient grazing was left for the tenants. To allow the grass to grow the Meadow was “hayned” i.e. left free from all manner of beasts from the 25th March until the 1st May each year (Turner 1880, Salter 1928). There are no common rights to take turf, marl or gravel from the Meadow (they belong to the landowner), and any person caught removing such material illegally was fined (Turner 1880).

Managing or stinting the grazing rights was at first very simple. Each Oxford Freeman was allowed one beast and Wolvercote commoners were restricted to one beast per yardland. In the 14th century, when the population probably declined significantly, stinting may have lapsed. It would have been revived in the 15th century, when the growth of the wool industry increased the value of even marginal pasture for sheep-grazing. However, from the time of the foundation of Godstow Nunnery in 1142, and the gift of both Wolvercote and Walton Manors to its Abbess, quarrels over the right to graze the Meadow (flanked by the two Manors), involving both freemen and commoners, smouldered until, in 1562, an Intercommoning Agreement was signed by the Lord of the Manor of Wolvercote and the Mayor of Oxford (Turner 1880). By 1569 there were between 400 and 450 Freemen and the regulation of stints had become very sophisticated with an allocation of eight beasts to the Mayor, down to one beast to the common Freeman, on condition that owners of beasts had somewhere to keep them over the winter and a herdsman was employed to look after the Freemen's animals. Three or four drives (now called a 'round-up') of the Meadow each year ensured that there was no illegal grazing and any mangy cattle or horses infected with "the glaunders of the chyne" had to be killed (Turner 1880). Following the Corporation Act of 1832, the Freemen's dominion over Oxford was weakened and there was little incentive to become a Freeman. The system broke down.

By 1972 the Freemen's grazing rights were registered, under the Commons Registration Act 1965, as part of those of the Freeman body and so would lapse when individual Freemen died. These are rights in gross, personal to each Freeman not to his property, and cannot in any way be loaned or assigned. The Freemen of Oxford remedied this anomaly by inserting a Clause in Section 27 of the Oxfordshire Act 1985. Their success was of great importance to holders of similar rights elsewhere in England, partly because the Clause enabled their grazing rights to be retained in perpetuity. (Register of Commons 1972, Campbell & Clayden 1973). As many house-owners as possible living in Wolvercote between 1965 and 1972 also registered grazing rights. The number of animals thus registered to graze the common land far out-stripped those of the Freemen and so became the most important rights over the Meadow (Crossley 1979). The Commons Registration Act dealt solely with quantifying the number of animals allowed to graze common land. It did not include management of the grazing which was to be included in a second Act which has not, so far, been enacted. This has five repercussions. Firstly, the new status of the grazing rights means that they can now be let or sold away from the registered property, provided that the total number of animals registered is not increased. Secondly, as few Freemen currently use their rights, up to 30 licences are issued each year to non-Freemen and, similarly, the Wolvercote Commoners Committee issues up to 30 grazing-licences to Wolvercote people whose houses do not have registered grazing rights. Thirdly, the law now allows graziers to keep their animals on the Meadow over winter, thus causing weed problems. Fourthly, in summer insufficient registered rights are used to maintain the quality of the plant communities and, therefore, of the pasture. Natural England therefore ensures that a Land Agent buys in cattle (and sometimes horses) to graze the commons in summer between the 24th April and the 30th November. Lastly, both the Freemen and the Commoners now receive payments for the appropriate maintenance of the commons under Government Environmental Stewardship Schemes.

Picksey Mead (common mead and aftermath pasture)

On either side of the river Thames and many other rivers in lowland England, lie flood-meads. Their value gradually decreased after the 14th century, partly because of the effect of weirs put in place along the Thames to allow bargemen to take their wares to markets up and down the river. This often raised the water-table on the adjacent flood-meads and so changed the vegetation. The raising of the water at King's Weir by 4 or 5 feet in the 17th century, for example, and the consequent rise in the water-table, "changed some of the best pasturage in Yarnton into coarse, worthless grass" (Stapleton 1893). Again individual species are not mentioned. At the same time access for hay-carts to Picksey Mead from Yarnton was prevented by the drowning of the ford between Picksey and Oxey Meads (Rev. Vaughan Thomas unpublished). By the early 18th century in Yarnton and Begbroke, the owners of the farms to which the flood-meads belonged no longer considered them to be the asset they had been in the 13th century. In contrast, in Water Eaton, for example, the unacceptable loss of the season's hay crop due to floods could amount to £500 (Young 1968). The small farmers who used to rely on the meads for winter fodder could do so no longer.

The tradition that meads, as well as arable fields, were divided into unenclosed mowths, lots, doles or strips, also referred to as 'customary acres', goes back to at least the Anglo-Saxon period. The customary acres were subdivided longitudinally (to maintain the rhythm of the mower with his scythe) into four divisions, or men's mowths, which were also known as a "yard" or "yerd", presumably meaning belonging to a yardland. The end of each unenclosed strip was marked by a post or small cairn of stones and the common boundary was walked immediately after ownership was established, to avoid quarrels. In some places a farmer may have been allocated every first or third strip but it has been argued that the most ancient method of distributing the hay was to allocate it by the drawing of lots annually in which competing farmers were represented by tokens (Dodgson 1980). A mowth or 'lot' as in 'allocated by lot' is the amount of hay that can be cut by one man with a scythe in one day. Ownership of a lot, represented by a token, changed every year according to the luck of the draw. At first the owner of a token would receive one customary acre every time it was drawn in a lot allocation ceremony. The number of times a set of tokens was drawn differed according to the amount of floodplain available. In Burford, for example, there were four 'shots' or divisions of mead-land (Gretton 1920) while in Yarnton and Begbroke there were ten (two in Picksey Mead, five in West Mead and three in Oxey Mead) (McDonald 2007). Where some land was enclosed in a village between the 13th and 17th centuries, the number of mowths often survived, although the area on the ground was reduced (Leadham 1897: 386, Stapleton 1893). In Wolvercote, however, where pasturage was apparently in short supply, the Lord of the Manor permitted the enclosure of Wolvercote Lot Meadow in 1698. Each of the tenants received compensation in the form of money or a piece of the meadow, according to the number of strips or mowths he/she owned in the lot-meadow. Unusually, the new owner could fence his part of the lot-meadow, provided that it remained open for common grazing as usual from the 21st September until the 24th February each year. A special clause was added to the effect that no sheep were to be grazed on the land until All Saints Day (1st November) (Dashwood XVI/i/a/24), McDonald 2007).

In Yarnton, Begbroke and Wolvercote, the hay on each mowth in Picksey Mead was cut on or about the nativity of St. John the Baptist's Day (24 June) and had to be carried as soon as it was 'made' (dry). From the 1st August (Lammastide) the animals belonging to the hay-making farmers were allowed intercommoning on the aftermath or, with the agreement of all the tenants, a second grass crop could be taken and grazing took place from the 21st September until the 24th February, after which the Landlord had the right to put his sheep on to graze until the 25th March. No doubt, if the floodplain became inundated, any sheep would have been removed to prevent foot-rot.

The management of the grazing of the aftermath followed traditional methods on Picksey Mead which was similar to that at Eynsham and Shifford where the landlord took all the hay in alternate years, at the same time ensuring that there was sufficient grazing left for the lot owners (Gretton 1912). On Picksey Mead the right to graze the aftermath went alternately to the Manors of Yarnton and Begbroke, which owned the southern half, one year (when the cattle were regulated at 10 per mowth/yardland) and, to the Manor of Wolvercote which owned the northern half the next. To distinguish them from Wolvercote beasts, animals belonging to Yarnton farmers were branded, in hot tar, with the letter "E" deriving from Eardington, an earlier name for Yarnton (Figure 7) (Gelling 1953/4). The Lord of the Manor, or his agent, ensured that the number of grazing animals was not above the carrying capacity of the land; in other words over-grazing was not allowed because it would affect the quality of the Lord of the Manor's grazing after Michaelmas. Yarnton and Begbroke were enclosed in the 17th century yet Yarnton and Picksey Meads remained open to the common rights of sharing the hay and aftermath grazing. Wolvercote was enclosed in 1845, when common rights to hay and grazing in the northern part of Picksey were extinguished, and the products of the land went to the landowner. A tenant of the Duke of Marlborough, one-time Lord of the Manor of Wolvercote, enjoyed them until recently.



Figure 7. Animals belonging to Yarnton farmers were branded, in hot tar, with the letter "E" deriving from Eardington, the earlier name for Yarnton.



Figure 8. This aerial photograph, taken in about the 1950s, shows the area south of Yarnton village, including West Mead divided into strips, Picksey Mead to the east surrounded by water and Oxey Mead immediately to the north of Picksey. Both the latter meads had been cut when the photograph was taken.

At the foot of Figure 8 West Mead, Yarnton, is shown lying to the north of the river Thames and is divided into mowths. They are visible because some of the grass has been cut recently while the rest is still standing. Figure 8 also shows that the mowths are no longer one customary acre each but when the mowths were re-organized and/or reduced in size is not clear. They could have been divided longitudinally and some shortened in 1294 when Yarnton was given to Rewley Abbey, or in 1695, when the Manor was divided between William Dashwood's four daughters, there might have been an opportunity to re-organize the mowths to accommodate the needs of an increased number of tenants. Similarly in 1936, when plans were made to construct the Oxford western bypass across the south end of Picksey Mead, the number of mowths was retained (26) but each was reduced in size (F. Charlett unpublished).

In Oxfordshire, drawing lots for hay was common in the Middle Ages. In North Aston and Duns Tew for example, names for tokens, such as Crown, Snipe and Millrind, were still in use in the early 16th century and in Burford, the names included: Single Cross, Double Cross, Two Pitts, Three Pitts, Pitt & Dock, Pitt & Thorn and Pitt & Stone (Gretton 1920). In Somerset farmers were said to collect wild apples from the hedgerows on which they drew similar symbols to those in Burford (Figure 9). Such symbols were one of the earliest ways of marking the tokens. Although they may vary from region to region these sets of marks is similar to others recognisable from the Orkneys to Herefordshire and Oxfordshire and even from Estonia (Brian 1999). Unusually, in Yarnton and Begbroke, the tokens for drawing lots were cherry-wood balls which carried the names of thirteen farmers. These were likely successors to those families living on farms, nine in Yarnton and four in Begbroke, in the Anglo-Saxon period (Crossley 1990). The names on the Yarnton balls are Bolton (or Bouton), Dunn, Freeman, Gilbert, Green, Harry, Rothe, Watery Molly and White. The Begbroke balls are Boat, Perry, Walter Geoffrey and William of Bladon (Crossley 1990) (Figure 10). When did these farmers live?



Figure 9. Apple tokens from Puxton, Somerset. Five apples are shown with their symbols: 'one pit', 'three pits' and 'four pits' together with the two bits used to mark them. The brace which works the bit is not included. (The late Dr. Anthea Brian pers. com.)



Figure 10. Cherry-wood balls used by Yarnton and Begbroke farmers when drawing hay lots: William of Bladon, Parry, Geoffrey, Boat, White, Boulton or Bolton, Green, Rothe, Freeman, Harry, Watery Molly, Dunn and Gilbert. The names on the balls are similar to the names of farmers recorded in the Hundred Rolls of Edward I in 1279.

The population had increased in Yarnton from 26 tenants in 1086 to 48 in 1279 implying a larger population than any recorded until the 19th century (Crossley 1990). In 1279 the Hundred Rolls of Edward I showed named farmers, singled out from the rest of the villagers, as owners of common rights. The list for Yarnton and Begbroke included the names of families living in Yarnton or Begbroke which are similar to the names on the 13 modern cherry-wood balls, except for Rothe who was living in the next parish, Worton.



Figure 11



Figure 12

A 19th century example of a boundary stone from Picksey Mead. EC stands for Exeter College (Rectors of Yarnton) and, on the obverse, BR stands for Begbroke Rectory. The date of engraving was established by Dr. Roger Tomlin.

It is clear from the taxation lists in 1306, 1317 and 1327 that people in the 14th century moved between parishes. Of the 33 names recorded in 1327, for example, only 19 were also shown in the Hundred Rolls some 50 years earlier (Crossley 1990). It is not, therefore, surprising to find that Rothe, who was recorded in Worton in 1279, had moved into Yarnton before 1294, and so was named as owning common rights in the meads and, therefore, due to pay a tithe on the hay. Two years later Rewley Abbey was endowed with Yarnton Manor, and Eynsham Abbey took this opportunity to settle a long-standing dispute over ownership (Gretton 1912, Crossley 1990). Eynsham Abbey, as Rectors of Yarnton, had received a tithe of hay each year from the lot owners, but Rewley Abbey, was not entitled to them. Firstly, the names of the tenants entitled to common rights had to be established, and the Hundred Rolls would have been a useful document to be consulted. Then an area in each mead, equivalent to the tithes from all the lot owners, was agreed and marked with stones (2 acres for Yarnton and 1 acre for Begbroke). They became known as Tythals or Tidals. On Picksey Mead a Victorian stone (now in the custody of the First Meadsman) was erected to show which part belonged to Exeter College, Rectors of Yarnton, and (on the obverse) which belonged to Begbroke Rectory (Figures 11 and 12). It is apparent that the names commemorate 13 farming families but when the names were actually painted onto the cherry-wood balls is unknown. Nevertheless, documentary and botanical history has suggested that traditional management of the meads continued from before Domesday until 1968, when the last lot allocation ceremony took place. Since then the value of the meads has changed. They are now preserved to conserve their archaeology and the internationally valuable plant and invertebrate communities. A contractor is employed by the lot owners to cut the hay and to graze the aftermath for this purpose.

Plant communities in the Oxford grassland

Port Meadow with Wolvercote Common

One of the ways in which one can show changes in grassland composition is to make a comparison of botanical surveys carried out at different times. In 1981-2 McDonald (2007) described three main plant communities on Port Meadow with Wolvercote Common, each influenced by different ecological factors: Dry Pasture, distinguished by heavy grazing, especially in winter, and rare flood events; Moist Pasture, distinguished by heavy grazing and a high water-table often flooded in winter; Marsh, distinguished by summer grazing and annual flooding. Each is similar to a plant community described for the UK by Rodwell (1992).



Figure 13. The dry pasture community (including ragwort and thistles) at the north end of Port Meadow.



Figure 14. Strawberry Clover representing the moist pasture community in the centre of Port Meadow.

The Dry Pasture (Figure 13) lies on a gravel island in the highest and, therefore, the driest part of Port Meadow with Wolvercote Common. Here the limestone gravel is covered by a layer of alluvium some 10cm thick subjected to occasional flooding. This grassland was designated a new Hoary Plantain Sub-community of MG5 crested dog's-tail - black knapweed (*Cynosurus cristatus-Centaurea nigra*) grassland (Rodwell 1992) with the following constant species: Perennial Rye-grass (*Lolium perenne*), Timothy (*Phleum pratense*), Hoary Plantain (*Plantago media*), Red Clover (*Trifolium pratense*) and White Clover (*Trifolium repens*). These constant species are those which Stapledon (1925) considered to represent a well-managed grassland component of a dairy farm. MG5 is generally found in old and relatively undisturbed pastures on chalk or limestone with fairly short turf, on shallow soils, in which species such as thistles and Hoary Plantain can reproduce vegetatively. The Dry Pasture is a short sward in which Hoary Plantain and light-demanding species, such as Daisy (*Bellis perennis*), are protected from grazing by their rosette form, and so are able to flower. Creeping Thistle (*Cirsium arvense*), Dwarf Thistle (*C. acaule*) and Woolly Thistle (*C. eriophorum*) are also common but have developed a different defence mechanism, prickles, and so are able to get a stronghold in the turf. These plants also reflect the limestone gravel and suggest an affinity with both chalk and limestone pasture rather than with floodplain meadows. However, the presence of Ragwort (*Senecio jacobea*) and the abundance of thistles show that on Port Meadow this grassland is over-grazed, particularly in winter (McDonald 2007).

The Moist Pasture (Figure 14), occupies the central part of Port Meadow and is similar to MG11 red fescue - creeping bent - silverweed (*Festuca rubra-Agrostis*

stolonifera-Potentilla anserina) grassland (Rodwell 1992). This area is subjected to frequent flooding in winter and sometimes during wet periods in other seasons. Grazing animals trample the soft ground and bare patches are formed. As its name suggests, this community contains a mixture of pasture and occasional marsh species dominated by the constant species: Creeping Bent, Silverweed and Red Fescue, as well as Perennial Rye-grass (*Lolium perenne*), Yorkshire-fog (*Holcus lanatus*), White Clover (*Trifolium repens*), Common Mouse-ear (*Cerastium fontanum*) while Strawberry Clover (*Trifolium fragiferum*), Common Spike-rush (*Eleocharis palustris*) and Marsh Foxtail (*Alopecurus geniculatus*) are components of the turf in marshy areas. Most are adapted to spreading rapidly over bare soil. Together they underline the long history of periodic winter-flooding which, with periodic heavy grazing, is the major influence in the formation of this community.



Figure 15. Creeping Marshwort representing the Marsh Pasture at the south end of Port Meadow.

The third community in 1981, the Marsh (Figure 15), is located next to the raised area in the south of Port Meadow when it was considered to be a new Water Mint (*Mentha aquatica*) variant of MG13 creeping bent - marsh foxtail (*Agrostis stolonifera-Alopecurus geniculatus*) floodplain grassland (Rodwell 1992; McDonald 2007). The constant species were: Floating Sweet-grass (*Glyceria fluitans*), Water Mint (*Mentha aquatica*), Tubular Water-dropwort (*Oenanthe fistulosa*), Water Forget-me-not (*Myosotis scorpioides*) and Common Spike-rush (*Eleocharis palustris*) with Common Marsh Bedstraw (*Galium palustre*), Marsh Stitchwort (*Stellaria palustris*), Lesser Spearwort (*Ranunculus flammula*) and Marsh Speedwell (*Veronica scutellata*) frequent. These species are tough. They can tolerate some anoxia due to prolonged flooding and inadequate surface drainage in winter (but not in summer), as well as grazing and trampling by cows and horses all the year round but they will die in summer-floods or drought. Some, such as Common Spike-rush, have rhizomes needing an open sward to spread into, others such as Creeping Marshwort (*Apium repens*) prefer moist bare ground in which their seeds will germinate. Marsh Arrowgrass (*Triglochin palustris*) and Tubular Water-dropwort indicate a transition to true fen, should the area become wetter.

Picksey Mead

The Oxfordshire meads are noted for the abundance of meadow-foxtail - great burnet (*Alopecurus pratensis-Sanguisorba officinalis*) (Rodwell 1992) (MG4) floodplain grassland. Very long-term management for hay, followed by grazing, has encouraged

the growth of specialist communities which are more species-rich than the MG5 crested dog's-tail - black knapweed (*Cynosurus cristatus*-*Centaurea nigra*) grassland (Rodwell 1992) on Port Meadow (Figure 3). MG4 has developed over centuries in lowland England where there are a thousand years of traditional management for hay and aftermath (second grass-crop) grazing on river floodplains (Rodwell 1992, McDonald 2007). This community on Picksey Mead is similar to the flood-meadow communities in parts of East Anglia and the South Midlands as well as in the Upper Thames Valley (Wells 1974, Jefferson this volume). In spring it is notable for its rare dandelions including *Taraxacum fulgidum*, *T. tamesense* and *T. littorale* which last has only been found on Picksey Mead (McDonald 2000). These are followed in early summer by Oxeye Daisy (*Leucanthemum vulgare*) and Great Burnet (*Sanguisorba officinalis*). In 1982 there were two major sub-communities of MG4 on Picksey Mead divided according to the soil-moisture. The first was a Yellow Rattle (*Rhinanthus minor*) and Meadow Vetchling (*Lathyrus pratensis*) sub-community which can clearly be placed within the MG4 grassland. Its constant species in Picksey Mead are (species classified by Rodwell (1992) in Class III or above are given in bold):

MG4 species (Rodwell 1992)

Bird's-foot Trefoil (*Lotus corniculatus*)
Black Knapweed (*Centaurea nigra*)
Cock's-foot (*Dactylis glomerata*)
Crested Dog's-tail (*Cynosurus cristatus*)
Dandelion (*Taraxacum officinale* agg.)
Great Burnet (*Sanguisorba officinalis*)
Red Clover (*Trifolium pratense*)
Red Fescue (*Festuca rubra*)
Perennial Rye-grass (*Lolium perenne*)
Meadowsweet (*Filipendula ulmaria*)
Meadow Buttercup (*Ranunculus acris*)
Meadow Vetchling (*Lathyrus pratensis*)
Pepper Saxifrage (*Silaum silaus*)
Sweet Vernal-grass (*Anthoxanthum odoratum*)
Yorkshire-fog (*Holcus lanatus*)

Additional species found in Picksey Mead 1982

Adder's-tongue (*Ophioglossum vulgatum*)
Common Vetch (*Vicia sativa*)
Cowslip (*Primula veris*)
Cuckooflower (*Cardamine pratense*)
Rough Meadow-grass (*Poa trivialis*)
Meadow Barley (*Hordeum secalinum*)
Yellow Rattle (*Rhinanthus minor*)

The second major community on Picksey Mead, and the wettest, was situated on either side of the Oxford by-pass where the wet soil is on the acid side of neutral (McDonald 2007). In 1984 this was described as a new Common Reed (*Phragmites australis*) wet variant of the MG4 flood-mead grassland. It was characterized by sedges, particularly Common Sedge (*Carex nigra*) and by early-flowering, moisture-loving species such as Marsh Marigold (*Caltha palustris*). In 1982 the constant species included (species classified by Rodwell in Class III or above are given in bold):

MG4 species (Rodwell 1992)

Black Knapweed (*Centaurea nigra*)
Creeping Buttercup (*Ranunculus repens*)
Dandelion (*Taraxacum officinale* agg.)
Golden Oat-grass (*Trisetum flavescens*)
Meadow Vetchling (*Lathyrus pratensis*)
Meadowsweet (*Filipendula ulmaria*)
Common Sorrel (*Rumex acetosa*)

Additional species found in Picksey Mead

Common Bent (*Agrostis capillaris*)
Common Sedge (*Carex nigra*)
Common Vetch (*Vicia sativa*)
Jointed Rush (*Juncus articulatus*)
Common Mouse-ear (*Cerastium fontanum*)
Common Reed (*Phragmites australis*)
Rough Meadow-grass (*Poa trivialis*)
Selfheal (*Prunella vulgaris*)
Sweet Vernal-grass (*Anthoxanthum odoratum*)
Timothy (*Phleum pratense*)
Yellow Rattle (*Rhinanthus minor*)

The Common Reed sub-community was very rich in species, including marsh thistles which were flowering in July 1983 (Figure 3). Occasional species in this community were Wild Angelica (*Angelica sylvestris*), Ragged Robin (*Lychnis flos-cuculi*), Marsh

Ragwort (*Senecio aquaticus*), Marsh Valerian (*Valeriana dioica*), Common Spotted-orchid (*Dactylorhiza fuchsii*), Twayblade (*Listera ovata*), Early Marsh-orchid (*D. incarnata*) and Bugle (*Ajuga reptans*). The Early Marsh-orchid was notable for its polymorphic colour variation from flesh pink to deep magenta. This community was thought to be associated with some disturbance of the drainage system as a result of building the Oxford bypass (A34) embankment in 1958. If no management took place McDonald (2007) predicted that the Common Reed in this community would become dominant, as had happened to the area to the west of the southern entrance into the mead where management stopped after the bypass had been completed. In some areas where the alluvium is deep, Tall Oat-grass (*Arrhenatherum elatius*) becomes abundant; it also dominates the vegetation along the river bank which forms a levée beside the river Thames. Today, this species is more often found on disturbed sites and road-side verges, notable for rich soils, forming a community classified as MG1 Tall Oat-grass (*Arrhenatherum elatius*) (Rodwell 1992) grassland, often found on road-side verges in the United Kingdom.

Vegetation changes in the Oxford grassland



Figure 16. The mud-bank flora beside the Thames in 1922. Note the roof (top centre).



Fig. 17. The mud-bank flora had been replaced by moist pasture by 1981. Note the roof (top centre right).

Port Meadow with Wolvercote Common

Using the 1981-82 data and that collected by H. Baker in 1922-3, as well as photographic and historic evidence, it is possible to show changes in the vegetation on the Oxford grassland over time. For example, a colourful semi-aquatic community was established adjacent to the river Thames above Medley Boat Station in 1922 (Figure 16), including: (Church 1922/3, Minn 1939).

- Common Club-rush (*Schoenoplectus lacustris*)
- Flowering-rush (*Butomus umbellatus*)
- Fringed Water-lily (*Nymphoides peltata*)
- Mare's-tail (*Hippuris vulgaris*)
- Marsh Marigold (*Caltha palustris*)
- Purple Loosestrife (*Lythrum salicaria*)
- Thread-leaved Water-crowfoot (*Ranunculus trichophyllus*)
- Tufted Forget-me-not (*Myosotis laxa*)
- Water Mint (*Mentha aquatica*)
- Lesser Water-parsnip (*Berula erecta*)
- Water-cress (*Rorippa nasturtium-aquaticum*)
- Yellow Loosestrife (*Lysimachia vulgaris*)
- Yellow Water-lily (*Nuphar lutea*)

This community had colonised the mud-bank formed as a result of bi-weekly inundation caused by the ponding-up of water above Medley flash-lock. In 1931 the flash-lock was replaced and silt was dredged from the river-bed to form a narrower,

deeper channel for navigation purposes (Stock 1951). The consequent withdrawal of water from the adjacent mud-bank caused it to dry out after the dredging was completed. The mud-bank flora died and the grazing animals favoured grassland species well adapted to the changed circumstances. The vegetation changed to Moist Pasture and several acres were added to the pasture (Figure 17). The evidence here points to a change, as a result of navigational and grazing activities, from a mud bank to a moist grassland community. H. Baker (1937) studied the flora in the Oxford grassland in 1922-3 and divided the Meadow into Areas A, B and C (See Figure 6 above), more or less equivalent to the Marsh, Moist Pasture and Dry Pasture of the 1981-4 study (McDonald 2007). The following year he made a similar survey of Picksey Mead where he found “wetter” and “drier” areas. Although in the early 1920s the Marsh area of the Meadow was generally inundated in winter (Figure 6), its drainage was excellent. As soon as the river level fell the pasture began to dry out (Minn unpublished). In Area A, for example, Baker (1937) noted a short Meadow Fescue (*Festuca pratensis*) - White Clover (*Trifolium repens*) sward including the annual or biennial, Tufted Forget-me-not (*Myosotis laxa*), Rough Meadow-grass (*Poa trivialis*), Creeping Bent, Creeping Buttercup and Brooklime (*Veronica beccabunga*). They were unusual for their miniature forms each about one inch high or prostrate. This habit allowed them to flower despite the closeness of the grazing by sheep and domestic geese as well as by cattle. If the grazing pressure were removed, Baker predicted that a marsh community would develop in succession towards the Reed Sweet-grass (*Glyceria maxima*) community growing near the river at Medley (Baker 1937).

After 1945, the grazing pressure was only relaxed to the extent that sheep were excluded and the practice of putting domestic geese on the Meadow (possibly equalled later on by increasing numbers of feral and Canada geese) gradually died out. In 1981, the turf in Area A no longer contained miniature plant forms. It was a loose springy sward about 15 to 30cm tall dominated by Floating Sweet-grass, of which there was very little in 1922, and water mint, which Baker did not mention. Meadow Fescue and White Clover were co-dominant in Area A in 1922 but in 1981 occurred only in the Moist Pasture. The plants are telling us that the area of Marsh (Area A) was not only grazed less intensively but it was wetter in 1981 than in 1922 (McDonald 2007).

In 2005 a ten-year study (1995-2005) of Creeping Marshwort (*Apium repens*) was completed by the Ashmolean Natural History Society of Oxfordshire's Rare Plants Group (RPG) (McDonald & Lambrick 2006). It also showed that the Marsh community did not match closely any of Rodwell's (1992) National Vegetation Classification communities. The RPG saw striking changes from vegetation resembling mesotrophic grassland (MG13), similar to that in 1981, to various forms of Open (OV21) and Sand Dune (SD17) vegetation (Rodwell 1991, Rodwell 2000). From 1996 rainfall increased leading to open water standing for long periods over winter and spring. In addition, standing water in June 1998, accompanied by high temperature, caused soil anoxia which resulted in the death of all the plants in the Marsh except for Common Spike-rush (*Eleocharis palustris*). When the water dried out the mud was colonized by a swarm of Creeping Marshwort seedlings and a range of ruderal species, including Toad Rush (*Juncus bufonius*), Redshank (*Persicaria maculosa*), Pale Persicaria (*P. lapathifolia*), Knotgrass (*Polygonum aviculare*), several Goosefoot (*Chenopodium*) species, Greater Plantain (*Plantago major*), Pink

Water-speedwell (*Veronica catenata*), and Marsh Yellow-creed (*Rorippa palustris*). Common Water-crowfoot (*Ranunculus aquatilis*) was also frequent as a seedling on wet mud, but did not usually survive the summer. It was important for the conservation of Creeping Marshwort to recognize that this species preferred to germinate in the intermediate zone between the closed and open vegetation types (McDonald & Lambrick 2006).



Figure 16. View from the foot of Aristotle Lane showing the extent of flooding on 27 July, 2006.



Fig. 17. View across the 'Moist Pasture' showing little egrets taking advantage of the flood-water 29 July 2008.

Another summer flood occurred on the 27th July 2006 and water then remained on the Marsh for two years (Figures 16 and 17), killing Creeping Marshwort and its associates which were replaced by Nuttall's Waterweed (*Elodea nuttallii*), Duckweed (*Lemna* sp.) and Branched Bur-reed (*Sparganium erectum*). Colonizing the wet mud next to the water were Amphibious Bistort (*Persicaria amphibia*) and water mint. In the next zone, where the mud was drier and less trampled, there were fewer than ten plants of Creeping Marshwort, but frequent Creeping Bent, Water Forget-me-not and Pink Water-speedwell. Water Mint, Celery-leaved Buttercup (*Ranunculus sceleratus*) and Amphibious Bistort were also seen (Lambrick & McDonald 2008). Again, the plants are telling us that the water-table was higher between 2006 and 2008 than in 1981 and 1923, but this time the cause of the increased height of water in the underlying gravel is not known but is being investigated by the Environment Agency and Dr. David Gowing, Open University.

Remnants of the mud bank community such as Water Mint and Common Spike-rush (Figure 16) were recorded in 1981 in the Long Pond on Wolvercote Common and were still thriving there in 1998, the year New Zealand Pigmyweed (*Crassula helmsii*) was discovered there. This is a highly invasive aquatic plant, native to Australia and New Zealand, which was imported by horticulturalists to act as an oxygenator in garden ponds. It 'escaped' in the late 1970's and rapidly expanded its distribution in Britain. New Zealand Pigmyweed forms a mat below which other species cannot grow and was already well established over 25% of the Long Pond. English Nature (Natural England) felt that it might jeopardise Creeping Marshwort if even tiny pieces of this very vigorous plant were carried on the hooves of animals to the south end of Port Meadow. The size of its population meant that herbicide treatment was the only course to follow. With the permission of Natural England and the Wolvercote

Commoners' Committee, Reglone or Glyphosate were applied by Oxford City Council's Port Meadow Ranger on ten occasions, between 1999 and 2003, but proved to be ineffective on the stoncrop though it did kill all other species except Reed Sweet-grass (*Glyceria maxima*). Since 2004 it has been necessary to wait for the water to go down before more action can be taken (Anthony Roberts pers. com.).

Picksey Mead

Picksey Mead is notable for its MG4 meadow foxtail – great burnet grassland and the Environment Agency, through Natural England, is responsible for ensuring that it remains in good condition. Although the traditional management has continued uninterrupted, new non-MG4 species have been recorded in Picksey Mead, on both sides of the bypass, over the last three years. For example, in June 2006, I found species which had been rare or absent in 1982 such as:

Species name	Number in 2006
Meadow Thistle (<i>Cirsium dissectum</i>)	150
Tubular Water-dropwort (<i>Oenanthe fistulosa</i>)	300
Marsh Valerian (<i>Valeriana dioica</i>)	100
Blunt-flowered Rush (<i>Juncus subnodulosus</i>)	>500
Sharp-flowered Rush (<i>Juncus acutiflorus</i>)	>500
(plus c.10,000 <i>J. acutiflorus</i> in a swathe to the north of the bypass)	

I later found that this was not surprising. Dr. David Gowing had been contracted by the Environment Agency, from 2006 to 2009, to undertake a hydroecological study, including a detailed botanical survey of Yarnton and Picksey Meads. Species recorded included: Marsh Violet (*Viola palustris*), Tufted Forget-me-not (*Myosotis laxa*), Fen Bedstraw (*Galium uliginosum*), Reed Sweet-grass (*Glyceria maxima*), Hard Rush (*Juncus inflexus*), Marsh Lousewort (*Pedicularis palustris*), Slender Tufted-sedge (*Carex acuta*) and the moss *Drepanocladus ?aduncus*. These species lead me to suppose that the south end of Picksey Mead has become wetter since 1981, and is now moving towards a variant of the blunt-flowered rush - marsh-thistle fen vegetation (MG22 *Juncus subnodulosus* - *Cirsium palustre*, quaking-grass - clover (*Briza media* - *Trifolium* spp.) sub-community (Rodwell 1991)). The reason for the increase in ground-water seems to be linked to the higher water-table on the Meadow where it is also under investigation by the Environment Agency.

Conclusion

Differences between communities within the Oxford grassland are attributed firstly to differences in management of the two common areas and secondly to the amount of soil-water underlying each community. Port Meadow with Wolvercote Common being permanent pasture and Picksey Mead permanent flood-meadow (cut for hay and the aftermath grazed). Port Meadow with Wolvercote Common was wetter in the early 1980s than in the early 1920s, due to changes in river management, and in the early 1990s due to summer flooding possibly indicating climate change. Given the variation in flooding in the 20th century (Figure 5) it is not surprising that a response to these changes can be seen in the grassland composition. On Picksey Mead the vegetation in both 1922 and 1982 showed comparable areas of 'wetter' and 'drier' grassland but, from at least 2006, the 'wetter' area began to change from mesotrophic grassland typical of ancient flood-meadows (MG4) to fen meadow (M22). These changes may be due to an increase in the height of the water-table, the origin of which is not clear but is being investigated by the Environment Agency and the Centre for

Ecology and Hydrology. It is very unusual, however, for botanical and water-level changes over a 90-year period to be documented, and the data made available for modern analysis. That this has been done for an area with significant evidence of its 4,000 year history is unique.

Dr. Alison W. McDonald, The University of Oxford, Department of Plant Sciences, South Parks Road, Oxford OX2 2JA
alison.mcdonald@plants.ox.ac.uk

References

- Baker, H. 1937. Alluvial meadows: a comparative study of grazed and mown meadows. *Journal of Ecology*, 25: 408-420.
- Brian, A.D. 1999. Lammas Meadows in Herefordshire. *Landscape History*, 21.
- Campbell, I. & Clayden P. 1973 *The law of commons and village greens*. Commons Open Spaces and Footpaths Preservation Society, Henley-on-Thames.
- Church, A.H. 1922/3. Introduction to the plant life of the Oxford District. *Botanical Memoirs* 13: 102. Oxford University Press.
- Clarke, G.R. 1954. 'Soils' in A.F. Martin & R.W. Steel (eds), *The Oxford Region*. Oxford University Press.
- Crossley, A. (ed.) 1990. *Victoria County History of the Counties of England*. Wootton Hundred, South. Vol. XII. Oxford University Press.
- Dodgson, R.A. 1980. *The origin of British field systems: an interpretation*. Academic Press.
- Gelling, M. 1953/4. *The place-names of Oxfordshire*. Vols I & II. Cambridge University Press.
- Gowing, D. & Youngs, E.G. 1997. The effect of the hydrology of a Thames flood meadow on its vegetation in: A.R.G. Large (ed.) *Floodplain Rivers: hydrological processes and ecological significance*, 8: 69-80. British Hydrological Society occasional paper.
- Gretton, R.H. 1912. Historical notes on the lot meadow customs at Yarnton, Oxon. *Economic Journal*, March: 55, 58, 60.
- Gretton, R.H. 1920. *Burford records: a study in minor town government*: 408. Oxford University Press.
- Harper, J.L. & Sagar, G.R. 1964. Biological flora of the British Isles. *Plantago major*, *P. media* and *P. lanceolata*. *Journal of Ecology*, 52, 189-221.
- Hey, G. 2001 Yarnton. *Current Archaeology*: 173, 216-225.
- Laing, L. 1979 *Celtic Britain*. Book Club Associates, London.

- Lambrick, G. & McDonald A. 1985. The archaeology and ecology of Port Meadow with Wolvercote Common. *in*: G. Lambrick (ed.) *Archaeology and nature conservation*. Oxford University Department for External Studies.
- Lambrick, C.R. & McDonald A.W. 2008. *Apium repens* Unpublished Annual Report for Natural England.
- Lambrick, G. & Robinson M. 1979. *The Iron Age and Roman riverside settlements at Farmoor, Oxon*. Oxfordshire Archaeological Unit Report 2, Council for British Archaeology Research Report 32.
- Lambrick, G. & Robinson, M. 1988. The development of flood-plain grassland in the Upper Thames Valley. *in*: Jones M. (ed.) *Archaeology and the Flora of the British Isles: Human influence on the evolution of plant communities*. Papers read at a joint conference of the Botanical Society of the British Isles and the Association of Environmental Archaeology, held at St. Anne's College, Oxford. September 1984. Oxford University Committee for Archaeology.
- Leadham, I.S. 1897. The domesday of enclosures 1517–1518: 386. Longmans Green & Company, London.
- McDonald, A.W. 2000. Meadow dandelions near Oxford. *Fritillary*, 2: 19-23.
- McDonald, A.W. 2007. The historical ecology of some unimproved alluvial grassland in the Upper Thames Valley. *British Archaeological Report, British Series*, 441.
- McDonald, A.W. 2008. *Wolfson College: the history and ecology of North and South Mead*. Wolfson College, Oxford.
- McDonald, A.W. & Lambrick, C.R. 2006. *Apium repens* Creeping Marshwort. Species Recovery Programme 1995-2005. *English Nature Research Reports*, 706.
- Morris, J. (ed.) 1978. *Domesday Book: Oxfordshire*. Phillimore, Chichester.
- Register of Common Rights. 1972. Port Meadow and Wolvercote Common. Yarnton and Pixey Meads. County Solicitor, Oxfordshire County Council, unpublished.
- Richardson, J. 1978. *The Local Historian's Encyclopaedia*. 2nd edition, 25. Historical Publications. London.
- Robinson, M.A. 1982. Water-logged plants and invertebrates. *Council for British Archaeology Group 9. Newsletter*, 12: 178-181.
- Robinson, M. A. 2009. This volume.
- Robinson, M.A. & Lambrick, G.H. 1984. Holocene alluviation and hydrology in the upper Thames basin. *Nature*, 308: 809-814.
- Rodwell, J.S. (ed.) 1991. *British Plant Communities. Vol. 2. Mires and heaths*. Cambridge University Press.

Rodwell, J.S. (ed.) 1992. *British Plant Communities. Vol. 3. Grasslands and montane communities*. Cambridge University Press.

Rodwell, J.S. (ed.) 2000. *British Plant Communities. Vol. 5. Maritime communities and vegetation of open habitats*. Cambridge University Press.

Stace, C., 2002 *New Flora of the British Isles*. Second edition. Cambridge University Press. Cambridge.

Stapledon, R.G. 1925. Permanent grass. *Farm Crops*, 3: 74-136.

Stapleton, Mrs. B. 1893 *Three Oxfordshire parishes: Begbroke, Yarnton and Kidlington*: 310,315. Oxford Historical Society, Clarendon Press, Oxford.

Stock, R.V.W. 1951. *Thames Conservancy report of operations and proceedings under the Land Drainage Act 1930 and 1937-51*. H.M.S.O.

Tansley, A.G. 1939. *The British Islands and their Vegetation*: 560. Cambridge University Press.

Taylor, C.C. 1981. Archaeology and the origins of open-field agriculture *in*: T. Rowley (ed.) *Origins of Open-Field Agriculture*: 13-21. Croom Helm, London.

Turner, W.H. 1880. Oxford City records 1509-1583. Oxford Historical Society. Clarendon Press, Oxford.

Victoria County History - see Crossley.

Vinogradoff, P. 1882. *Villainage in England*. Swan, Sonnenschein.

Wells, D. 1974. *in* E. Duffey *et al.* *Grassland Ecology Wildlife Management*: 59-60. Chapman & Hall, London.

Young, A. 1968. *General view of agriculture of the Oxfordshire Board of Agriculture, [1813]*: 205-215. 2nd edition. David Charles, Newton Abbot.

Manuscript References

Henry Minn, Bodleian Library MS.Top Oxon.e.384; and Bodleian Library MS.Top Oxon.d.502

Charlett F. 1936. *Account of the lot ceremony at Yarnton*. Map included. Oxfordshire County Record Office.

Rev. Vaughan Thomas, Bodleian Library MS Top Oxon b.19, f.93;

Dashwood XVI/i/a/24, Oxfordshire Record Office.