Freshmill Cottage and Ketches Meadows: downstream from Sloop Weir, East Sussex

River Ouse Project Report No. 5

Centre for Community Engagement
University of Sussex

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The Leverhulme Trust

Front cover Pool's Bay Weir

Contents

1 Introduction

This is one of series of reports produced by University of Sussex River Ouse Project about MORPH (Middle Ouse Restoration of Physical Habitat) sites. The reports provide information to the Environment Agency, the National Trust and other interested stakeholders to enable appropriate decisions to be made about biodiversity enhancement of riverside land in the Middle Ouse linked to flood alleviation. In this report, Middle Ouse refers to the Ouse and its tributaries in the area defined as Middle Ouse by MORPH.

Our work has focussed particularly on streamside grassland. The two main objectives were to discover more about species-rich sites and to assess the suitability of species-poor sites for either grassland enhancement or wet woodland restoration.

The report sets our work in context and describes the methods we used (Section 2 and 3). A site description (Section 4) includes details of the frequency of flooding and potential for the site to act as a flash washland. Relevant changes in land use over the last 200 years are detailed in Section 5. Sections 6 and 7 describe present-day vegetation with notable species and an indication of biodiversity value, while proposals for biodiversity enhancement that could be linked to flood alleviation are given in Section 8.

2 Context

2.1 A washland flood alleviation strategy

The river Ouse in Sussex is a flashy river, which rises quickly after prolonged heavy rain and then soon subsides. It has a wide catchment area with a large number of small streams, many of which become dry in their upper reaches during summer (Figure 1). This capillary system is mostly well-wooded with imperfect or poor-draining soils; mini-floodplains alternate with steep-sided sections of ghyll. Rain falling at the end of a dry period is absorbed initially but, once the ground becomes saturated, any extra rainfall causes rapid flows in these streams. The result is a sudden and dramatic rise in water level in the main Ouse. In the past, this water spilled on to land bordering the Middle Ouse resulting in flooding, which lasted 2-3 days. Land subject to such flooding is known as ‘flash washland’. Navigation works between 1790 and 1799 on the main Ouse and the deepening of Ouse streams in the 1970s to drain agricultural land have reduced the amount of land subject to this ‘flash’ flooding – leading to destructive flooding of homes and businesses further down the river.

A flood alleviation strategy for the Ouse depends on holding back the peak flow temporarily in the upper regions until water from lower down the system has passed through. Flash washlands, which flood briefly and then drain quickly, are ideal because they soon become available to store water again. Such a naturally functioning system is better for biodiversity and inexpensive compared with hard structures and sluice gates.

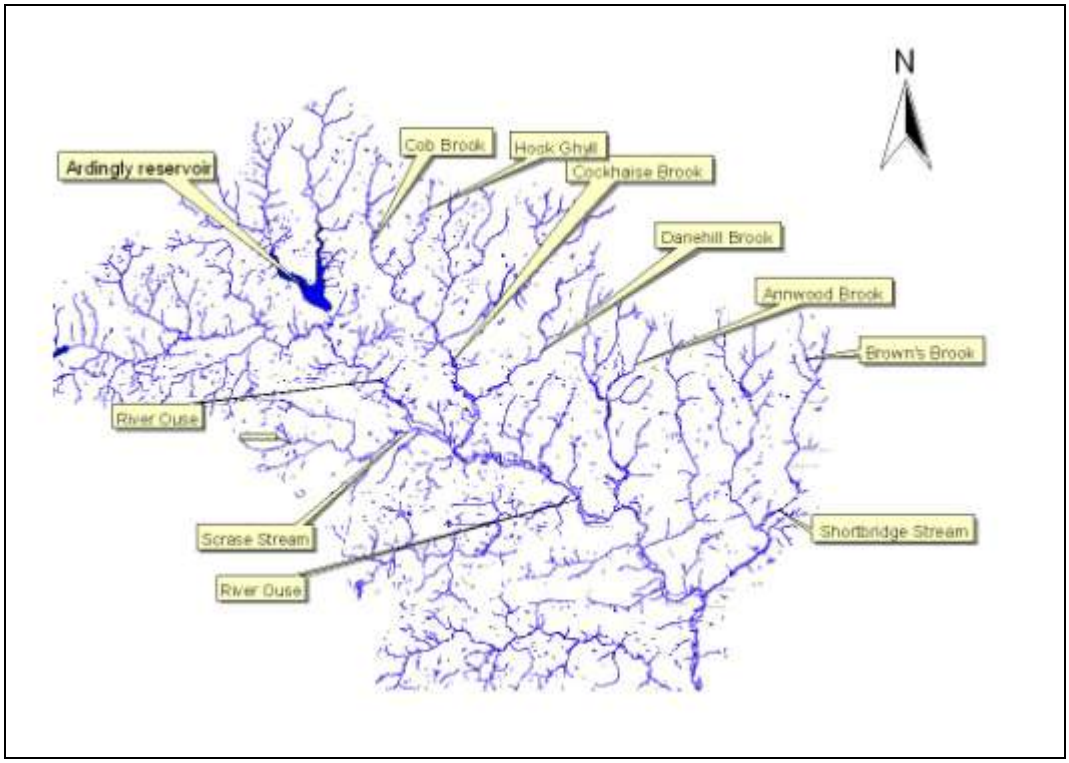

Figure 1. The stream system that feeds into the upper reaches of the river Ouse.

2.2 Flash washlands in the Middle Ouse

Flash washlands in the Middle Ouse share the following properties.

- They flood for 2–3 days during periods of peak flow after heavy and prolonged rain, usually during winter.
- They have free-draining soil as a result of the sandy silt brought down in floodwaters from the High Weald.
- They were managed as hay-meadows with flower-rich 'Crested Dog's-tail–Common Knapweed Grassland' (MG5 grassland in the National Vegetation Classification – see section 3.1). Such grassland tolerates short duration flooding.
- They are too dry for most of the year to support wetland plants unless they contain permanently wet areas fed by springs.
- Washlands with a matrix of spring-fed wetland areas within MG5 grassland are the most biodiverse habitats.

2.3 Wildflower meadows full of butterflies and bumblebees – a Biodiversity Action Plan target plant community

Wildflower meadows are rare. Despite the 1995 Biodiversity Action Plan target of no further depletion of this habitat, they have continued to vanish from our landscape. The decline in native bumblebees, which are essential crop pollinators, particularly early in the year when hive bees are inactive, is linked to the decline in flower-rich meadows.

In the days of horse transport, the best land was used as hay meadow and all along the Middle Ouse there were extensive hay meadows and pastures. Wild flowers such as cowslips and oxeye daisies grew in profusion. Now only small pockets of flower-rich grassland remain and the connected meadow-scape essential for bumblebees

has gone. The linear landscape along the Middle Ouse provides a wonderful opportunity for re-connecting the flower-rich fragments through grassland enhancement of suitable sites.

Our research shows that this can be done on sites where the soil fertility is low by planting wildflower plugs and sowing Weald Meadow Initiative wildflower seed. Such enhancement would retain agricultural land in good condition, enabling a return to low-input farming when oil-driven agriculture is no longer possible.

3 Methods

3.1 National Vegetation Classification (NVC) survey of principal grassland habitats bordering the Middle Ouse

The NVC is the most widely used system for describing vegetation and is particularly useful in the context of the present report because it relates to soil properties and site management. We followed the methods described in Rodwell (1992). The starting point is a botanical survey, which records the abundance (determined by a visual estimate of percentage cover using the Domin scale – see Box 1, p. 13 – for a description) of all the species present in a series of sample squares (quadrats) of either 2 x 2 or 4 x 4 metres. From this dataset we assign an NVC community to the present-day grassland based on the frequency (percentage of quadrats in which each species is present) and abundance of each species. Points of difference between our data and the average for this type of grassland are noted. We can then draw conclusions about how this grassland has evolved in the context of past land use and about how it can be transformed in future.

3.2 Determination of historical land-use and flooding

The historical land use of the site was investigated through document analysis and oral history interviews with local farmers.

3.3 Selection of appropriate future management

Survey data were analysed in an historical and cultural context to enable decisions to be made on the most appropriate management with respect to biodiversity and flood alleviation for the site.

4 Site Description

4.1 Location

Freshmill Cottage meadow lies along the north side of the meandering section of the main Ouse known as the Dave Knight stretch, downstream from Sloop Weir from TQ382247 to TQ385246. It is a long, thin, comma-shaped meadow bounded to the north by a stream, which rises in adjacent woodland and flows into the Dave Knight stretch at the south-east corner of the meadow (Figure 2).

Oakhams (Ketches Farm) is a roughly square-shaped meadow with the old meandering course of the river along its southern side from TQ390245 to TQ393245 and the Bluebell Railway along its northern side (Figure 2). A substantial stream,

which rises just south of Danehill, bounds the western side and at the south-east corner a gap in the hedge allows sheep to move freely into the adjacent Great Mead.

Great Mead (Ketches Farm) is rectangular in shape and is bounded on three sides by water made up largely of the old meandering course of the main Ouse from TQ393245 to TQ397244 except for the centre of the southern boundary where a ditch, which previously cut off part of the river, separates Great Mead from River Mead. A bridge allows sheep to move freely between the two meadows. The north-east side is bounded by a stream from Heaven Farm, which joins the river at the tip of the largest meander (Figure 2). Great Pole Mead (Spring Farm, Pilkington *et al*., 2012) lies on the other side of the meander.

River Mead, a smaller, rectangular-shaped meadow, lies immediately to the south of Great Mead, separated by the ditch (Figure 2). It is bounded on the other three sides by the original course of the main Ouse from TQ394244 to TQ396242. Pool's Bay Weir lies in the south-east corner adjacent to Great Pole Mead (Spring Farm, Pilkington *et al.,* 2012).

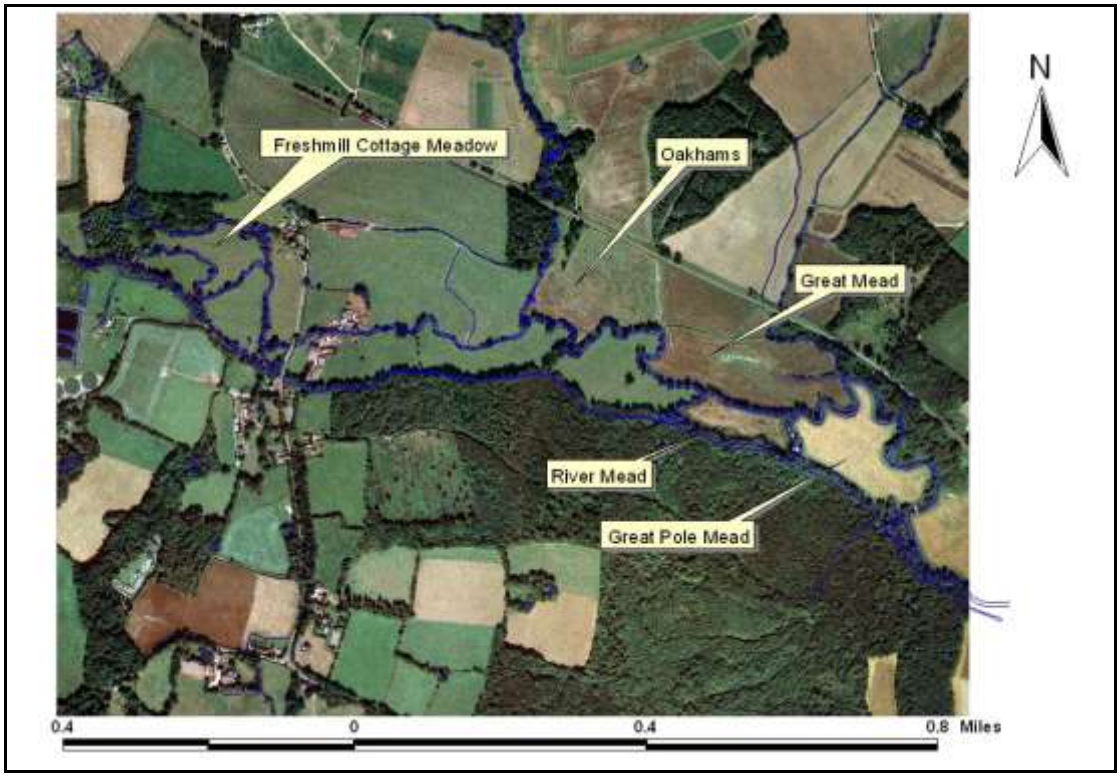

Figure 2 Location of Freshmill Cottage meadow and Ketches meadows.

4.2 Soil type

The soil is alluvium lying within the Upper Tunbridge Wells Sand formation. The soil pH is 5.1 in Freshmill Cottage meadow and 5.7 in Great Mead. The soil is not free-draining.

4.3 Meanders and spring-fed wet areas

In the corner of Freshmill Cottage meadow, the stream seeped through into the meadow, making an area of wetland. This was once a watercress bed but has been

made into a pond by the current owner. The pond is visible in the north-east corner of the meadow in the 1999 aerial photograph (Figure 2) but is absent from the 1947 aerial photograph (Figure 3).

In Great Mead a successful scrape was made as part of the Stewardship agreement. This has been colonized by alders and wetland vegetation.

Figure 3 Aerial photograph of 1947, showing Freshmill Cottage meadow.
(source: http://www.sussex.ac.uk/geography/researchprojects/airphotos-historic/1940/6-3047.jpg)

4.4 Flooding

The meadow at Freshmill Cottage floods, as the owner explained:

> *'It floods regularly ... as late as March and as early as October ... twenty-four, forty-eight hours – it rises very fast and it drains very fast.'*

And, although Freshmill Cottage itself does not flood, the neighbouring house was flooded in 2000:

> *'... the house next door ... got water in the house [in 2000] .... and the new people who bought it last year put a 'bund' all round the garden.'*

All three of the riverside meadows at Ketches Farm flood, as the farmer explained:

> *Oakhams would flood, the lower part ... and the Brooks [Great Mead and River Mead] ... definitely floods.'*

5 Land use

These meadows were part of an extensive band of flower-rich grassland lying alongside the river Ouse until well into the last century. Figure 4 shows the Ketches fields at the time of the Tithe map survey of 1840-41. Great Mead, River Mead and a large part of what is now Oakhams were hay meadows. In 1931 all of the fields were being managed as hay meadow (Figure 5). The aerial photograph of 1947 (Figure 6) shows a similar picture, with the two parts of Oakhams still separated by a hedge, but grassland in contrast to the ploughed area of Flax Mead (Figure 4).

Freshmill Cottage Meadow is managed by the neighbouring farmer for the owner, who is not a farmer. It has not been ploughed for at least the last 25 years, but was fertilized in 2010 and is topped, not cut for hay. It was grazed by cattle up to 2010 but this arrangement has been discontinued. It is used by the family for amenity (for example, camping) rather than agriculture.

The riverside meadows at Ketches Farm went into Stewardship in 2000. Prior to this they were arable with a grass ley/arable rotation. They were ploughed in 1999 prior to seeding with a stewardship mix of 'non-productive grasses'. Since then the land has been:

> *'reverting back to what it would have been if farming had not taken place'.*

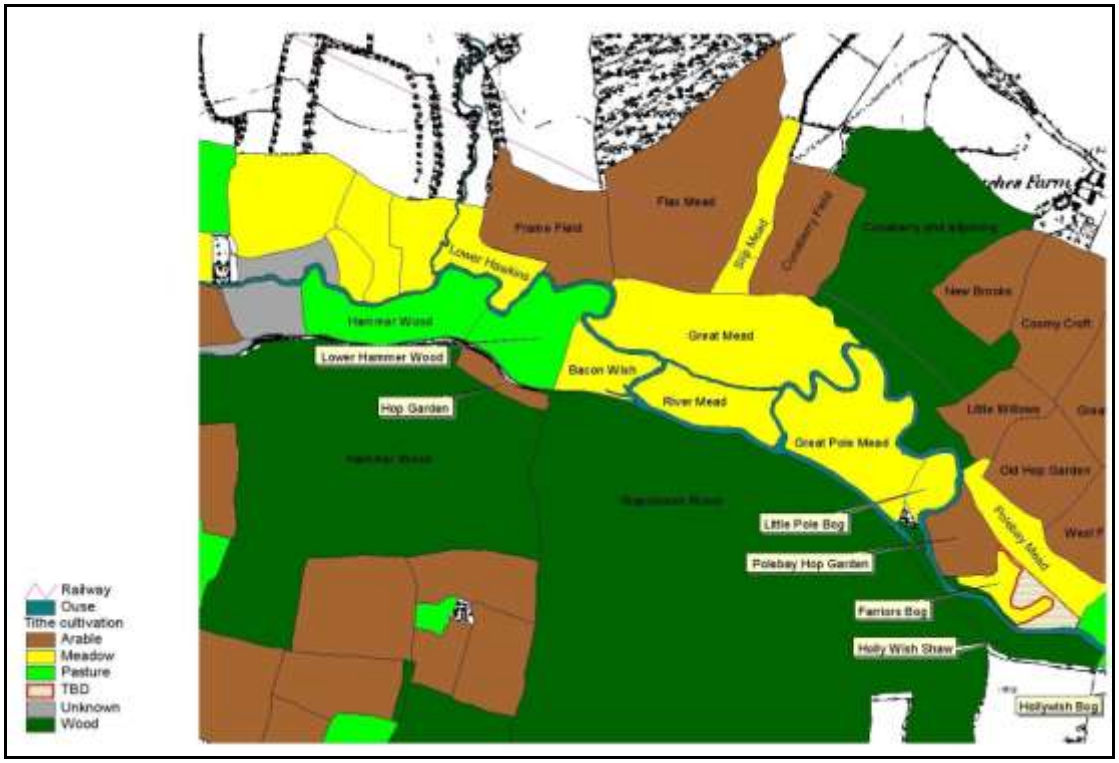

Figure 4 Map showing land use and field names compiled from the 1840-41 Tithe Map and apportionment data by Nick Steer. Oakhams was two fields in 1840: Lower Hawkins and Frame Field. Tithe maps for Fletching and Newick: East Sussex Record Office: ESRO TD/E 145 and TD/E 42

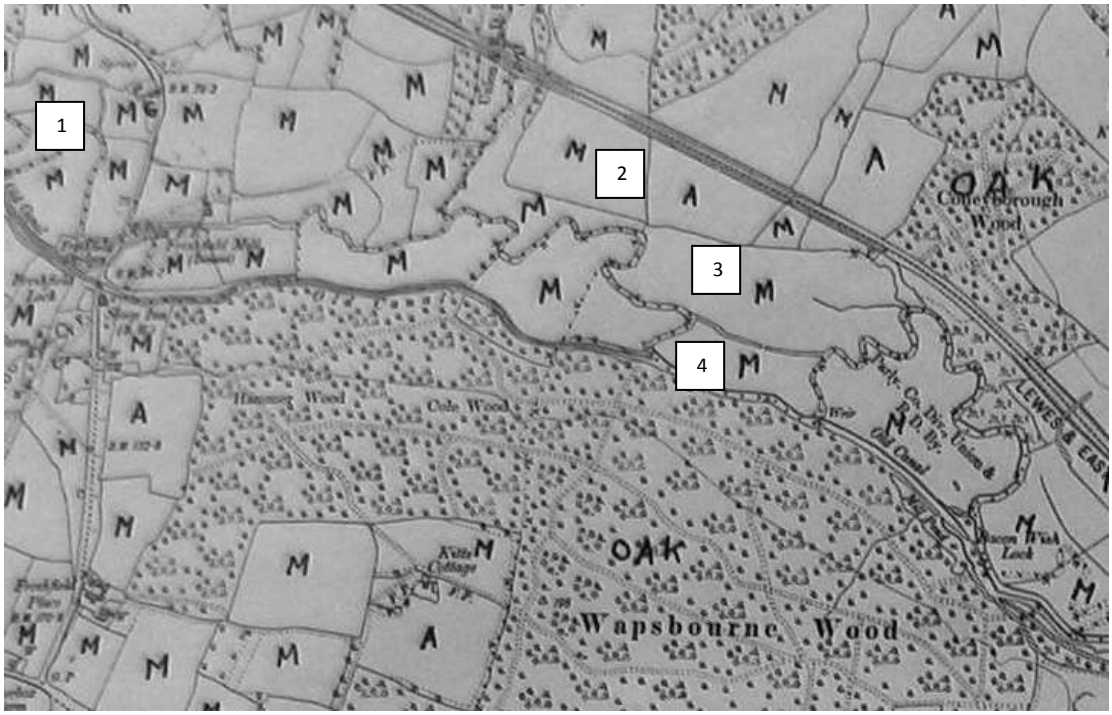

Figure 5 Part of the Land Utilisation Survey map 1931 of the Sheffield Park area. London School of Economics: LSE PA7248 Field Map/Fletching. M indicates meadow Land. 1 Freshmill Cottage Meadow; 2 Oakhams; 3 Great Mead; 4 River Mead.

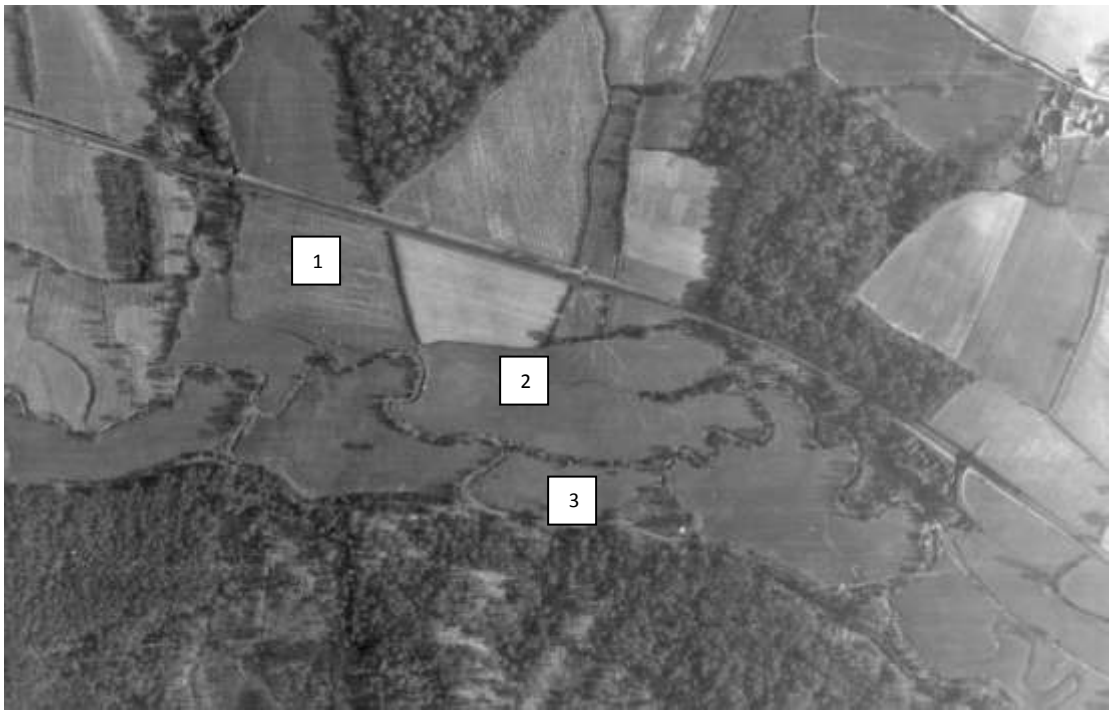

Figure 6 Aerial photograph of 1947, showing Ketches Meadows.
1 Oakhams; 2 Great Mead; 3 River Mead
(source:<http://www.sussex.ac.uk/geography/researchprojects/airphotos-historic/1940/6-3047.jpg)

They are lightly stocked with sheep, at a rate of about 30 sheep to 44 acres, which graze there all year round and are free to move between the three fields. Under the Stewardship agreement the meadows are topped once a year after 6 July, but

cutting for hay is not allowed. No lime has been applied since 2000. The sheep have virtually eradicated the initial high infestation of ragwort. Stewardship was due to end in 2011.

6 Botanical survey of grassland

6.1 Survey of Freshmill Cottage meadow

6.1.1 Grassland community

The results of this survey are presented in Table 1. The grassland best fitted the typical sub-community of Ryegrass–Crested Dog's-tail grassland, MG6a, in the NVC, which is characteristic of grassland managed as permanent pasture without the addition of artificial fertiliser. One MG6a Constant species – red fescue – was present at a very low frequency in the meadow.

Table 1 Results of botanical survey in Freshmill Cottage meadow (TQ384247), 7 July 2009. Eight samples (quadrats), each 2 m x 2 m, were surveyed and the summarised results show Frequency and range of Domin Values for each species. See Box 1 (p. 12) for explanations.

English name	Scientific name	Frequency and Domin range
Bent grasses	*Agrostis capillaris/stolonifera*	V (5–9)
Common Mouse-ear	*Cerastium fontanum*	V (1–3)
Yorkshire Fog	*Holcus lanatus*	V (4–8)
Perennial Rye Grass	*Lolium perenne*	V (5–8)
White Clover	*Trifolium repens*	V (2–7)
Creeping Thistle	*Cirsium arvense*	IV (1–4)
Crested Dog's-tail	*Cynosurus cristatus*	IV (1–7)
Creeping buttercup	*Ranunculus repens*	IV (1–5)
Rough-stalked Feather-moss	*Brachythecium rutabulum*	III (2–4)
Timothy	*Phleum pratense*	III (2–5)
Bulbous Buttercup	*Ranunculus bulbosus*	III (2–4)
Marsh Foxtail	*Alopecurus geniculatus*	II (1–2)
Meadow foxtail	*Alopecurus pratensis*	II (3–4)
Cock's-foot	*Dactylis glomerata*	II (2–3)
Meadow buttercup	*Ranunculus acris*	II (1–2)
Dandelion	*Taraxacum officinale*	II (1–2)
Sweet Vernal-grass	*Anthoxanthum odoratum*	I (5)
Common Feather-moss	*Eurynchium praelongum*	I (2)
Pepper-saxifrage	*Silaum silaus*	I (2)
Lesser Stitchwort	*Stellaria graminea*	I (2)
Red Clover	*Trifolium pratense*	I (2)
Common Nettle	*Urtica dioica*	I (2)
Thyme-leaved Speedwell	*Veronica serpyllifolia*	I (2)
Yarrow	*Achillea millefolium*	In field
Red Fescue	*Festuca rubra*	In field
Soft Rush	*Juncus effusus*	In field
Greater Bird's-foot-trefoil	*Lotus uliginosus*	In field
Common Bird's-foot-trefoil	*Lotus corniculatus*	In field
Common Sorrel	*Rumex acetosa*	In field
Ground-ivy	*Glechoma hederacea*	In field
Meadow Barley	*Hordeum secalinum*	In field
Tufted Forget-me-not	*Myosotis laxa*	In field
Water-pepper	*Persicaria hydropiper*	In field

6.1.2 Notable species

Two hay-meadow species, bulbous buttercup and pepper saxifrage, were present in at least one of the quadrats.

6.1.3 Number of species per quadrat

There was an average of 11 species per quadrat, with a range of 9 to 14. This is less species-rich than the standard table for MG6a – 13 (9-20).

6.1.4 Relationship with other grassland communities

This type of grassland develops from agriculturally-improved grassland when the soil fertility is gradually reduced by treatment as permanent pasture without the addition of artificial fertiliser. In this it is likely that this small, irregular-shaped field has never been ploughed and the species-poor community has developed from flower-rich hay-meadow through lack of appropriate hay-meadow management.

Box 1
Frequency
I – occurs in 1-20% of samples; II – occurs in 21-40% of samples; III – occurs in 41-60% of samples; IV – occurs in 61-80% of samples; V – occurs in 81-100% of samples.
Domin values: percentage cover being assessed by eye in each sample
10, 91-100%; 9, 76-90%; 8, 51-75%; 7, 34-50%, 6, 26-33%, 5, 11-25%; 4, 4-10%; 3, <4% with many individuals; 2, <4% with several individuals; 1, <4% with few individuals.

6.2 Survey of streamside and ditch round Freshmill Cottage meadow

6.2.1 Grassland community

The streamside and ditch were walked and species present were listed but no estimates of abundance were recorded. The species list is given in Table 2.

6.2.2 Notable species

There were a number of attractive wetland plants growing on the banks: water plantain, purple loosestrife, gipsywort and water forget-me-not. The invasive Indian balsam was frequent. The chalk grassland plant, small scabious, was a new record for this part of Sussex.

6.3 Survey of Oakhams (Ketches Farm)

6.3.1 Grassland community

The results are presented in Table 3. The grassland best fitted the typical NVC community of Ryegrass-Crested Dog's-tail grassland, MG6a, which is characteristic of grassland managed as permanent pasture without the addition of artificial fertiliser.

6.3.2 Notable species

In addition to the community Constants, the following species were constant: soft brome, creeping thistle, meadow fescue, rough meadow grass, dandelion and lesser trefoil.

Table 2 Freshmill Cottage meadow streamside herbaceous plants, 7 July 2009				
English name	Scientific name	Ditch to North	Streamside South	Far end – West*
Yarrow	*Achillea millefolium*		p	
Water-plantain	*Alisma plantago-aquatica*	p		
False Oat-grass	*Arrhenatherum elatius*	p	p	p
Mugwort	*Artemisia vulgaris*		p	p
Lady-fern	*Athyrium filix-femina*			p
Hairy-brome	*Bromus ramosus*	p		
Hedge Bindweed	*Calystegia sepium*		p	p
Remote Sedge	*Carex remota*	p		
Crested Dog's-tail	*Cynosurus cristatus*		p	
Cock's-foot	*Dactylis glomerata*	p	p	
Wild Teasel	*Dipsacus fullonum*		p	
Great Willowherb	*Epilobium hirsutum*	p	p	
Broad-leaved Willowherb	*Epilobium montanum*	p		
Meadowsweet	*Filipendula ulmaria*	p	p	
Cleavers	*Galium aparine*	p	p	p
Crosswort	*Cruciata laevipes*			p
Common Marsh-bedstraw	*Galium palustre*	p		p
Wood Avens	*Geum urbanum*			p
Ground-ivy	*Glechoma hederacea*	p	p	p
Hogweed	*Heracleum sphondylium*		p	p
Perforate St John's-wort	*Hypericum perforatum*			p
Square-stalked St John's-wort	*Hypericum tetrapterum*		p	
Indian Balsam	*Impatiens glandulifera*	p	p	p
Yellow Iris	*Iris pseudacorus*	p		
Compact Rush	*Juncus conglomeratus*	p		
Soft Rush	*Juncus effusus*	p		p
Nipplewort	*Lapsana communis*	p	p	p
Meadow Vetchling	*Lathyrus pratensis*	p		
Common Bird's-foot-trefoil	*Lotus corniculatus*		p	
Gipsywort	*Lycopus europaeus*	p		p
Purple Loosestrife	*Lythrum salicaria*	p	p	
Water Mint	*Mentha aquatica*	p		p
Tufted Forget-me-not	*Myosotis laxa*	p	p	p
Hemlock Water-dropwort	*Oenanthe crocata*	p	p	p
Water-pepper	*Persicaria hydropiper*	p		p
Barren Strawberry	*Potentilla sterilis*	p		
Common Fleabane	*Pulicaria dysenterica*		p	
Clustered Dock	*Rumex conglomeratus*			p
Broad-leaved Dock	*Rumex obtusifolius*	p	p	
Small Scabious	*Scabiosa columbaria*		p	
Water Figwort	*Scrophularia auriculata*		p	p
Common Figwort	*Scrophularia nodosa*	p		p
Red Campion	*Silene dioica*		p	p
Hedge Woundwort	*Stachys sylvatica*		p	p
Lesser Stitchwort	*Stellaria graminea*		p	p
Common Chickweed	*Stellaria media*			p
Common Nettle	*Urtica dioica*	p	p	
Germander Speedwell	*Veronica chamaedrys*		p	
Bush Vetch	*Vicia sepium*			p
				*Both streamside and ditch

Table 3 Results of botanical survey in Oakhams (TQ392246), 28 May 2009. Nine samples (quadrats), each 4 m x 4 m, were surveyed and the summarised results show Frequency and range of Domin Values for each species. See Box 1 (p. 12) for explanations of Domin Range and Frequency.

English name	Scientific name	Frequency and Domin value range
Common Bent	*Agrostis capillaris*	V (3–8)
Soft Brome	*Bromus hordeaceus*	V (3–7)
Creeping Thistle	*Cirsium arvense*	V (2–7)
Crested Dog's-tail	*Cynosurus cristatus*	V (2–7)
Meadow Fescue	*Festuca pratensis*	V (3–8)
Yorkshire Fog	*Holcus lanatus*	V (4–7)
Perennial Rye Grass	*Lolium perenne*	V (1–5)
Rough Meadow Grass	*Poa trivialis*	V (4–7)
Dandelion	*Taraxacum officinale*	V (1–4)
Lesser Trefoil	*Trifolium dubium*	V (1–5)
White Clover	*Trifolium repens*	V (4–9)
Creeping Bent	*Agrostis stolonifera*	IV (4–8)
Common Mouse-ear	*Cerastium fontanum*	IV (2–3)
Red Fescue	*Festuca rubra*	IV (4–8)
Cut-leaved Crane's-bill	*Geranium dissectum*	IV (1–3)
Hogweed	*Heracleum sphondylium*	IV (1–3)
Creeping buttercup	*Ranunculus repens*	IV (3–5)
Broad-leaved Dock	*Rumex obtusifolius*	IV (1–3)
Timothy	*Phleum pratense*	III (2–4)
Red Clover	*Trifolium pratense*	III (1–3)
Thyme-leaved Speedwell	*Veronica serpyllifolia*	III (1–3)
Smooth Tare	*Vicia tetrasperma*	III (1)
Cock's-foot	*Dactylis glomerata*	II (3–4)
Soft Rush	*Juncus effusus*	II (2–4)
Common fleabane	*Pulicaria dysenterica*	II (2–3)
Meadow buttercup	*Ranunculus acris*	II (1)
Common Ragwort	*Senecio jacobaea*	II (1)
Sweet Vernal-grass	*Anthoxanthum odoratum*	I (2)
Meadow Vetchling	*Lathyrus pratensis*	I (4)
Changing Forget-me-not	*Myosotis discolor*	I (3)
Selfheal	*Prunella vulgaris*	I (1)
Springy Turf-moss	*Rhytidiadelphus squarrosus*	I (2)
Lesser Stitchwort	*Stellaria graminea*	I (3)
Hairy Tare	*Vicia hirsuta*	I (3)
Bugle	*Ajuga reptans*	In field
Marsh Foxtail	*Alopecurus geniculatus*	In field
Hairy Sedge	*Carex hirta*	In field
Spear Thistle	*Cirsium vulgare*	In field
Crosswort	*Cruciata laevipes*	In field
Ground-ivy	*Glechoma hederacea*	In field
Hard Rush	*Juncus inflexus*	In field
Oxeye Daisy	*Leucanthemum vulgare*	In field
Greater Bird's-foot-trefoil	*Lotus uliginosus*	In field
Tormentil	*Potentilla erecta*	In field
Curled Dock	*Rumex crispus*	In field
Germander Speedwell	*Veronica chamaedrys*	In field
Heath Speedwell	*Veronica officinalis*	In field
Common Vetch	*Vicia sativa*	In field

6.3.3 Number of species per quadrat

There was an average of 20 species per quadrat, with a range of 18–23. This is considerably more species-rich than the standard table for MG6a – 13 (9–20).

6.3.4 Relationship with other grassland communities

This type of grassland develops from agriculturally improved grassland when the soil fertility is gradually reduced by treatment as permanent pasture without the addition of artificial fertiliser. In this case a similar process has taken place by arable reversion using a Stewardship seed mix of indigenous grasses to give the reversion process a good start (Figure 7).

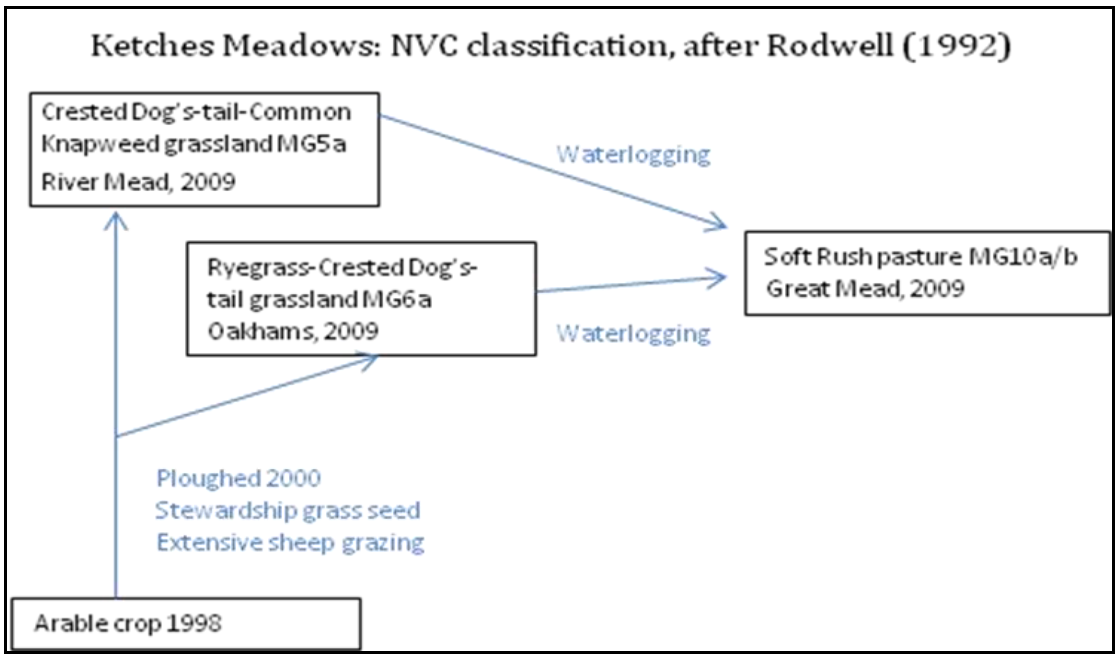

Figure 7 Summary NVC diagram showing relationship between three types of grassland community in Ketches Meadows.

6.4 Survey of Great Mead (Ketches Farm)

6.4.1 Grassland community

The grassland fits best the NVC MG10a/b, Rush Pasture with soft rush constant and hard rush frequent. There was no hairy sedge. The results are presented in Table 4.

6.4.2 Notable species

In addition to the community Constants, the following species were constant: soft brome, creeping thistle, broad-leaved dock and cut-leaved crane's-bill.

6.4.3 Number of species per quadrat

There was an average of 25 species per quadrat, with a range of 23–27. This is comparable to that given in the standard table for MG10 – 23 (12–38).

6.4.4 Relationship with other grassland communities

This type of rush pasture develops in waterlogged areas of MG5a or MG6 grassland (See Figure 7) on relatively base-rich soils.

Table 4 Results of botanical survey in Great Mead, Ketches Farm (TQ395245), 2 July 2009. Four samples (quadrats), each 4 m x 4 m, were surveyed and the summarised results show Frequency and range of Domin Values for each species. See Box 1 (p. 12) for explanation of Domin Range and Frequency

English name	Scientific name	Frequency and Domin value range
Soft Brome	*Bromus hordeaceus*	V (3–8)
Creeping Thistle	*Cirsium arvense*	V (3–5)
Cut-leaved Crane's-bill	*Geranium dissectum*	V (3–4)
Yorkshire Fog	*Holcus lanatus*	V (5–8)
Soft Rush	*Juncus effusus*	V (3–8)
Broad-leaved Dock	*Rumex obtusifolius*	V (2–4)
White Clover	*Trifolium repens*	V (3–9)
False Oat-grass	*Arrhenatherum elatius*	IV (4–5)
Crested Dog's-tail	*Cynosurus cristatus*	IV (3–4)
Cock's-foot	*Dactylis glomerata*	IV (4–5)
Meadowsweet	*Filipendula ulmaria*	IV (1–5)
Poa trivialis	*Rough Meadow Grass*	IV (1–5)
Creeping Buttercup	*Ranunculus repens*	IV (4–8)
Smooth Tare	*Vicia tetrasperma*	IV (1–3)
Bent grasses	*Agrostis capillaris/stolonifera*	III (7–9)
Meadow Fescue	*Festuca pratensis*	III (3–4)
Red Fescue	*Festuca rubra*	III (3–4)
Common Marsh-bedstraw	*Galium palustre*	III (1–4)
Hard Rush	*Juncus inflexus*	III (3)
Meadow Vetchling	*Lathyrus pratensis*	III (3–4)
Perennial Rye Grass	*Lolium perenne*	III (4)
Common Bird's-foot-trefoil	*Lotus corniculatus*	III (3–4)
Greater Bird's-foot-trefoil	*Lotus uliginosus*	III (3–4)
Selfheal	*Prunella vulgaris*	III (1–3)
Common Fleabane	*Pulicaria dysenterica*	III (2–3)
Hedge Woundwort	*Stachys sylvatica*	III (1–3)
Lesser Stitchwort	*Stellaria graminea*	III (3–4)
Dandelion	*Taraxacum officinale*	III (3)
Lesser Trefoil	*Trifolium dubium*	III (3–5)
Common Nettle	*Urtica dioica*	III (3)
American Willowherb	*Epilobium ciliatum*	II (1)
Short-fruited Willowherb	*Epilobium obscurum*	II (1)
Common Feather-moss	*Eurynchium praelongum*	II (3)
Compact Rush	*Juncus conglomeratus*	II (2)
Water Mint	*Mentha aquatica*	II (5)
Spear Mint	*Mentha spicata*	II (4)
Hemlock Water-dropwort	*Oenanthe crocata*	II (1)
Creeping Cinquefoil	*Potentilla reptans*	II (4)
Common Sorrel	*Rumex acetosa*	II (3)
Hairy Tare	*Vicia hirsuta*	II (1)
Upright Hedge-parsley	*Torilis japonica*	II (1)
Common Couch	*Elymus repens*	In field
Beaked Hawk's-beard	*Crepis vesicaria*	In field
Wild Angelica	*Angelica sylvestris*	In ditch
Cow Parsley	*Anthriscus sylvestris*	In ditch
Common Centaury	*Centaurium erythraea*	In ditch
Purple Loosestrife	*Lythrum salicaria*	In ditch
Reed Canary-grass	*Phalaris arundinacea*	In ditch
Common Figwort	*Scrophularia nodosa*	In ditch
Water Figwort	*Scrophularia auriculata*	In ditch

6.5 Survey of River Mead (Ketches Farm)

6.5.1 Grassland community

The grassland best fitted the typical NVC sub-community of Crested Dog's-tail–Common Knapweed grassland, MG5a. The MG5 Constants, ribwort plantain and common knapweed, were absent and sweet vernal-grass and common bird's-foot-trefoil were present at a low Frequency, The Preferential MG5a species, meadow vetchling, was also absent. The results are presented in Table 5.

6.5.2. Notable species

In addition to the community Constants, the following species were constant: soft brome, meadow fescue, rough meadow grass, broad-leaved dock, common fleabane, hogweed and cut-leaved crane's-bill. The attractive flower of ragged robin was also present (Figure 8).

Figure 8 *Ragged robin in River Mead (John Prodger).*

6.5.3 Number of species per quadrat

There was an average of 23 species per quadrat, with a range of 20–26. This is comparable to that given in the standard table for MG5a – 22 (13–32).

6.5.4. Relationship with other grassland communities

This community has developed by arable reversion, in which the soil fertility has been gradually reduced through extensive grazing without the application of artificial fertilizer. A Stewardship seed mix of indigenous grasses was used at the start of the process, but wildflower seed has not been sown. The wildflowers present have

Table 5 Results of botanical survey in River Mead, Ketches Farm (TQ394243), 4 June 2009. Nine samples (quadrats), each 4 m x 4 m, were surveyed and the summarised results show Frequency and range of Domin Values for each species. See Box 1 (p. 12) for explanation of Domin Range and Frequency

English name	Scientific name	Frequency and Domin values
Common Bent	*Agrostis capillaris*	V (4–9)
Soft Brome	*Bromus hordeaceus*	V (2–4)
Crested Dog's-tail	*Cynosurus cristatus*	V (3–7)
Meadow Fescue	*Festuca pratensis*	V (4–7)
Cut-leaved Crane's-bill	*Geranium dissectum*	V (1–4)
Hogweed	*Heracleum sphondylium*	V (1–4)
Yorkshire Fog	*Holcus lanatus*	V (2–6)
Rough Meadow Grass	*Poa trivialis*	V (5–8)
Common Fleabane	*Pulicaria dysenterica*	V (1–4)
Broad-leaved Dock	*Rumex obtusifolius*	V (2–5)
Lesser Trefoil	*Trifolium dubium*	V (1–4)
Red Clover	*Trifolium pratense*	V (1–4)
White Clover	*Trifolium repens*	V (5–7)
Creeping Thistle	*Cirsium arvense*	IV (1–5)
Red Fescue	*Festuca rubra*	IV (4–7)
Selfheal	*Prunella vulgaris*	IV (1–3)
Creeping Buttercup	*Ranunculus repens*	IV (3–7)
Dandelion	*Taraxacum officinale*	IV (1–2)
Thyme-leaved Speedwell	*Veronica serpyllifolia*	IV (1–3)
Smooth Tare	*Vicia tetrasperma*	IV (1–3)
Common Mouse-ear	*Cerastium fontanum*	III (2–3)
Cock's-foot	*Dactylis glomerata*	III (2–4)
Common Couch	*Elymus repens*	III (2–5)
Creeping Bent	*Agrostis stolonifera*	II (4–7)
Square-stalked St John's-wort	*Hypericum tetrapterum*	II (1–3)
Hard Rush	*Juncus inflexus*	II (2–4)
Oxeye Daisy	*Leucanthemum vulgare*	II (3–4)
Perennial Rye Grass	*Lolium perenne*	II (2)
Ragged Robin	*Lychnis flos-cuculi*	II (2–3)
Greater Plantain	*Plantago major*	II (1)
Lesser Stitchwort	*Stellaria graminea*	II (3–4)
Germander Speedwell	*Veronica chamaedrys*	II (3)
Bugle	*Ajuga reptans*	I (4)
Sweet Vernal-grass	*Anthoxanthum odoratum*	I (4)
Rough-stalked Feather-moss	*Brachythecium rutabulum*	I (3)
Glaucous Sedge	*Carex flacca*	I (1)
Common Cat's-ear	*Hypochaeris radicata*	I (1)
Soft Rush	*Juncus effusus*	I (3)
Common Bird's-foot-trefoil	*Lotus corniculatus*	I (5)
Greater Bird's-foot-trefoil	*Lotus uliginosus*	I (4)
Changing Forget-me-not	*Myosotis discolor*	I (1)
Timothy	*Phleum pratense*	I (2)
Smooth Meadow Grass	*Poa pratensis*	I (4)
Common Nettle	*Urtica dioica*	I (1)
Marsh Thistle	*Cirsium palustre*	In field
Common Spotted-orchid	*Dactylorhiza fuchsii*	In field
Field Madder	*Sherardia arvensis*	In field
Common Vetch	*Vica sativa*	In field

arrived naturally, which suggests that there is a good source of seed in the vicinity. (Figure 7). It may be that this meadow has received less agricultural treatment than Oakhams, being more isolated and subject to more frequent flooding.

7 Conclusions from our research

7.1 General comments

The Ketches meadows have provided valuable flood alleviation, both as washland and as permanent grassland with worm tunnels and plant roots absorbing rainwater (Stoate, 2011) for the last 10 years. They have also provided valuable wildlife habitat, but year-round sheep-grazing is preventing the establishment of wildflowers such as common knapweed and meadow vetchling. The current stewardship arrangement has just come to an end, which should provide an opportunity for a better deal, both for the farmer and for wildlife. Instead, pressure is being put on the tenant farmer to plough up and grow profitable arable crops again (although he says it is not very suitable for this). Unless some other form of support can be found, this is what he will have to do – with detrimental effects on biodiversity, water quality and flood alleviation.

7.2 Discussion of February 2012 Consultation Document: MORPH – Sheffield Park Options

Option 1: Modify Sloop Weir to apportion increased flow to the meandering river course

This might lead to increased risk of flooding for Freshmill Cottage. We know that the owner is worried about any changes to the meandering (original) river and how this might impact on the flood risk to his cottage.

Option 2: Remove the dam to open up the drain and apportion increased flow around the meanders

This is an attractive option because it could lead to more water being held on River Mead and Great Mead, with biodiversity and flood-alleviation benefits. However, the farmer would need to be compensated because his 10-year Stewardship agreement has just finished and there are financial pressures on him to return the land to productive arable farming. If this happens, existing biodiversity and flood-alleviation benefits will be lost and the farmer will no longer be able to tolerate floodwaters in these fields.

Option 3: Improve existing fish pass on Pool's Bay Weir

Again, this might lead to increased risk of flooding for Freshmill Cottage if implemented in conjunction with increasing the quantity of flow around the original river course by modifying Sloop Weir – see discussion under Option 1.

Option 4: Remove Pool's Bay Weir and replace with rock ramp

Again, this is an attractive option but very detailed hydrological modelling would be required to show that removal of the weir exactly balanced the increase flow directed around the original course so that there was no increased risk of flooding for Freshmill Cottage (see discussion under Option 1).

Option 5: Remove side spill weir in old mill channel

We have no comment to add to the discussion of this option.

Option 6: Habitat improvements in the current canal/meandering channel

See Dave Brown's comments (2005) on the River Restoration Trust Report (2000), which suggests that the existing habitat should not be disrupted. See also Pilkington et al., 2012.

7.3 Other considerations: otter holt on meandering (original) river course in Oakhams

As part of the Stewardship agreement, an otter holt has been constructed in Oakhams on the meandering river course. Any alteration to flow within this section of river should take account of this. Kingfishers were seen along this stretch of the river when we carried out our botanical survey, demonstrating the importance to wildlife of the prevailing conditions.

8 References

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