Iron Gates Mead: a riverside meadow at Sheffield Park, East Sussex

River Ouse Project Report No. 1

Centre for Community Engagement
University of Sussex

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Front cover Flooded Hammerdip and Iron Gates Mead.

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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 and 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 is given in (Section 4) and 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.

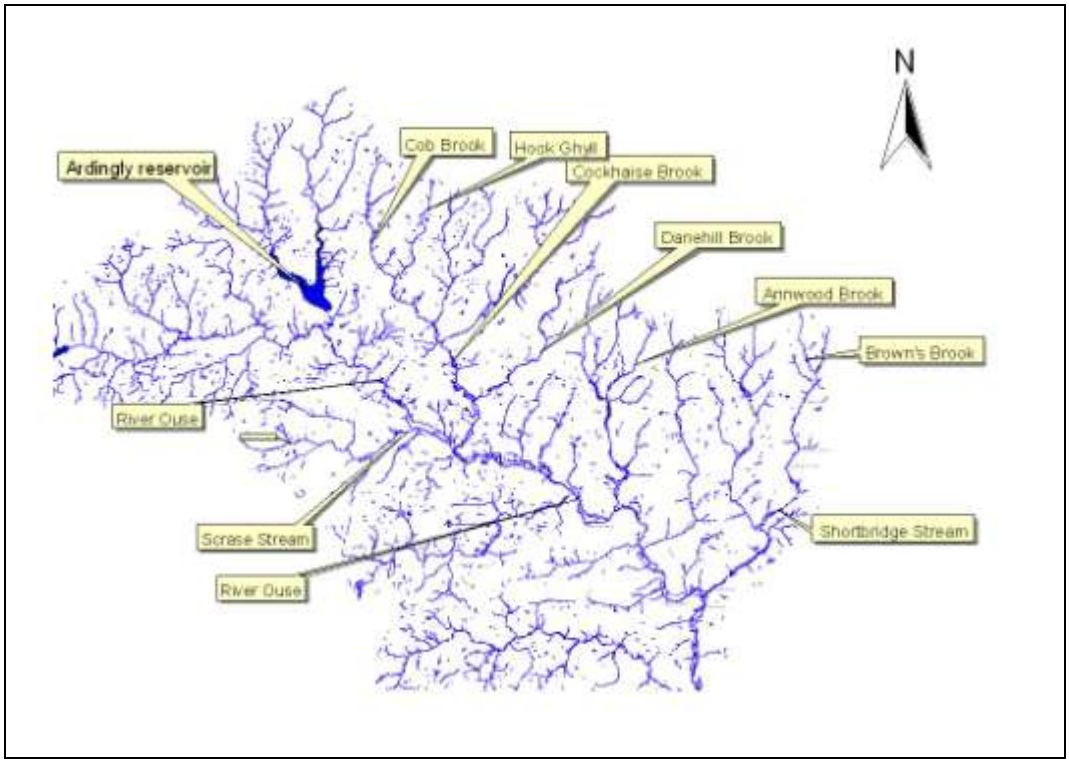

Figure 1. The stream system that feeds into the upper reaches of the river Ouse

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 the Domin scale) 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 was 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

Iron Gates Mead is a long thin meadow (27 acres) that lies along the north side of a saucer-shaped curve in the river Ouse from grid reference TQ407233 to 413229. The meadow lies about 400 m downstream from Sheffield Bridge and immediately below the old deer park, which rises steeply on the east and north flank of the meadow (Figure 2). The Hammerdip, a stream with intermittent flow, lies along the boundary between the meadow and the park.

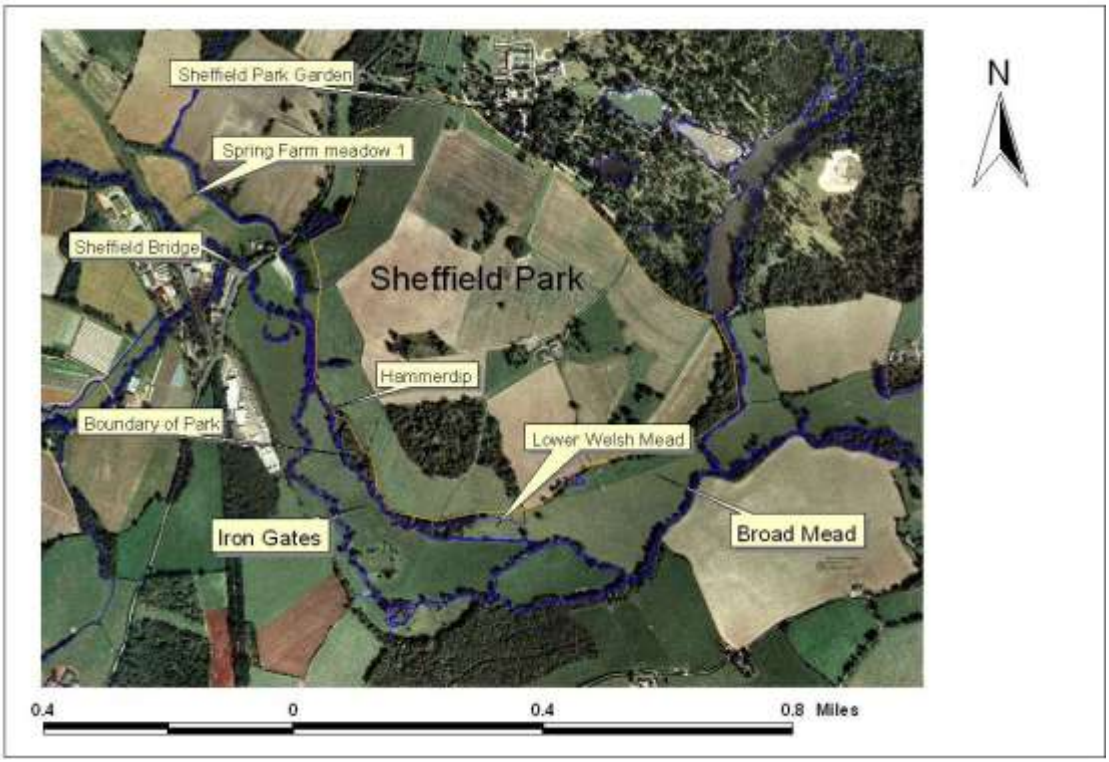

Figure 2 Location of Sheffield Park riverside meadows in relation to Sheffield Park Bridge, Spring Farm and the old Sheffield Park.

4.2 Soil type

The soil is alluvium lying within the Upper Tunbridge Wells Sand Formation (Figure 3). It is a silty soil, which is very free-draining and supports dry grassland vegetation. Soil pH is 6.0.

4.3 Meanders and spring-fed wet areas

There are three former meanders on the site, one of which contains wetland vegetation. There are no spring-fed wetland areas but the Hammerdip stream along the northern boundary contains wetland vegetation.

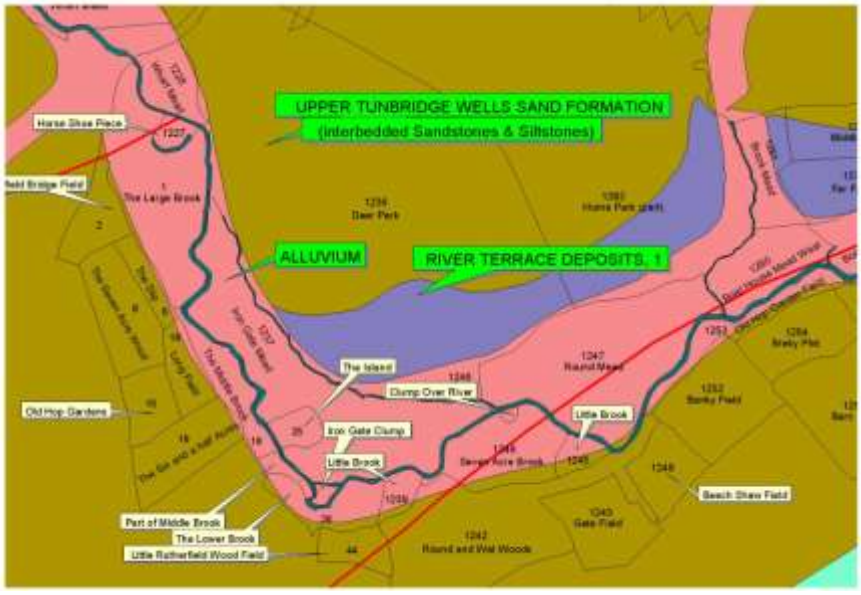

Figure 3
Geology and soil of the site.

4.4 Flooding

Flooding occurs typically 2-3 times a year usually in winter (Figure 4) and normally lasts for 2-3 days. Once the water has gone, the site dries out rapidly as the local farmer explained:

> *'Two days after … I've drove a tractor over it and you wouldn't see where I've been.'*

Oral history work with local farmers shows that farmers are quite happy about the brief flooding of their land, but very unhappy with river engineering work which results in banks slipping away and hence loss of useful land.

Figure 4 Iron Gates Mead under floodwater in January 2009, photographed from the north side of the main bridge over the Hammerdip into the meadow.

5 Land use

Iron Gates Mead was part of an extensive band of flower-rich grassland lying alongside the river Ouse until well into the last century. It was managed as hay meadow, retaining its species-richness until 1949. Figure 5 shows it marked on the Sheffield Park Estate map of 1816. Figure 6 shows it as it appeared as meadow on the Tithe Map of 1840-41. Figure 7 shows Iron Gates as a meadow in the Land Utilisation Survey map of 1931 and Figure 8 shows Iron Gates in the aerial photograph of 1947.

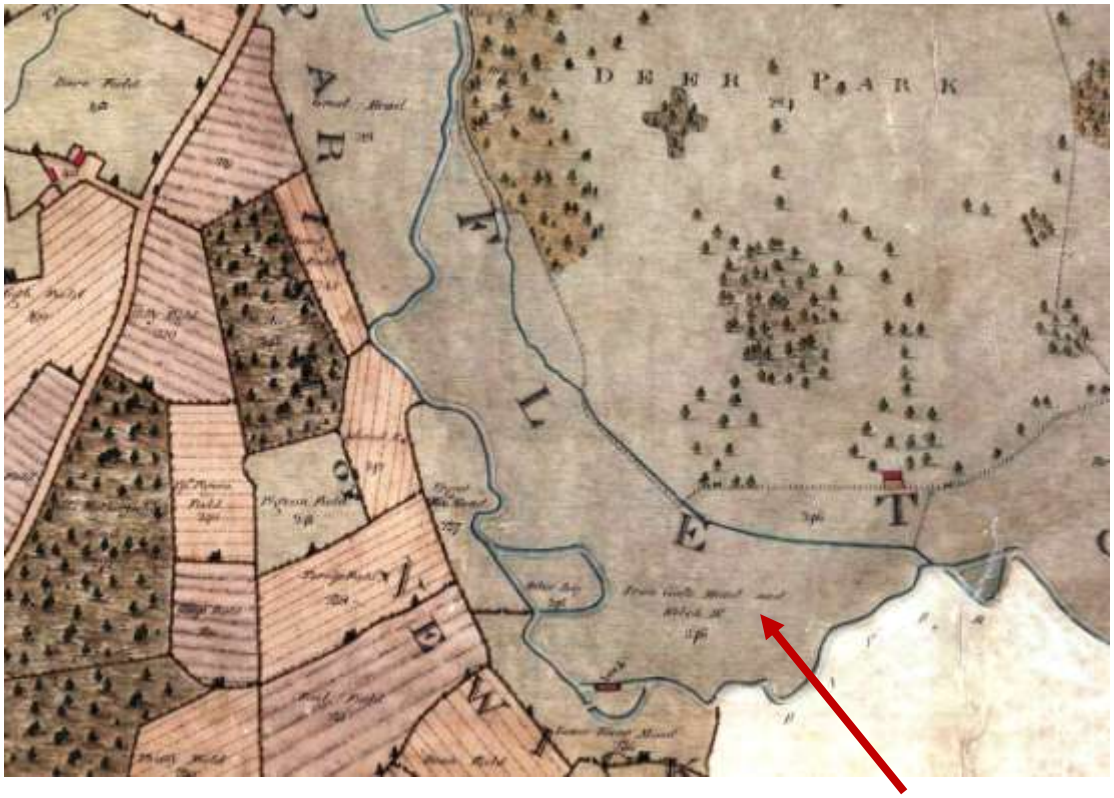

Figure 5 Part of Sheffield Park Estate Map 1816 by William Ebden showing Iron Gates Mead.

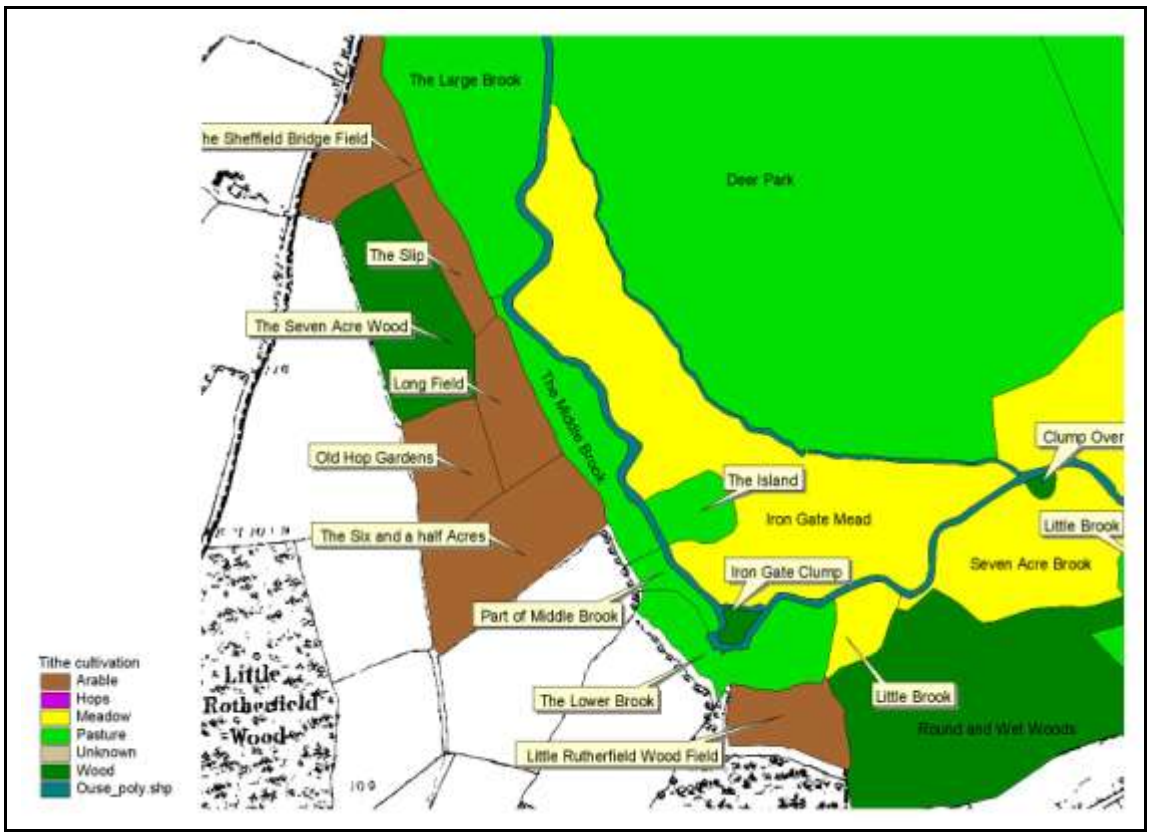

Figure 6 Map showing land use and field names compiled from the 1840-41 Tithe Map and apportionment data by Nick Steer. Tithe maps for Fletching and Newick: East Sussex Record Office: ESRO TD/E 145 and TD/E 42

Figure 7 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. ● indicates Iron Gates Mead.

Figure 8 Aerial photograph of Sheffield Park in 1947. ● indicates Iron Gates Mead.

Our interviews with local farmers provided additional evidence for past land use.

> *The Iron Gates, in my day (1948-1974) we always made hay … Because the grass there was a very fine grass and made beautiful soft hay, very suitable for feeding to calves*.
> (97-year old farmer interviewed in 2007.)

> *When I came here, the Iron Gates was* full *of cowslips and as soon as I applied some fertiliser, the cowslips disappeared completely and have never come back.*
> (97-year old farmer interviewed in 2007.)

In 1998 the management changed from hay to silage accompanied by an attempt to grow agriculturally-improved grasses.

> *Iron Gates … is incredibly free draining … we weren't allowed to plough as part of the tenancy … But what we did do back in, must have been 1998, … we actually burnt off the grass … and direct-drilled grass seed in because the productivity of the grass wasn't very great. It made great hay, but I didn't want to make hay I wanted silage.*
> (55-year-old farmer interviewed in 2007.)

There were comments on the loss of agriculturally-improved grasses through flooding whereas the natural meadow grasses survived.

> *Came really well ... and then we had the floods of 2000…, and that killed most of it off and it was very patchy thereafter. Whereas the bit that hadn't been reseeded recovered 'cos it was obviously used to being under water.*
> (55-year-old farmer interviewed in 2007.)

In 2005, the tenancy agreement was terminated by the owner, Sackville-West of Knole, and in October 2006 the land was sold to the National Trust. Following this, Iron Gates was managed with a silage cut followed by cattle grazing until 2010 when the National Trust negotiated a new agreement. No silage cut or grazing took place in summer/autumn 2010, but grazing was re-instated in 2011, mostly with sheep. A hay cut took place in August 2011.

6 Botanical survey of grassland

6.1 Survey of eastern part of Iron Gates Mead

The results of this survey are presented in Table 1.

6.1.1 Grassland community

This area was selected for a grassland enhancement field trial on a washland site. The field trial compared the use of locally sourced wildflower seed with plant plugs grown from the same seed, and was set up in 2009 and monitored annually. A botanical survey prior to the setting up of the field trial revealed that the grassland

best fitted the NVC MG7d Ryegrass–Meadow foxtail community. MG7d is typically a species-poor type of agriculturally improved grassland dominated by ryegrass but because Iron Gates is flooded from time to time and ryegrass is not tolerant of flooding, ryegrass was present only in about 70 per cent of quadrats where it mostly occurred at less than 10 per cent cover. Meadow foxtail was constant and occurred at high abundance in all quadrats. Rough meadow grass (characteristic of Ryegrass – Rough Meadow Grass MG7b grassland) was also constant, but at less than 50 per cent cover.

Table 1 Results of botanical survey in Iron Gates East, 20-21 May 2009. Forty-three 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 for explanations of Domin Range and Frequency.

English name	Scientific name	Frequency and Domin value range
Common bent	*Agrostis capillaris*	V (4-9)
Meadow foxtail	*Alopecurus pratensis*	V (6-10)
Yorkshire Fog	*Holcus lanatus*	V (4-8)
Rough Meadow Grass	*Poa trivialis*	V (4-8)
Dandelion	*Taraxacum officinale*	V (2-8)
Soft-brome	*Bromus hordeaceus*	IV (1-7)
Perennial Rye Grass	*Lolium perenne*	IV (2-6)
Common Mouse-ear	*Cerastium fontanum*	III (1-4)
Timothy	*Phleum pratense*	III (1-4)
Broad-leaved Dock	*Rumex obtusifolius*	III (1-3)
Creeping bent	*Agrostis stolonifera*	II (4-8)
Cock's-foot	*Dactylis glomerata*	II (2-5)
Cut-leaved Crane's-bill	*Geranium dissectum*	II (1-5)
Cow Parsley	*Anthriscus sylvestris*	I (1)
Lady's-smock	*Cardamine pratensis*	I (1)
Sticky Mouse-ear	*Cerastium glomeratum*	I (1)
Creeeping Thistle	*Cirsium arvense*	I (1-3)
Pignut	*Conopodium majus*	I (1)
Meadow fescue	*Festuca pratensis*	I (4)
Red fescue	*Festuca rubra*	I (2-5)
Hogweed	*Heracleum sphondylium*	I (1-2)
Meadow buttercup	*Ranunculus acris*	I (1-2)
Bulbous buttercup	*Ranunculus bulbosus*	I (1)
Creeping buttercup	*Ranunculus repens*	I (2-8)
Common Sorrel	*Rumex acetosa*	I (1-3)
Curled Dock	*Rumex crispus*	I (1-2)
Red Clover	*Trifolium pratense*	I (2-3)
White Clover	*Trifolium repens*	I (2-6)
Germander Speedwell	*Veronica chamaedrys*	I (2-3)
Meadow Barley	*Hordeum secalinum*	I (3)
Bugle	*Ajuga reptans*	In field
Common Nettle	*Urtica dioica*	In field

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.

6.1.2 Notable species

In addition to the characteristic species of the MG7d community, several hay-meadow species (characteristic of MG5 Crested Dog's-tail–Common Knapweed grassland) were present in at least one quadrat: common sorrel, meadow buttercup, red clover, pignut, lady's-smock and red fescue. Significantly, common bent grass, characteristic of unimproved neutral grassland, was present in every quadrat. This is likely to be the 'soft grass', which was present in the hay before the meadow was re-seeded and which made the hay so suitable for feeding to calves (See section 5).

6.1.3 Number of species per quadrat

The number of species per quadrat ranged from 5 to 14, with a mean value of 10. These values are comparable to those given in the standard table for MG7d: range 3-14, mean value 9.

6.1.4 Relationship with other grassland communities

This type of species-poor grassland was commonly managed as hay meadow. When treated as permanent pasture it reverts to more species-rich MG6b Ryegrass–Crested Dog's-tail Grassland. It grades into MG13 Creeping bent–Marsh Foxtail floodplain grassland where water-logging occurs (Figure 9).

6.2 Survey of western part of Iron Gates Mead

This survey included the third meander, which has the same species composition as the surrounding meadow. The results are presented in Table 2.

6.2.1 Grassland community

As with the eastern part of the meadow, the grassland fitted best with the NVC MG7d Ryegrass–Meadow Foxtail community. However, ryegrass became less constant (i.e. in fewer quadrats) with low cover (less than 10%) towards west end of meadow. Meadow foxtail was constant and occurred at high abundance in all quadrats. Timothy was also constant, but rough meadow grass was infrequent.

6.2.2 Notable species

Cat's-ear, meadow fescue and red fescue were present with bent grasses present in every quadrat. This is likely to be the 'soft grass', which was present in the hay before the meadow was re-seeded and which made the hay so suitable for feeding to calves (See section 5).

6.2.3 Number of species per quadrat

There were between 5 and 10 species per quadrat, with an average of 8. This is comparable to that given in the standard table for MG7d: an average of 9 with a range of 3 to 14).

Table 2 Results of botanical survey in Iron Gates West, 27 June 2007. Twenty-three 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 for explanation of Domin Range and Frequency.		
English name	**Scientific name**	**Frequency and Domin value range**
Creeping Bent	*Agrostis stolonifera*	V (3–9)
Meadow Foxtail	*Alopecurus pratensis*	V (3–8)
Yorkshire Fog	*Holcus lanatus*	V (7–10)
Perennial Rye Grass	*Lolium perenne*	V (2–8)
Timothy	*Phleum pratense*	V (2–6)
Creeeping Thistle	*Cirsium arvense*	III (1–6)
Cock's-foot	*Dactylis glomerata*	III (2–7)
Rough Meadow Grass	*Poa trivialis*	III (2–5)
Dandelion	*Taraxacum officinale*	III (1–4)
Common Bent	*Agrostis capillaris*	II (3–6)
Broad-leaved Dock	*Rumex obtusifolius*	II (1–2)
Soft-brome	*Bromus hordeaceus*	I (1)
Common Mouse-ear	*Cerastium fontanum*	I (1)
Meadow Fescue	*Festuca pratensis*	I (1–3)
Red Fescue	*Festuca rubra*	I (3–5)
Cleavers	*Galium aparine*	I (1)
Cut-leaved Crane's-bill	*Geranium dissectum*	I (1)
Creeping Buttercup	*Ranunculus repens*	I (1)
White Clover	*Trifolium repens*	I (1–3)
Common Nettle	*Urtica dioica*	I (1)
Spear Thistle	*Cirsium vulgare*	In field
Smooth Hawk’s-beard	*Crepis capillaris*	In field
Gound-ivy	*Glechoma hederacea*	In field
Common Cat’s-ear	*Hypochoeris radicata*	In field
Common Ragwort	*Senecio jacobaea*	In field
Prickly Sow-thistle	*Sonchus asper*	In field
Bread Wheat	*Triticum aestivum*	In field

6.2.4 Relationship with other communities

This type of species-poor grassland was commonly managed as hay meadow. When treated as permanent pasture it reverts to more species-rich MG6b Ryegrass–Crested Dog’s-tail community. It grades into MG13 Creeping bent–Marsh Foxtail floodplain grassland where water-logging occurs (Figure 9).

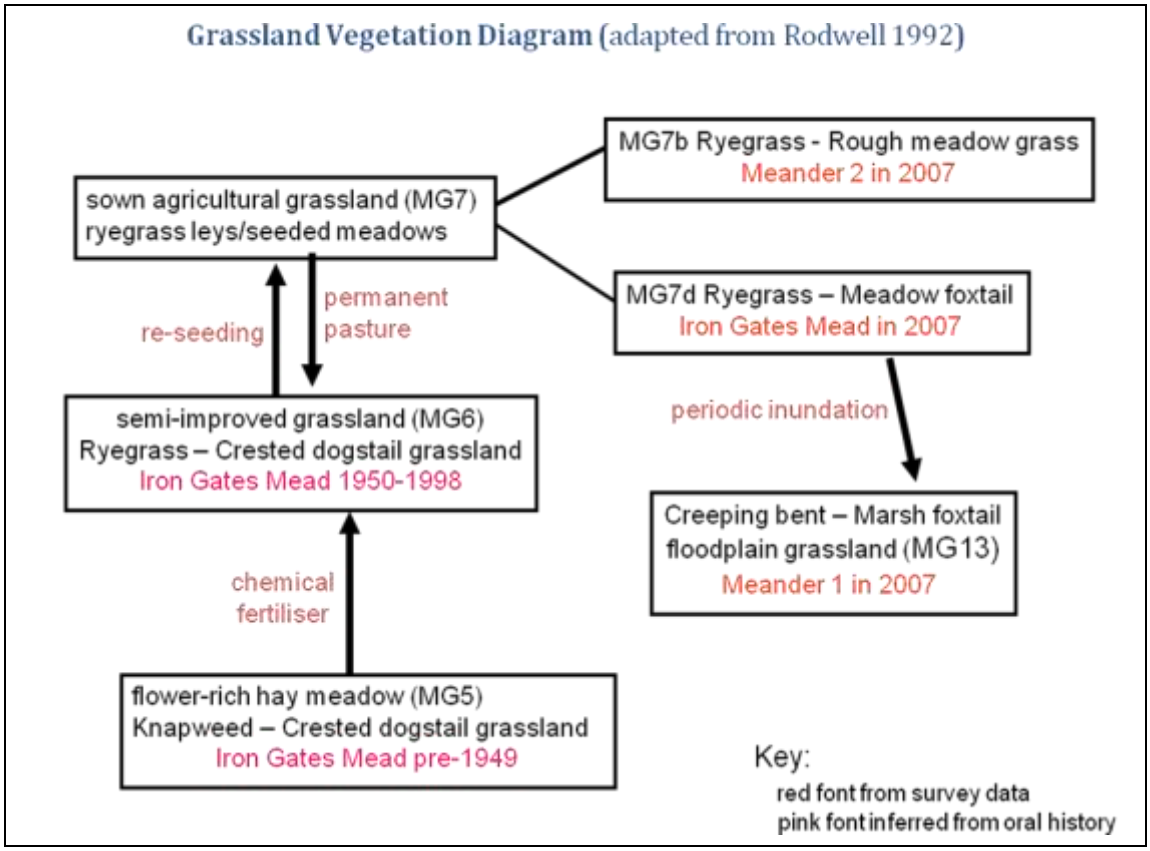

Figure 9 Summary NVC diagram showing changes in grassland community under different land-use from 1940s to present-day.

7 Botanical survey of meanders 1 and 2

7.1 Meander 1

7.1.1 Grassland community

The grassland in this meander fits best the NVC MG13 Creeping Bent–Marsh Foxtail floodplain community. In addition to the species that are listed as constants in the standard table for this community (i.e. present in more than 60 percent of the samples), the following were also constant: gipsywort, water-pepper, reed canary-grass and floating sweet grass. The results are presented in Table 3.

7.1.2 Notable species

The following attractive wetland plants were also present in the samples: trifid bur-marigold, purple loosestrife, marsh woundwort, marsh bedstraw, water chickweed, reed canary grass, hairy sedge, and gipsywort. There were also some patches of the invasive Indian balsam.

7.1.3 Number of species per quadrat

There was an average of 13 species per quadrat, with a range of 10 to 14. This is considerably more species-rich than that given in the standard table for MG13: an average of 8 and a range of 3-15).

7.1.4 Relationship with other communities

This type of floodplain grassland occurs on silty soils often in small areas around pools or where there is periodic flooding. See Figure 9 for the relationship with other

communities. Meander 1 is the wettest of the three cut-off meanders with pools of water from time to time (Figure 10).

Table 3 Results of botanical survey in Iron Gates Meander 1, 11 July 2007. 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 for explanation of Domin Range and Frequency

English name	Scientific name	Frequency and Domin value range*
Marsh Foxtail	*Alopecurus geniculatus*	V (2–8)
Floating Sweet Grass	*Glyceria fluitans*	V (5–9)
Gipsywort	*Lycopus europaeus*	V (1–5)
Water-pepper	*Persicaria hydropiper*	V (5–7)
Reed Canary-grass	*Phalaris arundinacea*	V (3–5)
Creeping Bent	*Agrostis stolonifera*	IV (5–8)
Creeping Buttercup	*Ranunculus repens*	IV (1–3)
Broad-leaved Dock	*Rumex obtusifolius*	IV (1–5)
Trifid Bur-marigold	*Bidens tripartita*	III (5–7)
Hairy Sedge	*Carex hirta*	III (3–5)
Meadow Foxtail	*Alopecurus pratensis*	II (3)
Meadowsweet	*Filipendula ulmaria*	II (2)
Common Marsh-bedstraw	*Galium palustre*	II (3)
Yorkshire Fog	*Holcus lanatus*	II (3)
Soft Rush	*Juncus effusus*	II (2)
Creeping-Jenny	*Lysimachia nummularia*	II (4)
Purple-loosestrife	*Lythrum salicaria*	II (1)
Water Mint	*Mentha aquatica*	II (3)
Hemlock Water-dropwort	*Oenananthe crocata*	II (2)
Redshank	*Persicaria maculosa*	II (1)
Timothy	*Phleum pratense*	II (3)
Rough Meadow Grass	*Poa trivialis*	III (3)
Clustered Dock	*Rumex conglomeratus*	II (2)
Marsh Woundwort	*Stachys palustris*	II (1)
Lesser Stitchwort	*Stellaria graminea*	II (1)
Common Nettle	*Urtica dioica*	I (1)
Marsh Cudweed	*Gnaphalium uliginosum*	In meander
Water-forget-me-not	*Myosotis scorpioides*	In meander
Water Chickweed	*Myosoton aquaticum*	In meander

Figure 10 Water in Meander 1, 6 December 2009.

7.2 Meander 2

7.2.1 Grassland community

The results of the survey are presented in Table 4. The grassland in this meander was a best fit with the NVC MG7b Ryegrass–Rough Meadow-grass community in

Table 4 Results of botanical survey in Iron Gates Meander 2, 11 July 2007. 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 for explanation of Domin Range and Frequency.

English name	Scientific name	Frequency and Domin value range*
Creeping Bent	*Agrostis stolonifera*	V (8–9)
Creeping Thistle	*Cirsium arvense*	V (1–4)
Timothy	*Phleum pratense*	V (2–5)
Rough Meadow Grass	*Poa trivialis*	V (5–7)
Yorkshire Fog	*Holcus lanatus*	IV (3–5)
Meadow Foxtail	*Alopecurus pratensis*	III (4–5)
Broad-leaved Dock	*Rumex obtusifolius*	III (1–2)
Marsh Foxtail	*Alopecurus geniculatus*	II (4)
Hairy Sedge	*Carex hirta*	II (8)
Perennial Rye Grass	*Lolium perenne*	II (6)
Creeping Buttercup	*Ranunculus repens*	II (1)
Common Nettle	*Urtica dioica*	II (2)
Reed Canary-grass	*Phalaris arundinacea*	In meander

transition to MG13 Creeping Bent– Marsh Foxtail floodplain community. Rough meadow-grass was constant, but at less than 50 per cent cover and there was no ryegrass. Instead, creeping bent dominates at more than 50 per cent cover in all quadrats. However, Marsh foxtail, the other co-dominant for MG13, was infrequent.

7.2.2 Number of species per quadrat

There was an average of 7 species per quadrat, with a range of 5 to 9. This is comparable to that given in the standard table for MG7b: an average of 8 with a range of 4 to 14.

7.2.3 Relationship with other communities

See Figure 9 For the relationship with other communities.

8 Conclusions from our research

8.1 General comments

This is a very special meadow site, which has not been ploughed and so still retains its special soil structure. The soil is free-draining. It was managed as a flower-rich hay meadow for centuries and was full of cowslips until 1949. Agriculturally-improved grasses sown in the late 1990s have not prospered due to the brief flooding episodes that this site is subject to each winter. Soil fertility is low, making it ideal for grassland enhancement.

8.2 Potential for grassland enhancement

The potential for grassland enhancement is good. In 2006, when the National Trust bought the area of the original parkland next to Sheffield Park gardens, the riverside meadows were included in the sale. This meadow lacked wild flowers, but still retained the original soil structure. The results of the field trial set up in 2009 confirm the potential of the site for grassland enhancement. The field trial compares the use of wildflower plugs and WMI (Weald Meadows Initiative) wildflower seed for grassland enhancement of a washland site. Cowslip, oxeye daisy and yarrow established well from both plugs and seed. Other species such as selfheal, knapweed, and bird's-foot trefoil established best from plugs.

In 2011, volunteers planted 3000 wildflower plugs into the west end of Iron Gates Mead and a small area was sown with WMI wildflower seed (Figure 11). Green hay from this area will be spread on strips of meadow in subsequent years, so that the species-rich vegetation is 'rolled out' across the whole meadow.

8.3 Potential for flood alleviation

As a flash washland this meadow already provides flood alleviation. The loss of Fletching weir in 2010 may mean that the meadow will flood less often now. However, work carried out by the Environment Agency (EA) in spring 2011 may compensate for this: the bank at the west end of Iron Gates (2,800m upstream from the site of Fletching Weir) was lowered.

Figure 11 Volunteers planting plugs into Iron Gates Mead.

The Environment Agency and the National Trust are looking at the possibility of re-instating the cut-off meanders in Iron Gates. Such work would need to provide clear flood alleviation benefits because it is unlikely to provide biodiversity gains. There are three main problems with this proposal.

1. The National Trust is carefully restoring the historic landscape of Sheffield Park. The riverside meadows are also part of a cultural landscape: a landscape of which we have a clear picture from oral history accounts and historic documents such as the estate map of 1816 (Figure 5). The meanders were cut off from the river before this time and we have no real idea of what the natural river looked like. We suggest that it would fit the remit of the NT better to retain the meadow-land rather than trying to rewild the cultural landscape as wetland.
2. It is difficult to see how re-instatement of the cut-off meanders could be accomplished without destroying the special soil structure of this site (which was protected by tenancy agreement for more than 300 years) and jeopardizing work since 2009 on restoring MG5 grassland – a BAP target plant community.
3. Work on the Uck by hydrological modellers from Durham University (Byers, 2011) has shown that detailed models on a fine scale are required to demonstrate benefits from site specific interventions such as this. The position of the intervention within the catchment was crucial to determining whether the intervention had a negative or positive effect on the flood risk in Uckfield. It was also clear that interventions were needed to prevent major flooding events rather than small events. Iron Gates already floods well at peak flows and by being dry the rest of the time provides maximum flood storage capacity in its

present state. Worms are abundant in the meadows and worm tunnels absorb floodwater at 4-10 times the rate of soils without earthworms (Stoate, 2011).

8.4 Discussion of Royal Haskoning suggestions

The Royal Haskoning Report (2009) made the following suggestions for Iron Gates Mead.

1. 'Re-instate meanders and regrade bed to reduce flow velocities and encourage overbank flows.' See comment under 8.3
2. 'In addition the potential to create floodplain scrapes and riparian buffer strips should also be investigated.' The free-draining soil of Iron Gates Mead is not suitable for scrapes. Cut-off meander 1 already provides an area of wetland within the meadow. This is not a good site on which to plant riparian woodland because the soil is free-draining and the original un-ploughed soil profile is still intact – a very rare occurrence.

8.5 Other considerations: work on the Hammerdip

The stream that runs along the north side of Iron Gates Mead and joins the Ouse at the north-east corner of the meadow, rises in Circle Wood to the north of Ketches Lane and originally flowed into the Ouse at the north-west end of Spring Farm Meadow 1 (see MORPH report for this site), before it was diverted through 90 degrees along the east side of Meadow 1 and under the road. The new section, known as the Hammerdip, had a little sluice in it and supplied water for charcoal burners working in Lower Welsh Mead (Figure 2) and before this was associated with the iron industry. Recently some of the water from this stream leaked into the Ouse at the west corner of Iron Gates. Work by the EA in spring 2011 corrected this and there are plans to put debris dams into the Hammerdip to facilitate overspill into Iron Gates. This is a good idea, and is unlikely to impact on plans for Spring Farm meadows.

9 References

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