



Historic England

Conserving Historic Water Meadows



Summary

This guidance aims to promote wider awareness of the rich heritage of England's water meadows. It is intended primarily for nature conservation groups, farmers, landowners, communities or individuals undertaking habitat 'restoration' work on historic water meadow sites. It describes the archaeological remains which may be encountered and highlights their importance as part of the historic landscape. It demonstrates how these remains, managed sensitively, can provide a variety of habitats which have considerable benefits for wildlife.

This guidance note has been prepared by Nicky Smith. The case studies were provided by Adrian Bird (River Wey Trust), Hadrian Cook (School of Geography and the Environment, Kingston University) and Robin Field (River Nene Regional Park).

First published by English Heritage July 2014. This edition published by Historic England November 2017. All images © Historic England unless otherwise stated.

Please refer to this document as:

Historic England 2017 Conserving Historic Water Meadows. Swindon. Historic England.

<https://historicengland.org.uk/advice/technical-advice/parks-gardens-and-landscapes/lakes-and-water-features/>

Front cover: Drowning of Lower Seven Acres at Harnham water meadows near Salisbury in February 2008. Note the element of protection from frost afforded by irrigation.

Contents

Introduction.....1		5	Case Studies.....16
1	What are Water Meadows?.....2		Water meadows on the River Wey, Hampshire16
2	Why Preserve Water Meadows? ...3		Harnham Water Meadows at Salisbury, Wiltshire.....17
3	A Brief History4		Wicksteed Water Meadows, Kettering, Northamptonshire18
4	Heritage-Sensitive Management9	6	Bibliography.....19
Managing Vegetation9		7	Specialist Advice20
Preventing ground disturbance12		8	Acknowledgements.....22
Maintaining watercourses13			
Preventing erosion and soil damage13			
Maintaining timber and masonry structures14			
Dealing with water erosion14			
Maintaining site hydrology14			
Should water meadows be re-floated?15			

Introduction

Conservation of natural and cultural heritage frequently goes hand in hand, providing opportunities to co-ordinate efforts for the benefit of both. The area of Semi-natural Grassland in the UK has decreased considerably since 1945, with around 90% having been lost in lowlands. Water meadows form part of a range of English wet grassland habitats, all of which have declined in extent and ecological resilience since the 1930s due to intensification of farming practices, drainage and development on flood plains. Old water meadow sites provide opportunities for the emergence of valuable new habitats supporting open undulating grassland interspersed with wet channels where many species of plants and animals can thrive. Their particular environment of multiple channels encourages mammals, some of which have declined in numbers, such as the water vole. They also provide ideal breeding grounds for priority species listed in the UK Biodiversity Action Plan (succeeded by

the UK Post-2010 Biodiversity Framework in 2012), such as the southern damselfly. Water meadows help to increase the connectivity of England's ecological network (as advocated in the Lawton Report of 2010 'Making Space for Nature' and the subsequent government Natural Environment White Paper of 2011). Examples spread along river valleys serve as green corridors for wildlife, supporting wet lowland grassland, which is important for a wide range of species and provides ideal breeding grounds for wading birds and wildfowl. Many of the chalk river valleys of southern England are designated Sites of Special Scientific Interest, Special Protection Areas and Special Areas for Conservation, largely because of the ecological diversity of their water meadows. Formal assessment of the significance of sites, led by legislation, tends to be based on plant diversity yet other aspects of water meadows, such as their nutrient-trapping, farming, amenity, cultural and historical value have received far less recognition.

1 What are Water Meadows?

Water meadows are areas of land that used to be flooded deliberately, under carefully controlled conditions, the timing being at the discretion of the farmer or landowner. They had three main purposes: to force early growth of grass in the spring, to improve the quality of the grass sward and to increase the summer hay crop. The relative importance of these benefits varied depending on the type of water meadow and the local farming

regime, but control of the flooding was what made them different from floodplain meadows, grazing marshes or other naturally flooded areas. The practice of operating them, known as ‘drowning’, created movement of water across the meadow’s surface, preventing stagnant pools forming and harming the grass. It was said that water should flow *“on at a trot and off at a gallop”*.

2 Why Preserve Water Meadows?

Water meadows have been described as ‘one of the greatest achievements of English agriculture’. They are an important part of our cultural and agricultural heritage – painted by John Constable, described by Thomas Hardy and vital to the economy of many river valleys for over four hundred years. Most fell out of use from the late 19th century onwards and working examples are extremely rare today. The exceptions are the handful of examples which have been the subject of restoration schemes initiated by individuals and trusts, usually with the aid of agri-environment schemes. Redundant water

meadows are far more commonly seen, and their remains contribute greatly to the character of the landscape in some areas of England. In parts of central southern England, for example, they are among the most distinctive and pervasive features of the chalkland river valleys.

In addition to their importance for wildlife and the historic environment, there is good evidence that water meadows provide wider environmental benefits. They can contain flood water, trap silt and help to reduce the nutrient load in water returned to rivers.

3 A Brief History

'Yf there be any running water of lande floode that may be set or brought to ronne over the meadows... they will be moche the better and it shall kyll, drowned and dryve away the moldy-warpes and fyll up the lower places with landes and make the ground even and good to mowe. All maner of water be good so that they stande not styl upon the ground....' (John Fitzherbert The Boke of Surveying and Improvements, 1535)

From at least the medieval period, meadows were sometimes deliberately flooded with river water, since this promoted grass growth by warming the soil and enriching the ground with silt. Although the practice was largely beneficial, uncontrolled flooding had the drawback of creating pools of stagnant water which could kill the grass. Water meadows provided the solution to this problem by using channels, ridges, hatches and other devices to keep water moving across the meadows and take it off effectively. Flowing, oxygenated, water brought the additional benefit of enabling the grass to continue growing under water.

Catchworks, also known as 'catch meadows' or 'field gutter systems', were one of the earliest forms of true water meadow in England. They may have been in use by medieval times in some areas, but larger numbers were created between the 17th and 19th centuries. From the time of the Napoleonic Wars (1803-1815) until the mid- 19th century they assumed particular importance as a means of improving marginal land. They often formed part of extensive land reclamation schemes in hill-farming areas, such as Exmoor, and were used to improve pastures in other areas of England with suitable topography, including parts of Somerset, Dorset, Gloucestershire, Herefordshire, Shropshire and Berkshire.

They were relatively simple and cheap to construct and used the natural gradients of slopes to irrigate meadows on hill and valley sides. Their most prominent remains are parallel, roughly contour-following, channels. A water source higher upslope fed the channels via a leat, which usually passed through a farmyard or byre. Water flowed from these channels onto the meadows below and any surplus water was carried away by a ditch or stream at the foot of the slope. Catchworks were particularly suitable for washing nutrients from roads or animal houses onto the meadows.

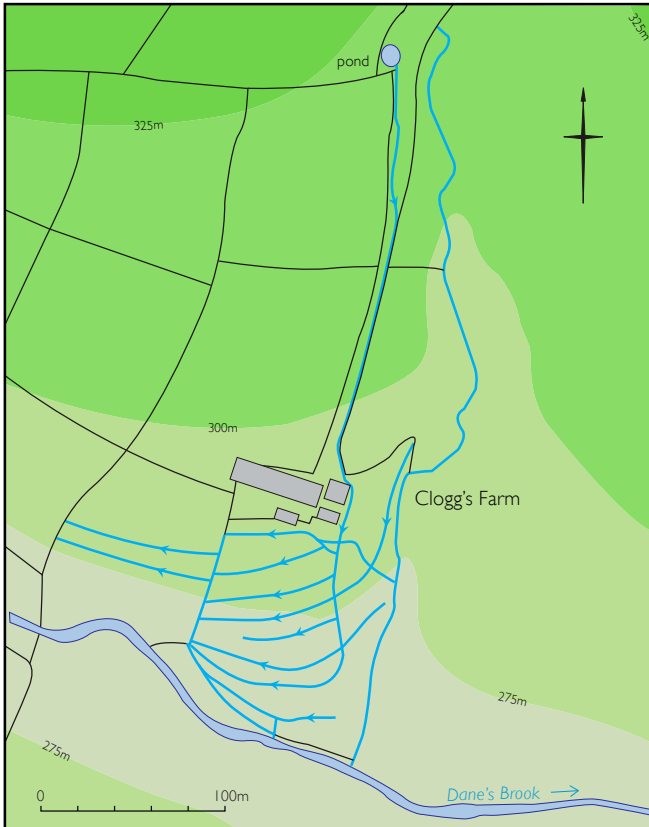


Figure 1 (top)

Catchwork meadows such as these at Clogg's Farm on Exmoor are evident as parallel channels ('field gutters') on hill slopes. They follow the natural contours roughly, dropping down just slightly to allow water to flow along their courses.

Figure 2 (bottom)

Water from a pond fed into a leat which passed through the farm complex driving a water wheel. The water wheel powered a threshing machine, a grinder, a chaff cutter, a shearing machine and a wood saw. The leat also washed away farmyard slurry, which flowed onto the meadows below and was distributed evenly by the 'field gutters'. Water drained away into a brook at the foot of the hill. The exact date of construction of this system is uncertain but it may be contemporary with the farmstead, which dates from at least 1688.

Bedworks, the 'classic' riverside water meadows, became popular from the 17th century onwards as a means of improving relatively flat, alluvial, river valleys.

Prior to the introduction of artificial fertilisers, water meadows were an essential component of the local 'sheep and corn' farming system on the chalklands of southern England. Sheep grazed on water meadows by day and were folded on unsown arable fields during the night, enriching the soil with their dung and urine.

Bedwork systems required more complex and costly networks of carriers, ridges and drains to distribute fast-flowing river water over the meadows evenly and carry it away efficiently. Characteristic earthen ridges called 'beds' were laid out in either herring-bone fashion or in parallel blocks, with tapering channels (known as 'floats') running along their apexes and drains in the furrows between them. A major earthwork channel, the main carrier ('head main') fed river water to the uppermost part of the meadow, while a main drain returned surplus water back to the river at the meadow's lowest point. By carefully controlling the flow of water through these features, a thin sheet of water, less than 1" (25mm) deep, was made to run steadily through the grass for short lengths of time at prescribed seasons of the year. The period of irrigation varied from being simply overnight to several weeks at a time, and it required the constant supervision of professionals called 'drowners', 'meadmen' or 'watermen'. Co-operation with neighbouring landowners was also essential, since there could be fierce competition over the use of water supplies, particularly with water mill owners.

The construction of bedworks required considerable expertise and expense so, unlike the catchworks created by hill farmers, they tended to be the product of wealthy landowners and large estates.

Although bedworks are best known and most common in chalkland parts of Dorset, Hampshire and Wiltshire, where extensive networks developed, they are also present in many other areas of England and their true extent is likely



Figure 3 (top)
Artist's reconstruction showing a simple bedwork water meadow.

Figure 4 (bottom)
Elaborate bedworks by the River Avon, Alderbury near Salisbury.

to be under-represented in archaeological records. Hybrid water meadow systems also occur to suit local conditions, most commonly using catchworks on valley sides combined with bedworks on the valley floor.

Built structures controlled the flow of water through the meadows. Dams and weirs, with sluices or ‘hatches’, were used to divert water onto the meadows from rivers and streams via a main carrier. The hatches were opened and closed as required, usually by slotting timber or metal boards into vertical grooves (Figures 8 and 12). Main carriers sometimes discharged into ‘hatch pools’ (Figure 7) with two or more exits, permitting the irrigation of several meadows. Smaller hatches and turf ‘stops’ were used to regulate the flow of water through the meadows. Bridges of different types and sizes allowed foot or hay carts to cross over the channels, while causeways provided dry access and aqueducts carried water on to downstream areas of meadow.

These structures were constructed of any suitable material that was readily available at the time they were built. Early examples were of stone and timber but during the 18th century brick became an alternative to stone in many places. Complex iron mechanisms were introduced in the 19th century to assist in the raising and lowering of hatches, and concrete structures appeared from Victorian times onwards. The 20th century saw the use of other materials, including breeze blocks and iron girders. For the meadows to function properly, their structures needed to be maintained regularly and renewed periodically, so most of what we see today will date from the end of a water meadow’s use, which may be much later than the date of its original construction.

English water meadows reached a height of popularity during the 18th and 19th centuries, when agricultural improvers promoted them enthusiastically. Particularly large numbers were laid out across central southern England, which became water meadow ‘heartlands’, and they spread to many other areas with varying degrees of success depending on the local soils, topography and agrarian economy.

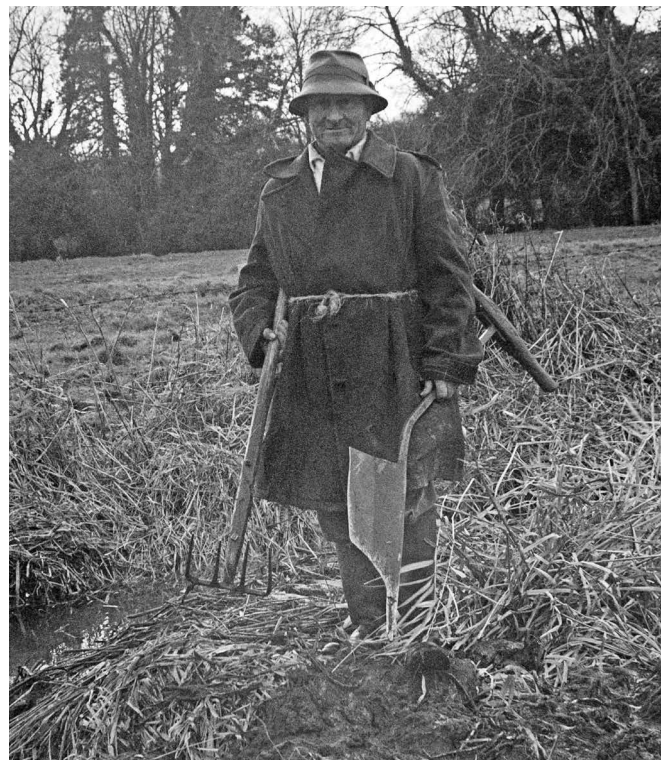


Figure 5 (top)

Drowners’ tools displayed at Breamore Countryside Museum, Hampshire.

Figure 6 (bottom)

Maintaining and working water meadows was a skilled art and water meadow drowners enjoyed a high status amongst farm staff. This photograph shows Mr Bill ‘Barleymow’ West, the drowner at Lower Woodford, Wiltshire, in the early 20th century. He is holding the tools of his trade – a cutting knife for trimming channels and a ‘gravel’ for removing rushes and reeds once cut.

Their heyday ended after about 1880, due to economic recession and changes in agriculture. The 'sheep and corn' economy of Wessex collapsed when the prices of home-produced corn and lamb were undercut by cheaper foreign imports. Additionally, the special advantages of meadow grass and animal dung were no longer needed since fodder crops, such as turnips, began to be used widely and land could be fertilised easily with newly developed artificial fertilisers. Labour shortages, following the First World War, exacerbated the situation and attempts at mechanising water meadow operation met with little success. Despite these setbacks, some water meadows were still worked well into the 20th century by adapting to new uses, usually for grazing dairy and beef cattle. Most of these had also fallen out of use by the 1960s, by which time the River Drainage Boards were straightening rivers and removing weirs and other obstructions in their resolve to speed up the water flow and prevent urban flooding. This was a point of no return for many water meadows, since their water supply was lost as river levels were lowered.

As agriculture became more intensive many redundant water meadows were drained and levelled to make them accessible to modern agricultural machinery before being ploughed up. The national rate of loss is difficult to quantify with precision, but a survey of water meadows by Hampshire County Council estimated that 39% of those it recorded from aerial photographs and 19th-century maps were destroyed by 1997 and that only 4% remained well preserved. A more recent survey of Herefordshire's water meadows comparing early maps, documents and 1940s aerial photography with recent aerial photographs and lidar images showed a similarly high rate of destruction and at least two systems which had survived as earthworks were ploughed up between 2000 and 2012 (DW Associates 2017).

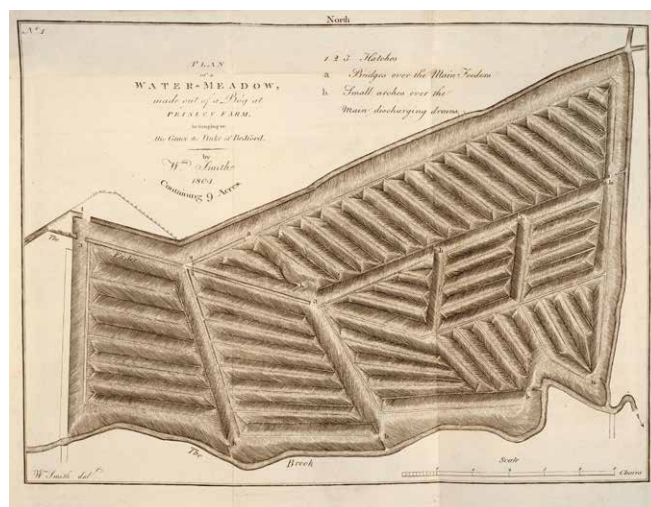


Figure 7 (top)

Hatch pool at Itchen Valley Country Park, Hampshire.

Figure 8 (middle)

Drowner working on a weir, Lower Farm, Britford, Wiltshire, 1954.

Figure 9 (bottom)

The Agricultural Revolution saw English wetlands turned into productive fields and pastures. At Prisley Farm, Bedfordshire, William Smith worked for the Duke of Bedford, transforming boggy ground into water meadows.

4 Heritage-Sensitive Management

A well-informed and holistic approach to the management of water meadow sites can both enhance biodiversity and protect archaeological remains. A management plan should be the fundamental tool for balancing differing conservation interests and avoiding conflicts between them. The outcome of any management should reconcile competing interests and should be drawn up after consulting specialists in relevant disciplines. When plans involving work on historic water meadows are intended, it is always advisable to contact local authority historic environment staff (both archaeological advisors and historic building conservation officers) as they will be able to provide advice on how emerging proposals should take account of the meadow's historic significance.

Recognising the presence of historic features and understanding their significance will be initial steps towards their sympathetic management:

- Careful field observation will identify earthen ridges and channels (which may be shallow and dry due to silting or peat accumulation).
- An examination of derelict channels and existing watercourses should locate any surviving structures, perhaps hidden below water level, masked by soil or vegetation, or indicated by the presence of rubble.
- Changes in vegetation can be clues to the presence of buried structures, for example clusters of trees or saplings (particularly ash or thorn trees) indicating mortar.

- Documentary sources, such as late 19th-century Ordnance Survey large-scale maps, estate plans, tithe and enclosure maps or aerial photographs may show the layout of main channels and the positions of structures.
- Recording the historic features, including taking photographs, will be important for helping to re-identify them in the future and for monitoring their condition over time.
- Establishing the locations of earthworks and structures as accurately as possible on large-scale current maps will be needed for their management and will provide information which may help to demonstrate how the meadow worked.

A copy of all the information gathered should be lodged with the local Historic Environment Record for safekeeping and to inform local planning. Maps will form an essential component of the management plan, which can then introduce measures to protect the features identified on them from damage and decay. These measures will usually include:

Managing Vegetation

Maintaining a meadow's open character will be the best policy for preserving any historic remains. This can also be considered the best use, botanically, aesthetically and in terms of maintaining the local landscape's character. Grazing livestock remove dead grass and leaf thatch from the ground surface as well as

eating invasive scrub and coarse vegetation. This improves floral diversity by allowing less competitive plants to grow. Grazing thus forms a key element of water meadow management, either as spring and aftermath grazing on hay meadows or longer term grazing where no hay crop is taken. The timing and frequency of grazing, the level of stock and the type of animal are important considerations. Research carried out on natural floodplain meadows, by Oxford University, has demonstrated that to get the highest plant biodiversity floodplain grassland should be cut for hay annually and the aftermath lightly grazed by cattle. This sequence of use prevents taller, coarser, plant species from becoming dominant and helps to create a diverse flower rich sward. Timing of the hay cut needs to be carefully considered and will be strongly influenced by the weather conditions, but sometime during a dry spell in June or July is usually preferable.

Hay cutting on historic water meadows can prove difficult using machinery, due to their undulations and structures on which machinery may ‘bottom’ or be damaged. In these instances, earlier grazing is recommended. Light grazing with stock is often a good method of vegetation control, which benefits biodiversity, but it is necessary to establish the correct nature and timing of grazing to suit the management priorities. The type of stock will be an important choice for producing the grass sward required while avoiding damage to the soil structure and the archaeological earthworks (see below). Where ground-nesting birds are breeding, stocking levels may need to be reduced on the meadows in late spring.

Where necessary, further vegetation control measures may include ‘topping’ of invasive weeds, spot weeding or selective mowing. Clearance of dense green vegetation cover which obscures historic features should be a priority, to prevent accidental damage from occurring. Weeds such as ragwort, rushes, docks and thistles need to be controlled as they appear and cutting thistles before flowering, for example, controls their spread.



Figure 10 (top)
Removing trees, a first step towards conserving sluices, Turnastone Court Farm, Herefordshire.

Figure 11 (middle)
Vegetation control helps preserve a water meadow's open character and encourages biodiversity.

Figure 12 (bottom)
Simple hatches, like this restored example at Harnham, controlled the flow of water.



Removal of tree and scrub encroachment will also be crucial, but boundary features such as hedges, ditches, walls and trees, should be conserved to increase the diversity of habitats for birds and invertebrates and to retain historic land divisions. Conflicting conservation interests may arise, particularly when work could compromise legally protected species and their habitats. In these cases advice should be sought from Natural England or voluntary bodies, such as County Wildlife Trusts.

Sensitive and selective tree felling and scrub clearance will usually benefit both the historic and natural environment. An important concern for a water meadow's historic structures will be to prevent root damage. Penetrating roots of large shrubs, trees and ivy will distort the profiles of ridges and channels and will prise brickwork and masonry structures apart, allowing water to enter and cause further damage through freeze-thaw cycles. Unstable trees may also fall, damaging underlying remains by root upheaval or crushing. Tree growth on earthworks and structures should be assessed carefully and a programme of removal should be agreed which reconciles conflicting interests. To prevent damage, to water meadow features woody growth should be cut back as close to the features as possible. Attempts to remove roots will cause damage, so it is best to leave exposed stumps and treat them with an environmentally friendly agent to prevent re-growth. There may be a need for re-treatment and a 'little and often' approach will be preferable to long periods of inactivity followed by major work. Where roots are stabilising a structure and their decay might cause collapse, trees can be cut back regularly, preferably in winter or autumn. Moss, lichen and thin grass will not damage stone structures, but the presence of moss may accelerate the decay of timber by retaining moisture.



Figure 13 (top)
Victorian concrete bridge providing access for hay-carts at Harnham.

Figure 14 (bottom)
Bridge saved from collapse by the River Wey Trust. Modern extensions prevent river erosion.

A Year in The Water Meadows

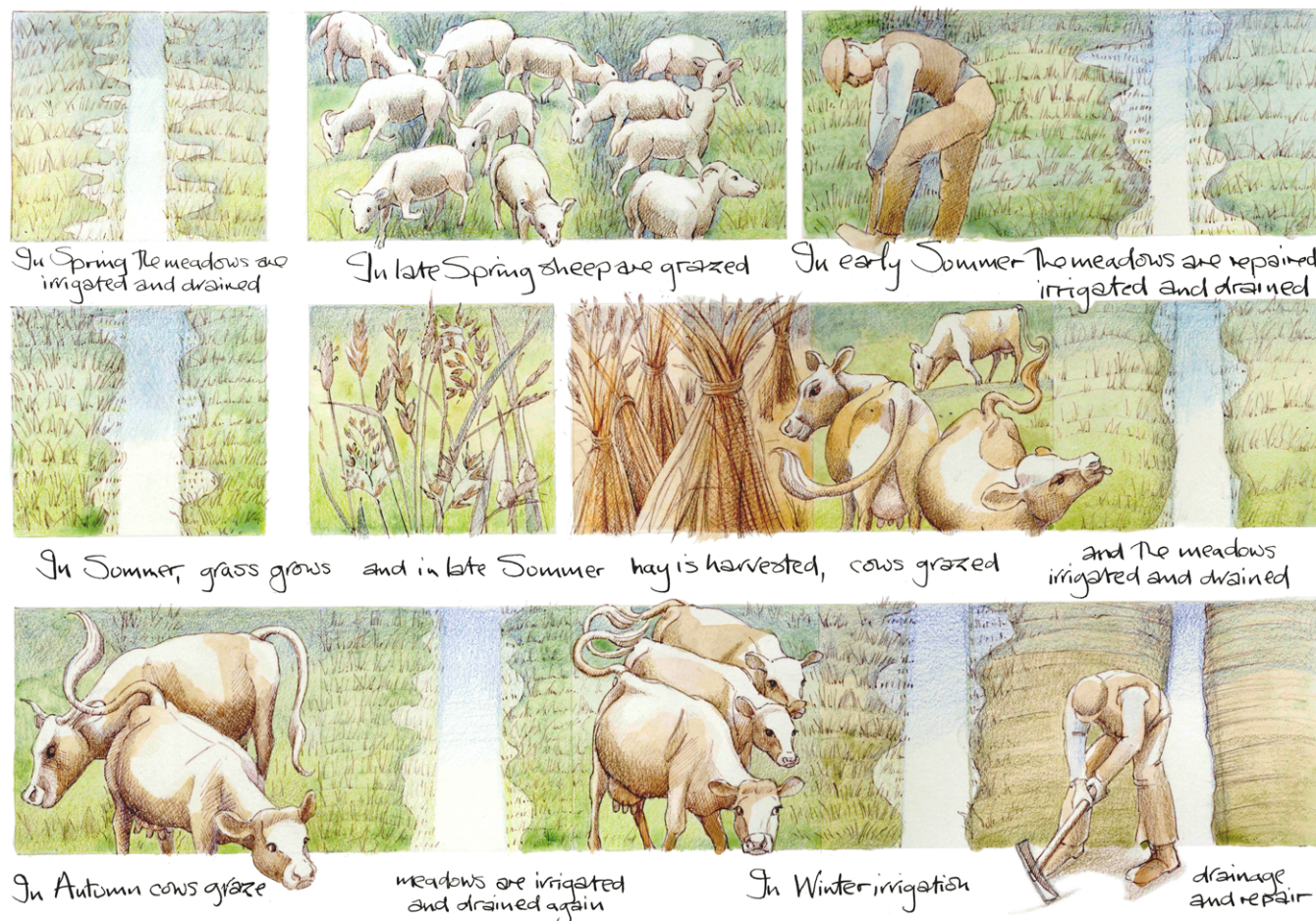


Figure 15

The precise methods of irrigation followed and their timing varied according to local circumstances. The reconstruction drawing shows a typical year in the water meadows, as advocated by William Smith in his 'Observations on the Utility, Form and Management of Water Meadows, and Draining and Irrigating of Peat Bogs',

published in 1806. Winter irrigation produced an 'early bite' for sheep, before grass was available elsewhere. The sheep came off the meadows in May to avoid contracting liver fluke and foot rot. Further irrigation in late spring made two or more hay crops possible, following which cattle grazed on the aftermath.

Preventing ground disturbance

Ground disturbance on historic water meadows will damage and distort their earthwork profiles and may destroy built structures. While ploughing is particularly destructive, less extensive disturbance or amendments to the layout of a water meadow will also result in loss of its archaeological significance. Fencing should not be placed across water meadows, since driving post holes into the

ground will damage earthworks and structures. The digging of ponds and bird scrapes to provide habitats for wildlife causes greater damage and destroys the meadow's historic layout. Rather than creating new ponds, existing ditches can be adapted to provide similar habitats. Creating new drainage features should be similarly avoided, particularly where existing water management features, such as grips and drains can be re-used.

Maintaining watercourses

Keeping historic water channels flowing or returning them to working order can benefit wildlife and restore the meadow's traditional layout. Well-maintained ditches and drains prevent soil loss and earthwork erosion from uncontrolled run-off, as well as increasing biodiversity by providing a variety of habitats. Good maintenance of ditches is also recommended to reduce flooding in some areas. Overgrowth of reeds and other dense vegetation clogs ditches and traps silt, so these need to be cleared periodically.

Some of this work can be done by using tractor-mounted machinery, operated by experienced contractors, while some will need to be undertaken by hand. Hand-digging, which may be carried out by volunteers, provides a level of precision particularly valuable when repairing intricate bedwork channels. To preserve wildlife, the task should be done on a rotational basis taking small sections at a time, with as long an interval as possible between each clearance. Superficial silt deposits should be removed carefully to avoid over-deepening the channels and damaging archaeological remains. The resulting up-cast should be taken away from the channel edge and spread thinly and evenly, to avoid altering the meadow's earthwork profile. A rotary digger with low pressure tyres may be used to disperse silt. Spreading silt onto a meadow can affect the soil nutrient levels, but if hay is cut this will help to restore the balance. Vegetation should also be moved away from the watercourse to prevent it falling in and polluting the water. Wherever possible, it can be left to dry and then removed from site for use as animal bedding etc.

If invasive non-native species are present, advice should be sought (see relevant organisations below) before any vegetation is removed. If work is carried out within 8m of a river, the Environment Agency should also be consulted as a licence for temporary works may be needed. Measures to prevent disturbed silt in ditches from entering rivers and exacerbating problems of siltation and diffuse pollution may also be required.

Preventing erosion and soil damage

It is advisable to keep off meadows when they are wet, since their soil structure and earthworks will be damaged easily by the passage of people, animals or vehicles. Grazing cattle on wet meadows will compact the soil and distort the earthworks. Vehicles will create wheel ruts, cause soil compaction and may become bogged down. Where vehicle access is completely unavoidable, lightweight vehicles, such as quad bikes, fitted with low pressure tyres are preferable.

Even in dry conditions the protective grass cover overlying earthworks can wear away where it is heavily trodden, allowing exposed soil to erode and earthworks to deform rapidly. For this reason track-ways and footpaths, whether permanent or temporary, should avoid clipping or cutting across historic features. Where erosion does occur, repairs will be necessary to prevent further deterioration. Chalkland water meadow earthworks are often repaired using chalk, which settles well and grasses over naturally. Maintaining an appropriate level of grazing is important for preventing erosion, since over-grazing will lead to poached ground and loss of protective grass cover. The type of stock kept also requires careful consideration. Sheep are generally preferable on historic remains, as they cause less damage than cattle or horses, but they are prone to foot rot in wet conditions. While cattle tend to be the preferred animals for sward biodiversity due to their mode of grazing, their heavier tread damages soils and earthworks. Grazing the margins of watercourses can help to control vegetation, but it may cause damage to channel edges and accelerate silting. Using moveable electric stock fencing to restrict access to certain areas can help in managing erosion, while using stock-operated drinkers (pasture pumps) will allow cattle to drink river water without damaging banks. Permanent water troughs and feeders concentrate ground poaching in their vicinity, so their use is detrimental to historic earthworks and structures and it is preferable to avoid giving stock supplementary feed while they are on the meadows because this can upset the pasture's nutrient balance in favour of coarse grasses and weeds. If the grass runs out it is best to remove the stock.

Maintaining timber and masonry structures

Depending on the condition of a water meadow and when it was last operated, historic timber and masonry structures may survive and require varying levels of remedial work. Ongoing maintenance will also be essential to address decay over time. The necessity for such work can be identified at an early stage by regular condition monitoring. When repairing or conserving historic structures the main challenge is to halt decay without altering their character or destroying their historic fabric. **It is very important that they should not be removed, relocated, replaced or 'over-restored'.** The best practice is to carry out the correct amount of repair necessary to ensure survival and to meet the requirements of a structure's use. Good quality repair work will prove cost-effective in the long term.

Photographs should be taken before, during and after restoration to document the original fabric and construction method, as well as the extent and nature of the repair work. Copies of these and any supplementary information should be deposited with the local Historic Environment Record. Cracks and missing blocks of masonry or brickwork will not need repairing, unless they are likely to cause collapse. Re-pointing is, similarly, only necessary in cases of extreme erosion. Materials used for repairs should match the existing fabric in texture, shape, size and colour, irrespective of whether the repair is permanent or temporary. Mortars should be lime-based and weaker than the masonry, so hard cement-based mortars are not generally appropriate (unless used with engineering bricks) as they will cause damage to the surrounding masonry. Where rotten timber needs to be replaced, seasoned hardwood will be the best material to use. Elm was common in the past, but oak is an acceptable alternative nowadays. Treated soft wood is sometimes used for smaller hatches, although it cannot be used in SSSIs, as the preservative treatment it contains is detrimental to insects, lichens etc. Where possible, the original method of construction should be replicated and surviving fabric and fittings should be re-used.

Dealing with water erosion

Water meadow structures are highly vulnerable to erosion from the flow of river water. Weirs, sluices and hatches that become undermined or breached by water will eventually collapse. To prevent this, the bed of the watercourse through such structures may need to be stabilised in addition to any repairs to the structures themselves. It is easiest to do this when river levels are low, since temporary damming will be necessary to allow access. Work on weirs, dams or other features within rivers, will require prior consent and a licence from the Environment Agency. Repairing breached water meadow structures in rivers may cause problems by obstructing fish migration, but unobtrusive and well-positioned by-pass channels can provide an acceptable solution.

Maintaining site hydrology

Hydrological management of historic water meadows should seek to sustain the traditional regime as far as it is possible and practical. Restoring or maintaining wet features such as drains, such that they hold water for most of the year, is beneficial to many groups of wildlife. However, excessive inundation across a meadow is likely to be detrimental to species diversity, posing problems for some birds and plants. It will also submerge archaeological earthwork features and cause structures to decay. The best policy is to re-instate existing channels that allow the site to shed surface water effectively. Carefully positioned dip wells may be inserted into a meadow to monitor the level of the water-table.

Should water meadows be re-floated?

Water meadow systems were intended to be operated periodically and in places they were irrigated annually for 200-300 years. Re-floating, or partial re-floating, of some water meadows may be desirable (see case studies below) if an adequate water supply is available. The viability will depend upon local circumstances, such as the geological composition of the area and the reliability of the water supply. Major changes to river courses since water meadows were abandoned have caused many river levels to drop, making them too low for the re-floating of many water meadows to be possible today. Another difficulty is their economic viability, being costly and labour-intensive to maintain. The nature of the work, traditionally manual toil in cold and muddy conditions, is also such that few people are prepared to take it on and the particular skills required have been lost.

Government agencies should be consulted if re-floating water meadows is being considered. The Environment Agency, which licenses water abstraction, including its impounding and transfer, has to be contacted before any water can be taken from rivers or other watercourses. Where sites fall within areas of ecological designation,

such as SSSI, SPA, SAC and Ramsar Sites, consultation with Natural England is also required before changes in management can take place.

Despite the difficulties, a few water meadows continue to operate successfully today, most receiving assistance from agri-environment schemes promoting wildlife conservation as a primary consideration in their management. From the 1990s, agri-environment schemes identified traditional water meadows as a target habitat for support under specific options and offered financial assistance for their restoration. However, a more popular approach was to manage them as disused systems under grassland options to benefit wildlife, particularly wading birds or meadow flora. In 2016 a new Countryside Stewardship scheme started, with competitive Mid and Higher Tiers. The main priority of the scheme is to protect and enhance the natural environment, especially biodiversity and water quality. One of the Higher Tier options directly targets the 'management of historic water meadows through traditional irrigation' (HS7), while a number of other options, such as those for improving and managing wet grassland, are also applicable to water meadow sites.

5 Case Studies

The following case studies demonstrate effective and balanced approaches to the management of historic meadows, both operational and abandoned, and highlight how they present opportunities for both the natural and the historic environment.

Water meadows on the River Wey, Hampshire

Water meadows provided the major landscape and economic influence on the southern Wey Valley for nearly three hundred years. When they fell out of use, in the first half of the 20th century, the open meadows reverted to scrub and woodland in many places. In order to preserve the unique local character of the landscape, it was recognised that a significant proportion of the former meadows should remain as open grassland and that evidence of historic irrigation practices should be maintained. These have begun to be more widely reviewed in a catchment-wide context

through collaboration between agencies and local groups as partners in the 'Wey Valley Landscape Partnership', organised by the Surrey Wildlife Trust. One of the partners, The River Wey Trust (RWT, whose geographical area of interest is the southern branch of the upper Wey), has played a key role in preserving the archaeological interest of the River Wey. Through the efforts of individual trustees and the assistance of volunteers the RWT, since the mid-1980s, has recorded and rescued many decaying water meadow structures and continues to preserve the archaeological interest of the meadows through ground monitoring, scrub and weed control and carrying out remedial work.



Figure 16

Aqueducts carried water through narrow sections of the Wey Valley, allowing its water meadow systems

to function in difficult topography. This example at Bramshott Court, was one of several connecting water meadows on either side of the Wey.

Harnham Water Meadows at Salisbury, Wiltshire

The Harnham Water Meadows (HWMs) are situated between the city of Salisbury and West Harnham on an island of 40ha area formed by the split in the River Nadder before it joins the Wiltshire Avon near Salisbury Cathedral. Ownership of the majority of the area lies with the Dean and Chapter of Salisbury Cathedral and the Harnham Water Meadows Trust (HWMT), the latter managing some 34ha of water meadow and former water meadow. The remaining area is in private hands and is not under HWMT management. The Cathedral is clearly visible from much of the site, making the HWMs arguably the most famous system of water meadows in England. They present a sequence of development from medieval grazing marsh through to a succession of water meadow constructions, or flatter degraded water meadows due probably to abandonment of peat soil areas and some ploughing during the Second World War. Today the meadows have a wide range of uses including: sheep pasture, hay meadow, floodplain meadow and water-fringe areas including reed beds. A small portion (about 10%) of the total area may be drowned on a regular basis, the restriction being largely due to persistent low river levels in the Nadder, something of which the Environment Agency is aware. A substantial area (about 60%) retains the 'floating' infrastructure and has the potential for irrigation with small investment in restoration. Heritage interest is a prominent consideration in the management of the meadows and HWMT accommodates archaeological remains in its restoration work, while also meeting the statutory requirements of the area's status partly as a Site of Special Scientific Interest (SSSI) that is designated on the basis of sward diversity.



Figure 17

A 'double hatch' water control structure installed at Harnham Water Meadows in 2009 with joint funding from the Environment Agency and Salisbury District Council. It replaces an earlier structure removed during the 1930s.

The interests of the 'natural' and historic environment are reconciled in a Farm Environment Plan which forms the basis of its management and in 2008, HWMT was successful in enrolling the area in Higher Level Stewardship as an historic landscape, administered and advised through Natural England. The Friends of the HWMT, operational for over 20 years, provides a focus for strong community involvement, including education and outreach, with a workforce of volunteers. These factors have been instrumental to the Trust's success. It operates through both bought-in professional services and volunteers, but it is kept afloat on a regular basis by forming working partnerships. The Trust's work is funded through money raised by the Friends, agri-environment scheme payments from Natural England and other public bodies, rent from grazing, bequests, grants from charitable foundations and a modest income from the visits and lectures it provides.

Wicksteed Water Meadows, Kettering, Northamptonshire

Complete restoration of an historic water meadow at Wicksteed Park has been carried out by a partnership of organisations under the management of the River Nene Regional Park and the Wildlife Trust for Bedfordshire, Cambridgeshire and Northamptonshire. It is situated close to the Kettering East Sustainable Urban Extension (Hanwood Park) where, in 2010, planning permission was granted for 5,500 new homes and their associated infrastructure. Aspects of the restoration such as ditch clearance and cattle fencing were supported by grant aid under Natural England's Higher Level Stewardship Option for management as a water meadow and additional funding was obtained from the Big Lottery. The work was assisted by the Natural-ISE community group, Groundwork

Northamptonshire, the Probation Service, Moulton College and local volunteers. Prior to the restoration the historic remains of the water meadow were hidden by vegetation. Clearance of scrub and brambles revealed traces of the former channels, which were re-cut. No built structures remained but new sluices were built. A key objective of the project was to restore lowland meadow grassland and re-create habitat diversity to support UK Biodiversity Action Plan (BAP) species. 1500m of wet channels were cleared, benefiting a range of species including frogs, toads, newts, dragonflies and other wetland invertebrates. Since the beginning of the restoration 114 new species have been recorded at the meadow, which forms about a quarter of a 24ha nature reserve (other parts include a Repton parkland, a wet meadow and Castle Field moats, ponds and village earthworks, which comprise a Scheduled Ancient Monument).



Figure 18

Recently restored water meadows at Wicksteed, form an integral part of the wider historic landscape. Barton Seagrave Hall's landscape park, laid out with advice from Humphrey Repton in

the late 18th and early 19th centuries, lies in the background. The meadow is a key area for wetland biodiversity, forming part of a linear habitat stretching through Kettering.

6 Bibliography

Clark, M *The Conservation of Water Meadow Structures* Hampshire County Council

Cook, H & Williamson, T eds 1999 *Water Management in the English Landscape: Field, Marsh and Meadow* Edinburgh University Press

Cook, H & Williamson, T 2007 *Water Meadows: History, Ecology and Conservation* Windgather Press: Macclesfield

Cook, H; Cowan, M & Tatton-Brown, T 2008 *Harnham Water Meadows: History and Description* Hobnob Press, Salisbury

DW Associates 2017 *Herefordshire Water Meadows Identification Project* unpublished report for Historic England
<http://h2om.uk/Water%20Meadows%20in%20Herefordshire%2011Mar17.pdf>

Everard, M ed 2005 *Water Meadows: Living Treasures in the English Landscape* Forrest Text: Cardigan

Kerridge, E 1953 'The floating of the Wiltshire water meadows' *Wiltshire Archaeological Magazine* 55, 105

McOmish, D; Field, D & Brown, G 2002 *The Field Archaeology of the Salisbury Plain Training Area*

Rimmington, Dr J N 2004 *Managing Earthwork Monuments: A guidance manual for the care of archaeological earthworks under grassland management*

<http://hadrianswallcountry.co.uk/hadrians-wall-management-plan/management-system/whmp-delivery-groups/conservation-planning-heritage>

Save our Magnificent Meadows

http://www.magnificentmeadows.org.uk/assets/pdfs/Types_of_Livestock.pdf

Smith, N 2013 *Water Meadows Introduction to Heritage Assets*

<https://content.historicengland.org.uk/images-books/publications/iha-water-meadows/watermeadow-ih-a.pdf/>

Stearne, K 2005 'Archaeology and Heritage' in ed M Everard

University of Birmingham 2008 *Recognising water meadows: A field guide and fact-sheet*

<https://www.staffordshire.gov.uk/environment/eLand/planners-developers/HistoricEnvironment/Projects/RecognisingandRecordingWaterMeadows-AFieldGuideandFactSheet.pdf>

7 Specialist Advice

Specialist advice and reliable funding streams can be invaluable when developing effective management strategies, and in some cases statutory bodies must be consulted.

Local authorities

When plans are being prepared that could involve work affecting historic water meadows advice should always be sought from local authority historic environment staff (both archaeological advisors and historic building conservation officers). They will be able to provide the necessary information to ensure that the meadow's historic significance is fully understood and this can help to avoid any possible damage, whilst also highlighting opportunities for future enhancement. Work affecting listed structures will additionally require listed building consent from the relevant local authority. Local authorities can lead the way through their work to enhance the protection of water meadows. Exemplary surveys have been carried out by Hampshire and Staffordshire Councils, who have developed particular expertise on the subject.

Historic England

Historic England is the government's expert advisor on England's heritage and we have a statutory role in the planning system. Central to our role is the advice we give to local planning authorities, government departments, developers and owners

on development proposals affecting the historic environment. We have a statutory role in responding as a consultee to planning authorities in connection with applications for planning permission and listed building consent. We administer applications for scheduled monument consent on behalf of the Department for Digital, Culture, Media and Sport and provide related advice. In addition, we provide non-statutory advice, including pre-application advice on important proposals affecting the historic environment in England, and advice on archaeology within Greater London. Historic England's Charter for Advisory Services explains our advisory services for planning and development.

<https://historicengland.org.uk/services-skills/our-planning-services/charter/>

We provide our advice through teams in our nine Local Offices covering Development Management, Heritage at Risk and Historic Places.

<https://historicengland.org.uk/services-skills/our-planning-services/local-advice/>

Department for Food and Rural Affairs (DEFRA)

The Department administers the Rural Development Programme, which can provide financial assistance for projects to improve agriculture, the environment and rural life.

<https://www.gov.uk/government/organisations/rural-development-programme-for-england-network>

Natural England and the Environment Agency are non-departmental public bodies of DEFRA, which work closely together.

Natural England (NE)

Natural England can advise on appropriate management regimes and funds may be available, particularly for work supporting biodiversity or creating habitats for priority species. It has to be consulted where work is planned on water meadows which fall within Sites of Special Scientific Interest or other areas covered by natural environment designation. Agri-environment schemes, directed by NE, can be a basis for heritage-sensitive management. NE also provides grants for Catchment Sensitive Farming (CSF), a voluntary scheme funding capital works that improve water management and quality. Priority areas for the scheme include some famed for their water meadows, such as the Hampshire Avon.

The Environment Agency (EA)

The Environment Agency has a responsibility to satisfy the requirements of the EU Water Framework Directive (WFD 2000) and has produced a series of 'River Basin Management Plans'. Where work is intended on structures in, over, under or adjacent to rivers the EA should be consulted. It encourages the removal of obstructions in rivers in order to restore river corridors to a more natural state of flow, improving connectivity, sediment transport, morphology and habitats and has particular powers to ensure the provision of river passage for salmon, eels and migratory trout. It also regulates water abstraction from rivers, so an EA licence is required for irrigation using river water.
<https://www.gov.uk/guidance/water-management-apply-for-a-water-abstraction-or-impoundment-licence>

Other Relevant Organisations

County Wildlife Trusts

County Wildlife Trusts can offer conservation-based advice on species and habitats, which may be especially helpful for sensitive species.

<http://www.wildlifetrusts.org/>

The Rivers Trust

The Rivers Trust provides a good link between stakeholders with an interest in river management, including those with expert knowledge such as farmers and anglers.

<http://www.theriverstrust.org/>

The Heritage Lottery Fund

Water meadow restoration may be eligible for assistance as part of an approved project. For more information see:

<https://www.hlf.org.uk/looking-funding>

Further Information

Harnham Water Meadows Trust

The Trust has considerable knowledge and experience of water meadow management. Their website contains a wealth of useful information.

<http://www.salisburywatermeadows.org.uk/>

The River Wey Trust

The River Wey Trust has thirty years' experience in the active management of water meadow sites and has advised many other catchments on how to find historic water meadows, how to plot their layouts and their viability for reinstatement.

<http://www.riverweytrust.org.uk/>

The National Trust

Has practical experience of restoring a traditional water meadow to working order on its Sherborne Estate in Gloucestershire.

<https://www.nationaltrust.org.uk/lodge-park-and-sherborne-estate/features/restoring-the-water-meadows>

8 Acknowledgements

Editorial comments on this document were kindly supplied by the following individuals: Magnus Alexander, Mark Bowden, Stephen Dean, Seb Fry, Shane Gould, Prof David Gowing, Will Holborrow, Vince Holyoak, Barry Jones, Paul Stamper, Katherine Stearne, Vanessa Straker, Jim Williams and Prof Tom Williamson.

Images

© Historic England

All images except those listed below

© Other

Cover, Figure 7, 13, 17: Hadrian Cook

Figure 6, 8, 9: Museum of English Rural Life (MERL), University of Reading

Figure 18: Robin Field

Every effort has been made to trace the copyright holders and we apologise in advance for any unintentional omissions, which we would be pleased to correct in any subsequent editions.

This page is left blank intentionally

Contact Historic England

East Midlands
2nd Floor, Windsor House
Cliftonville
Northampton NN1 5BE
Tel: 01604 735460
Email: eastmidlands@HistoricEngland.org.uk

East of England
Brooklands
24 Brooklands Avenue
Cambridge CB2 8BU
Tel: 01223 582749
Email: eastofengland@HistoricEngland.org.uk

Fort Cumberland
Fort Cumberland Road
Eastney
Portsmouth PO4 9LD
Tel: 023 9285 6704
Email: fort.cumberland@HistoricEngland.org.uk

London
Fourth Floor
Cannon Bridge House
25 Dowgate Hill
London EC4R 2YA
Tel: 020 7973 3700
Email: london@HistoricEngland.org.uk

North East
Bessie Surtees House
41-44 Sandhill
Newcastle Upon Tyne NE1 3JF
Tel: 0191 269 1255
Email: northeast@HistoricEngland.org.uk

North West
3rd Floor, Canada House
3 Chepstow Street
Manchester M1 5FW
Tel: 0161 242 1416
Email: northwest@HistoricEngland.org.uk

South East
Eastgate Court
195-205 High Street
Guildford GU1 3EH
Tel: 01483 252020
Email: southeast@HistoricEngland.org.uk

South West
29 Queen Square
Bristol BS1 4ND
Tel: 0117 975 1308
Email: southwest@HistoricEngland.org.uk

Swindon
The Engine House
Fire Fly Avenue
Swindon SN2 2EH
Tel: 01793 445050
Email: swindon@HistoricEngland.org.uk

West Midlands
The Axis
10 Holliday Street
Birmingham B1 1TG
Tel: 0121 625 6870
Email: westmidlands@HistoricEngland.org.uk

Yorkshire
37 Tanner Row
York YO1 6WP
Tel: 01904 601948
Email: yorkshire@HistoricEngland.org.uk



Historic England

We are the public body that looks after England's historic environment. We champion historic places, helping people understand, value and care for them.

Please contact
guidance@HistoricEngland.org.uk
with any questions about this document.

HistoricEngland.org.uk

If you would like this document in a different format, please contact our customer services department on:

Tel: 0370 333 0607
Email: customers@HistoricEngland.org.uk

All information and weblinks accurate at the time of publication.

Please consider the environment before printing this document

HEAG176
Publication date: v1.0 July 2014 © English Heritage
Reissue date: v1.2 November 2017 © Historic England
Design: Historic England