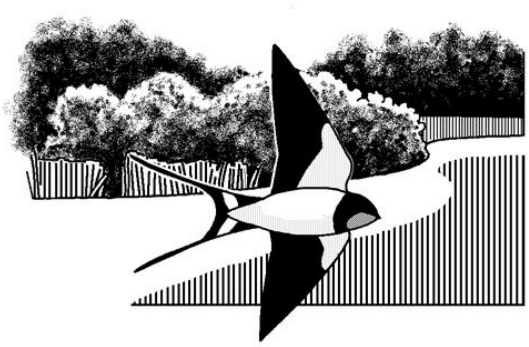

Fieldwork to Support Habitat Restoration Work at Scarfe Meadows, Garboldisham

Undertaken on behalf of the Little Ouse Headwaters project

by

OHES ENVIRONMENTAL

Incorporating

elp Ecology Land and People

A Division of OHES

With Funding from

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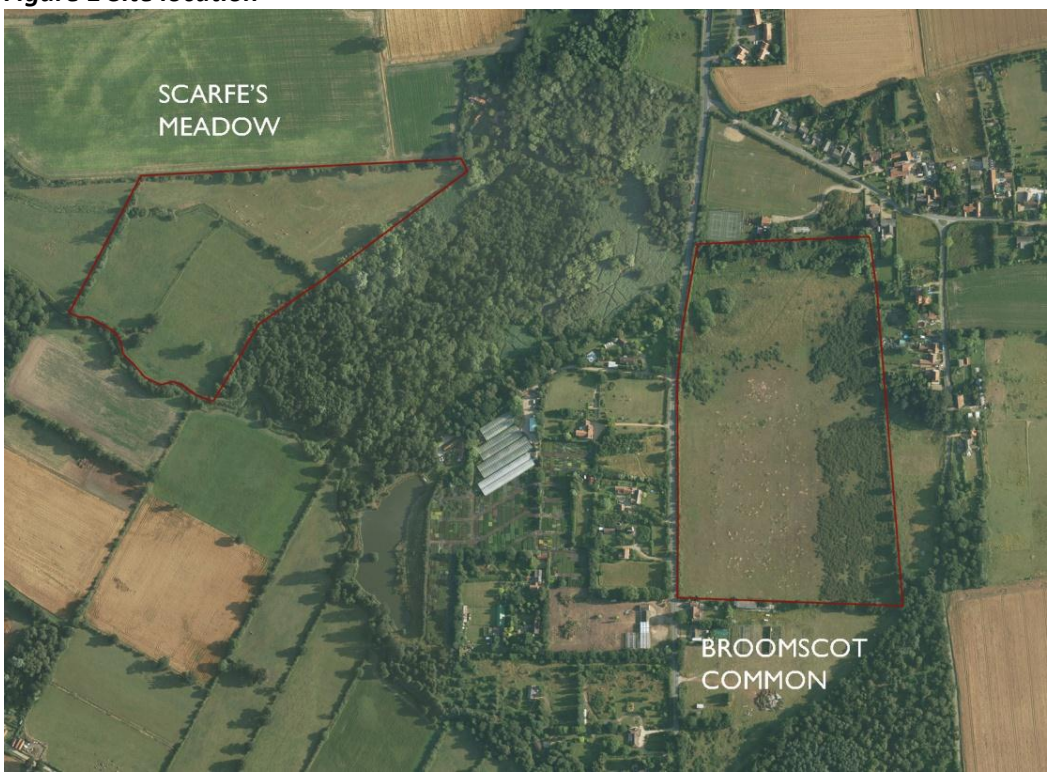
Contents

1. INTRODUCTION

1.1 The Site

Scarfe Meadows in Garboldisham was acquired by the Little Ouse Headwaters Project (LOHP) in 2010, through funding by donors to the LOHP's River Link Appeal and donations from LOHP members. Restoration of the site is funded by the Heritage Lottery Fund. It is a 5.7 ha area of cattle grazed floodplain grassland, near Broomscot Common, lying between the River Ouse and the valley margin, as shown in Figure 1.

Figure 1 Site location



1.2 The Brief

As part of the programme of restoration to wet valley fen developed by LOHP, OHES Environmental has been asked to conduct and report on the following field surveys at Scarfe Meadows:

- Water Vole Survey of internal ditches, side ditches and the Little Ouse river;
- Levels and Water Features Survey to Ordnance Datum, including land levels, ditch levels and infrastructure, to produce an accurate assessment of water flows, through to Broomscot Common via Garboldisham Fen;
- Peat Condition Survey to identify bodies of 'good' fen peat and poor peat;
- National Vegetation Classification survey to provide a baseline for vegetation restoration;
- Vegetation Monitoring to establish and record two permanent plots.

2. WATER VOLE SURVEY

2.1 Methods

Suitable habitats (including larger and smaller water courses) within the survey area outlined in the brief (see Figure 2) were searched for signs of water vole activity on 21st March 2011 (weather conditions are shown in Table 1). Where the watercourse was deemed unsafe to survey (e.g. unstable or very steep banks) or access was not possible (e.g. dense scrub) observations could only be made from a distance.

Signs of water vole activity that were searched for included sightings, sounds of entering water, latrines, tunnel entrances, grazing lawns, feeding stations of chopped vegetation, paths and runs in vegetation and footprints.

Table 1: Weather conditions for water vole survey

Date	Air temperature (^{o}C)	Cloud cover	Wind	Precipitation
21/03/11	10	3/8	Still	Dry

2.2 Results

The National Biodiversity Network was searched for records of water vole within the tetrad TL98. Accepted records confirm that water vole activity was known to be present within the tetrad as recently as 2005, but exact locations were not given.

The results of the current water vole survey are shown in Figure 2 below. The ditches, drains and river within the survey area have been photographed, to provide more detailed information than text alone (as labelled in Figure 2) and are shown in Photos 1 to 4.

A feeding station (store of cut grass stems in the characteristic way of food stored by water voles) was identified beneath lodged reed adjacent to the northwest ditch (Photos 5 and 6, Figure 2). This is believed to be the food store of a water vole, however, further signs (to include droppings) would be required for a positive confirmation of water vole presence and to design appropriate mitigation.

This recommendation was followed up by the Little Ouse Headwaters Project, and a subsequent assessment by Penny Hemphill of Suffolk Wildlife Trust during the active season for the species provided further evidence of water vole activity, as shown in Figure 3.

It is also noted that a badger dung pit was identified in a rabbit burrow above the culvert in the north-south ditch of Scarfe Meadows (as shown in Photo 7 and Figure 2). The latrine appeared to have been used twice within the recent past. There were no further signs of badger activity or setts within the survey area.

Figure 2. Water vole survey

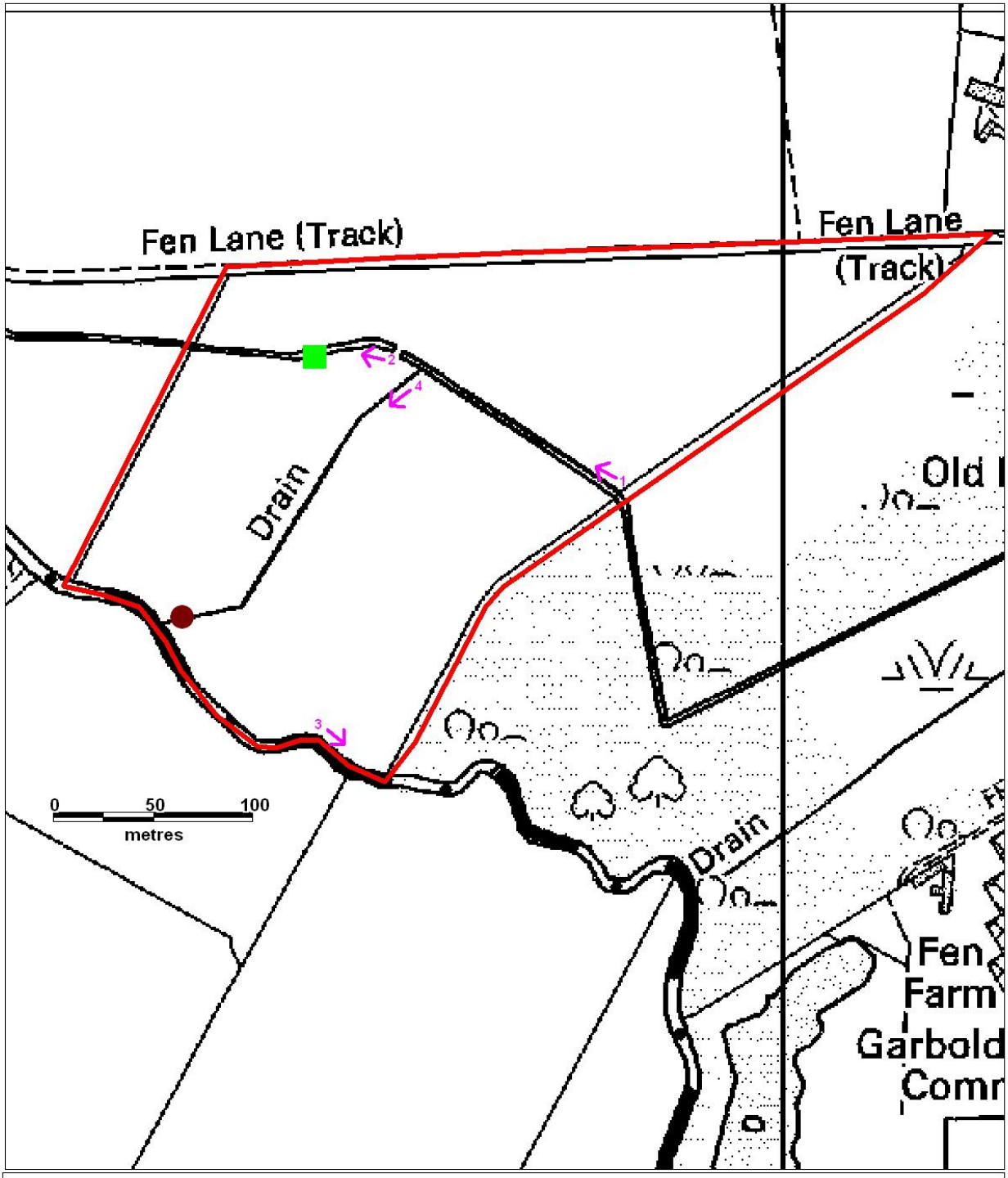


Figure 2: Water Vole Survey

Key:

Survey boundary

1 → Photo number and direction

Probable water vole feeding station

Badger latrine

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Ordance Survey Licence: 0100031673

Photo 1: Ditch

Photo 2: Ditch

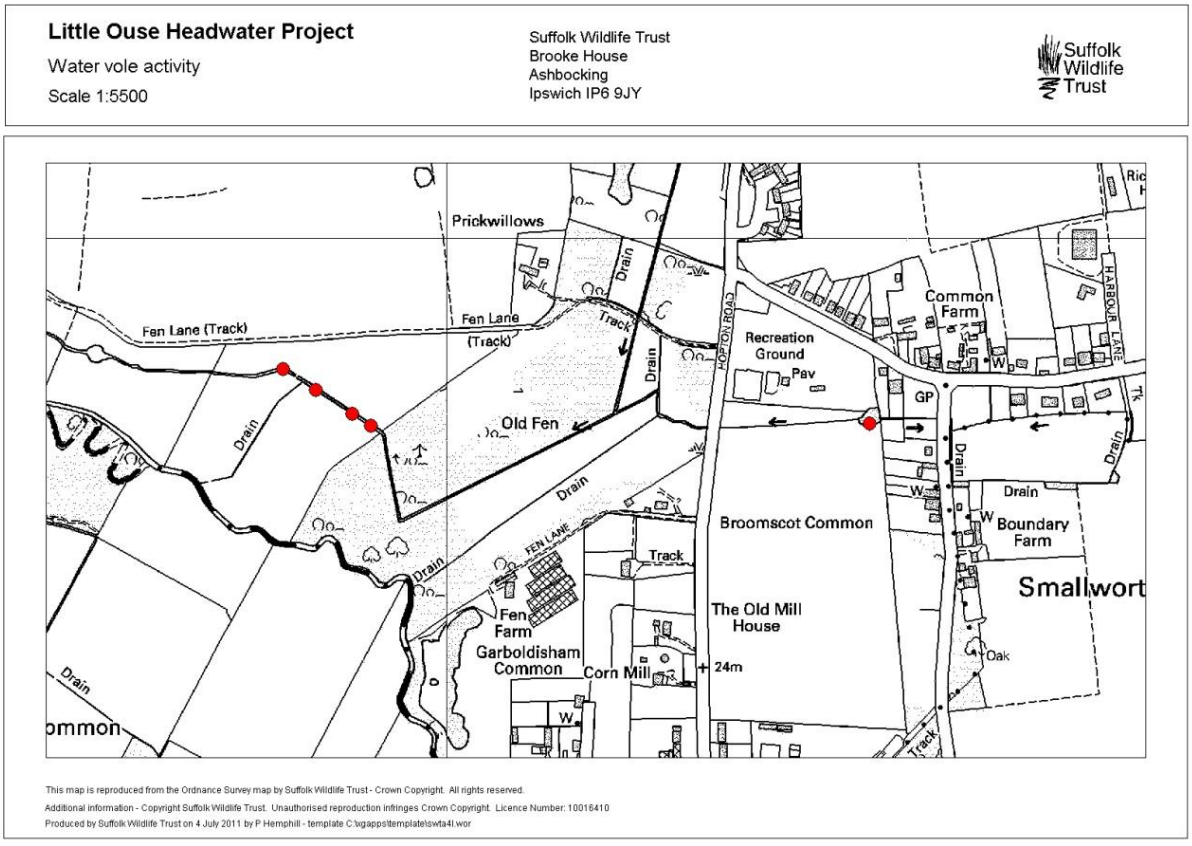
Photo 3: River

Photo 4: Ditch

Photo 5 and 6: Probable water vole feeding station

Photo 7: Badger dung pit

Figure 3. Water vole assessment of Scarfe Meadows and Broomscot Common by Suffolk WildlifeTrust



2.3 Interpretation

All the water courses had natural, soft, earth banks. In some areas scrub and young trees that were overhanging the banks had been recently felled. Each of the ditches within the survey area was considered to be suitable water vole habitat (as the banks were largely grassy, the flow was slow and there was in-stream and bankside vegetation suitable for food and shelter). In parts, the river banks were difficult to survey due to their steep angle, undercutting and overhanging, lodged vegetation which prevented access to the bank edges.

In summary, signs of probable water vole activity were found adjacent to the waterbodies within the survey area in March 2011. However, no latrines were identified at that stage to confirm water vole presence (at this time of year water voles are less active and may stay below ground, although they do not hibernate, for periods of time). As works are proposed that would affect the ditches/river banks and would to raise water levels, it was recommended that further water vole surveys were completed in the more active season (late April to September) when signs of water vole activity, if present, would be more abundant. The follow-up survey by Suffolk Wildlife Trust, in confirming the presence of water vole, enables a mitigation plan to be designed with the consent of Natural England (if this is possible and necessary).

Note on Ecology and Legislation

Nationwide surveys have revealed that the water vole (*Arvicola amphibious*) population is declining in Britain, particularly within the last 50 years. Water vole numbers are threatened by:

- habitat loss
- predation (particularly by mink)
- population fragmentation
- variations in water level
- persecution
- water pollution from agriculture, industry and transport.

The water vole is protected through Schedule 5 and Schedule 9 of the Wildlife and Countryside Act, 1981 (as amended). This legislation makes it illegal to:

- intentionally kill, injure or take water voles
- possess or control live or dead water voles or derivatives
- intentionally or recklessly damage, destroy or obstruct access to any structure or place a water vole uses for shelter or protection
- to disturb a water vole whilst it occupies such a place.

Offences under the Wildlife and Countryside Act carry heavy fines and a maximum penalty of six months imprisonment. An offence can be easily avoided by surveying sites for water voles prior to works and implementing appropriate mitigation strategies to protect them and enhance their habitats (with consent from Natural England, as appropriate).

In addition, the Wild Mammals (Protection) Act, 1996, protects all mammals from any action with the intention of causing deliberate harm.

3. SOIL SURVEY

3.1 Survey objective and method

The fieldwork brief defines the objective of this survey as:

- To map the shallow soils and identify their hydrological characteristics

As described by Mathers et al (1993), soils of this section of the Little Ouse valley floor are formed in peat and clayey-peat substrates, underlain by sands and gravels. The sands and gravels have been taken as the basement layer for this survey. The British Geological Survey shows the extent of the peats and clayey peat as covering almost the whole of Scarfe Meadows, giving way to Glacial Sands and Gravel at the upland margin, and the low First Terrace sands and gravel marked by the modern course of the Little Ouse.

The methodology for this survey is therefore:

1. To survey and map the extent of the valley floor, establishing the boundaries with the upland and terrace margins;

2. To establish the character and disposition of the 'peat and clayey peat' materials that form the valley floor;

3. To identify and assess the field characters related to their hydrological behaviour.

The results of the survey can provide an indication of the influence of the soil on site hydrology.

The survey was carried out on 17th February 2011 in moderate light conditions, following several weeks of low insolation levels and low rainfall.

In accordance with the topography suggested by the Ordnance Survey 1:25 000 Series Sheet 230, transects were selected running roughly northeast to southwest, so as to sample each field. As shown in Figure 4, cores were taken at roughly equal distances along each transect, at apparently typical locations, with supplementary cores infilling coverage of the northern field. Approximate core locations were marked on a field copy of an aerial photograph of each site and exact locations were recorded using a hand-held GPS reading and are presented within Appendix 1.

All cores were taken using a Dutch Edelmann auger. Arisings were examined in the field and recorded in a log to show the sequence of geological materials from the surface. The depths of cores were typically taken down to the basal surface of the peat and clayey peat layers, where sands and gravels were encountered.

On the upland margin and the embanked margin of the River Ouse, occasional shallow cores were also taken to confirm the presence of sands and gravels.

Extraction and assessment of the arisings from each core comprised:

- augering the core in c.20 cm depth sections, with the exception of fluid materials found at depth;
- distinguishing discrete sedimentary units within each core by means of macro-fabric characters, colour and textural classification;
- identifying unit boundaries within each core by recording a 'below ground level' (bgl.) measurement to the nearest centimetre;
- recording the depth of water within the core when first encountered (ie the watertable depth) and also following the extraction of the last section – measured to the nearest centimetre bgl.

When assessment of the arisings was complete, they were used to plug the cored hole.

3.2 Results

The locations of cores are given in Figure 4, and the log of soil cores is given in Appendix 1.

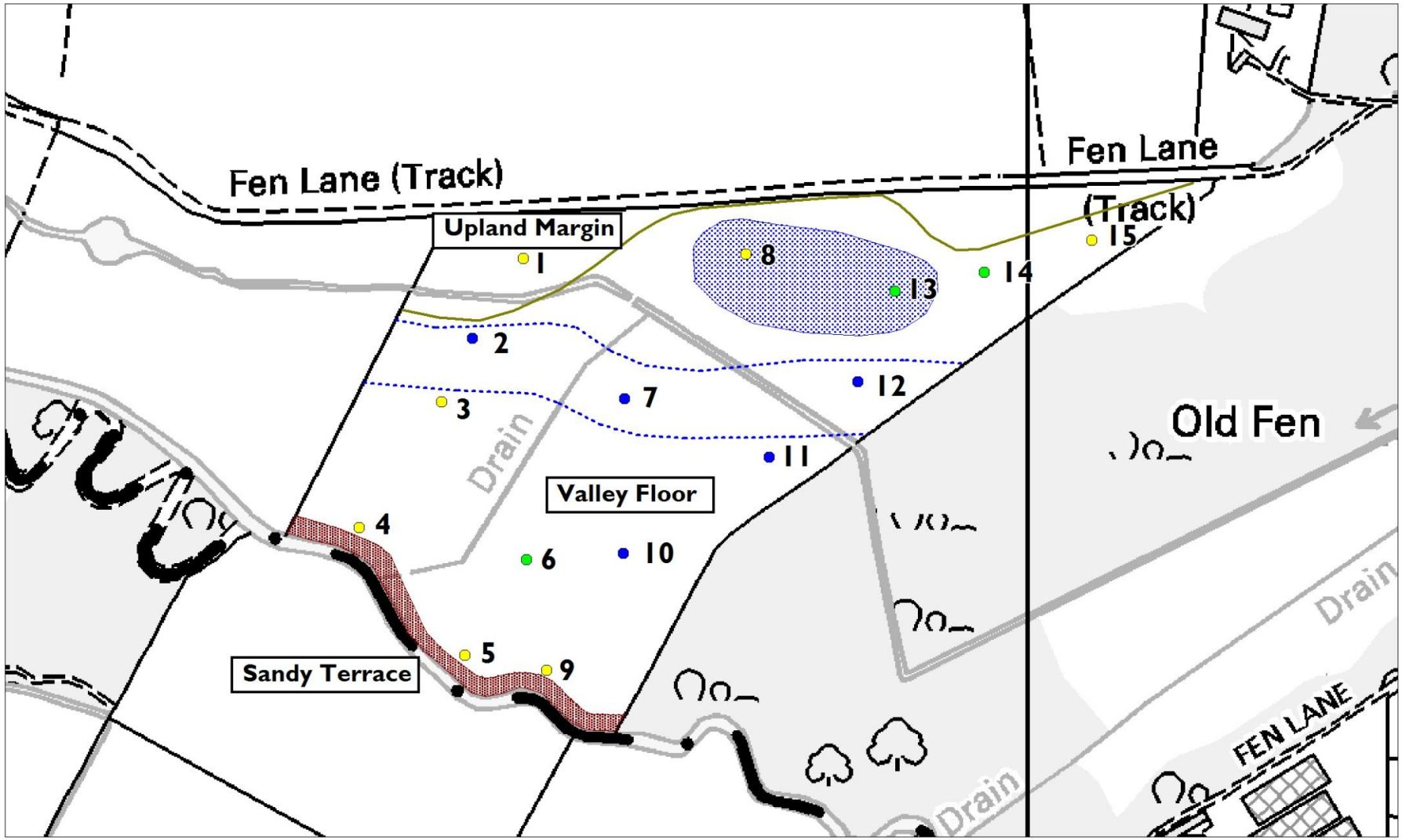
The log of soil cores provides information on the assessments made during augering. For each core, the logs are read from left to right, and describe the depths at which features are first encountered. In addition to the sequence of geological materials (see Table 3), a number of other readings are recorded, defined in Table 2.

Table 2. Terms used within the log of soil cores

Core	The sequence of core numbers within a survey area indicates the methodical route followed for taking cores.
Grid Ref.	These are given as standard 10-figure numeric references from the National Grid (TL/TM).
Surface water	In cores taken in standing water, the depth of water is given as a positive number above the ground surface which, as in all cores, is treated as 0 cm.
Initial watertable	The depth below ground surface of the watertable is assessed as soon as it is encountered. This is the actual groundwater surface which may differ markedly from the watertable level measured after the features of the core have been assessed. See 'Final watertable'.
Base of core	The depths of cores vary markedly with the depth of the upper surface of sands and gravels. This was encountered at the surface or, as in several cores, at depths of > 250 cm. In all cases, the base of the cores were located in sands and gravels.
Final watertable	Where groundwater is confined within the substrates, augering acts to remove the impediment and the level of water initially defined as the watertable will rise up the borehole to settle at a new level within the core. The figure given in this column is therefore the depth below ground level reached by the groundwater rise at the end of augering.
Vegetation	An abbreviated description of the vegetation is given for each core location as a generic habitat type and a list of typical species.

The types and relative disposition of geological materials encountered by each sample core (as in Appendix 1) is described in Table 3. The substrate that is not overlain by other materials is listed first, followed in sequence by those over which it is superimposed. Table 3 shows that a surficial silt loam often overlies silty clay, and that these alluvial substrates lie over a bed of peat over much of the site. Sands either underlie these materials on the valley floor, or appear at the surface on the margins of the upland, or the edge of the floodplain terrace, where the alluvium and peat is absent.

Figure 4. Location of soil cores and features



Key

- Standing Water
- River Spoil Bund
- Approximate line of channel
- Core - total peat thickness 0-49 cm
- Core - total peat thickness 50-99 cm
- Core - total peat thickness 100+ cm

Table 3. General field characters of geological materials

Material	Field characters
Loamy silt	Mid grey-brown to mid red-brown in colour, this stoneless material has a gel-like character when saturated, and can form a hard crust over the ground when dry. At core sites in the northern field, arisings from this material reddened in colour upon exposure and drying.
Silty clay	A somewhat lighter grey-brown than the loamy silt, this material has a distinctly stiffer texture and, although forming an impediment to water flow, rarely displayed iron mottling indicative of waterlogging. Stoneless, the clay varied somewhat in the percentage of silt and sand present, but frequently contained freshwater shells.
Hemic peat A	Forming an abrupt boundary with clay, this peat is uniformally very dark brown, and lacks woody inclusions, and only rarely were plant fragments recognised. While quite firm, the peat lacks the gritty or gel-like character of very 'earthy' or largely decayed peat, or the abundant plant fragments of peat B.
Hemic peat B	Over a few centimetres in the deeper areas of peat on the valley floor, the peat colour lightens to mid- to dark- brown, and inclusions of wood become occasional to frequent in occurrence. This peat is relatively soft (compared to peat A) and plant fragments are abundant. In the deep cores, the lower part of this peat layer is very soft and slurry-like.
Sands	Over the southern fields, the boundary of peat and sand was abrupt and the slightly stony sand had cohesion. In most cores the sand was a uniform light grey in colour, though this was replaced with a pinkish hue at depth. In the wetter parts of the northern field, the boundary between peat and sand was diffuse, forming a very soft, dark grey humic layer, often with woody inclusions. This humic sand was proved to be c.30 cm in depth, before assuming the typical light grey colour.

When the log of soil cores is taken into account, the survey results show that the alluvium mantles all the valley floor to a depth of 36-54 cm, and occurs in all cores except core 1, which sampled the upland margin near the northwest corner. Peat is also ubiquitous but is everywhere buried beneath an alluvial sediment, although it typically appears as mole hills, particularly on the apparently drier norther and southern parts of the site.

Beneath the alluvium, the upper part of the peat (hemic peat A) was typically submerged beneath the late winter watertable and was found to grade from the shallow margins to a typical thickness of 60-65 cm with a base at 100-111 cm bgl. Here, the character of peat alters over a few centimetres and in some cores hemic peat B fills a deeper hollow beneath the alluvium, broadly coincident with the line of the channel separating the northern and southern fields. Hemic peat B was proved at thicknesses of up to 212 cm in 7 cores. Figure 4 includes a value for 'total peat' thickness, which clearly shows the line of a broad channel from east to west, and the rapidly thinning peat body to the south.

A particular feature of the site is borne out by the consistent behaviour of the watertable. The initial watertable depths were encountered at 40-70 cm bgl. In most cores, the watertable coincided with the base of the alluvium. The deeper watertable readings were recorded from cores near the river, or along the eastern margin of the site. With the exception of core 9 – near the river – groundwater rose within the auger holes, so that the final readings, when each core was complete, were 11-48 cm bgl. A consistently strong reaction was recorded from the four cores in the centre of the northern field, with rises of 26-34 cm.

The margin of the valley with the northern upland is quite clearly marked by a break in slope, changes in vegetation and by the absence of peat in mole hills. In the vicinity of the cores where a strong rise in watertable was recorded, the upland margin has receded to form a slight embayment.

The southern margin of the valley floor is largely obscured by the sandy bund form by spoil dumped from channel maintenance beside the river's course. Nonetheless, core 9, which lacks peat, suggests that the river channel lies roughly along the boundary between the valley floor and first terrace.

3.3 Interpretation

The soils of Scarfe Meadows form the valley floor north of the River Little Ouse, and consist largely of alluvium over a buried body of peat with a sandy basement. The sequence of loamy and clayey alluvium over peat is typical of soils defined by the Soil Survey of England and Wales as alluvial gley soils. The presence of freshwater shells within the alluvium, and the proximity of chalk on the valley side, may be an indication that the hydrological system has a calcareous component, perhaps solely from groundwater. If the alluvium were determined as calcareous, the Scarfe Meadows soils can be allocated within the Windrush soil series. Such calcareous alluvial gleys have a very local distribution in East Anglia. If the alluvium is neutral or even mildly acidic, the soils are better regarded as the more frequently occurring pelo-alluvial gley soils assigned to the Midelney soil series. This series is known to occur in the Deben, Dove and Gipping valleys in Suffolk.

The abrupt boundary with the upland to the north includes an embayment typical of headwall erosion by local seepage. This is consistent with the presence of a poorly defined boundary in cores from this area between the base of the peat and the underlying sands, which is organic-rich, and with the strong positive rise in watertable level upon coring.

Along the southern margin of the northern field, and extending into the southern fields, the peat body thickens to fill a broad channel (proved to 318 cm bgl.) running approximately east to west across the site. The line of the channel may either be coincident with a former course of the Garboldisham Brook, or of the Little Ouse itself. If the former, which is suggested by the LIDAR-derived Flood Map developed by the Environment Agency[1], the peat-filled channel may be connected with the modern course of the Little Ouse to the west of the site.

The possibility that the channel is part of a former course of the River Little Ouse is intriguing. Although the modern river course is long established, and is marked by the parish boundary, a secondary channel to the north of the river, now marking the boundary between the northern and southern fields in Scarfe Meadows, is given considerable prominence in earlier maps (eg. Faden 1783), and can be traced as far west as Rushford Heath.

The route taken by the channel to the west of Scarfe Meadows is therefore of importance in terms of the subsurface passage of groundwater within the valley floor sediments.

A further feature of old maps[2] of Scarfe Meadows is the density and location of the ditch network. While the southwest field is shown as it is today on the Ordnance Survey Map 1st Edition, the southeast field was subdivided by three further ditches running northwest-southeast across the field. The centre of the northern field was also bounded by perimeter ditches draining southwards, which lead from the supposed seepage headwall.

[1] www.environment-agency.gov.uk accessed 18th February 2011.
[2] E-Map Explorer at www.norfolk.gov.uk accessed 18th February 2011.

The modern ground surface of the valley floor remains relatively poorly drained, with extensive areas of Tufted Hair-grass *Deschampsia cespitosa* and Hard Rush *Juncus inflexus* tussocks, and more localised patches of Reed Canary grass *Phalaris arundinacea* and inundation grassland evident in the northern field. The presence of Hard Rush, rather than Soft Rush *J. effusus*, is uncommon in the northeast part of East Anglia, including the Broads rivers. Further east on Waveney floodplain, sites such as at Worlingham near Beccles are carpeted with Soft Rush over peat, where ponded rainwater is believed to favour this rush. Hard Rush is restricted to dyke sides and access the groundwater.

At Scarfe Meadows, the ubiquity of Hard Rush provides an indication that the surficial alluvium enables a degree of vertical hydraulic connectivity between the underlying groundwater in the peat and the ground surface. This may be a seasonal phenomenon, most evident in late winter and early spring.

At the time of survey, the watertable has been shown to be located close to the base of the alluvium. In winter, and perhaps through much of the spring, the low hydraulic conductivity of the loamy silt (when moist) and silty clay of the alluvium would suggest that water inputs would only be transmitted very slowly to the ditch network. However, the differences in vegetation between the fields would indicate that only the supposed seepage area has a sufficiently long period of waterlogged conditions to promote the development of inundation and wetland vegetation.

Elsewhere, and throughout much of the southern fields, the duration of impeded drainage is only sufficient to encourage the non-wetland rush and tussock grass. These species are absent from the low riverside bund, were nettle is more evident and the vegetation shows no signs of impeded drainage. Cores 4, 5 and 9 demonstrate the transition between slightly impeded and free drainage.

The long-established current course of the Little Ouse along the margin of the First Terrace has obscured the actual margin of the valley floor, but core 9 indicates that the peat fringes out before the alluvium, which may extend to the foot of the terrace sands. The British Geological Survey map all land on the south side of the river as First Terrace sands, and the Environment Agency's Flood Map shows the northernmost fields of Garboldisham Common as of the modern floodplain. Notwithstanding, it can be assumed that the river channel is the boundary of the hydrologic unit assessed by the survey.

The Soil Survey have mapped the entire floodplain between Hopton and Garboldisham using the more frequent humic sandy gley soils (Isleham 2 Association) to describe the area, no doubt reflecting the more abundant cover of thin peats and humose topsoils overlying the terrace sands and gravels, and the absence of alluvium. Without extending the survey, it will not be possible to place the Scarfe Meadows soils within the surrounding context of the floodplain, but it is likely that the alluvium is restricted to the valley floor, and may be associated with the confluence of the Garboldisham brook with main drainage valley.

4. LEVELS AND WATER FEATURES SURVEY

4.1 Methods

The survey objective was to ascertain the levels of water features (i.e. their water level, bed level and control structures such as pipes and culverts) within and immediately surrounding Broomscot Common and Scarfe Meadow. The water features that connect the two sites (via Garboldisham Old Fen) were also surveyed. In addition the topography of the land within Broomscot Common and Scarfe Fen were also surveyed in detail, with spot heights taken through Garboldisham Old Fen. Where vegetation was particularly dense (preventing access or a sight line) or conditions were unsafe (e.g. degraded banks) levels were not recorded.

The site visit was made on 10th December using a Laserplane laser level theodlite and receiver. All levels were reduced to Ordnance Datum (OD) using an Ordnance Survey Benchmark located on Old Mill House, Hopton Road.

Throughout the survey identifiable points were levelled to create Temporary Benchmarks that may be used as known heights for any future works.

4.2 Results

The results of the topography survey (to include water features are shown in Figure 5. Table 4 provides detail on the Temporary Benchmarks (TBMs) set throughout the site.

4.3 Interpretation

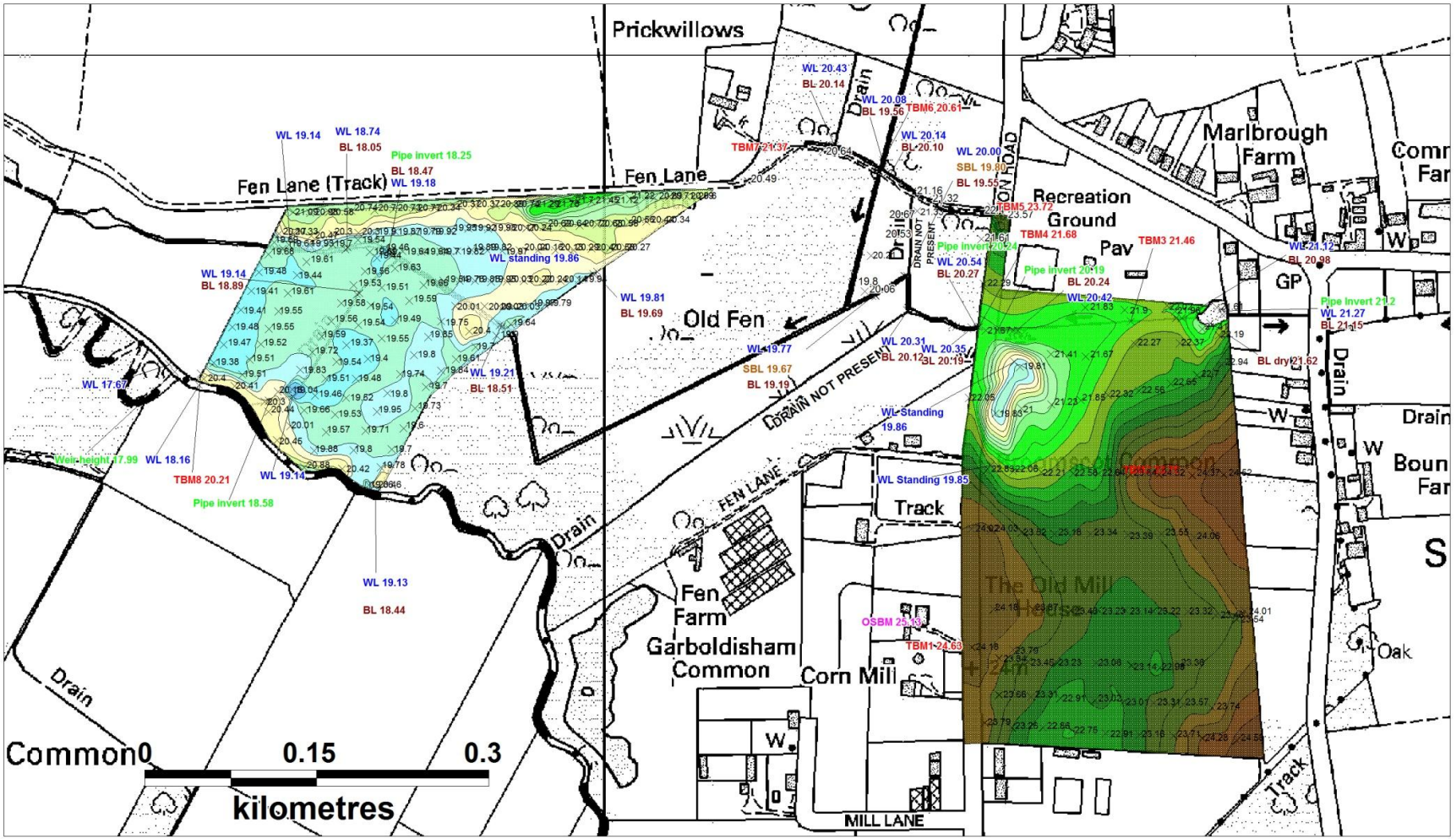
Broomscot Common has higher land to the south and the east at a height of up to 26.25mOD. The land was noted to rise further to the east (to residential properties), to the road on the western boundary, and to the Recreation Ground in the north.

To the north of Broomscot Common the topography declines to low marshy ground as low as 19.81mOD with standing water at 19.85mOD. There is a pond in the northeast corner, with marshy ground surrounding it. The pond is fed by a piped ditch to the east (culverted beneath residential gardens and properties). The stream flows freely west until it is culverted under Hopton Road and enters Garboldisham Old Fen.

Within Garboldisham Old Fen, water features are free-flowing (due to the nature of fenland) and the ground was marshy under foot. Two ditches within the Fen that were marked on the OS map were not apparent on the ground: these are labelled 'Drain not present' on Figure 4.

An access track leads west off Hopton Road towards Scarfe Meadows at heights of 21.32 to 20.64m OD. A drainage ditch passes beneath the track, which is bridged by a concrete slab (the ditch is open and not culverted beneath the bridge).

Figure 5. Topography and water features



Key:

Land level	Water level	Soft bed level	Bed level	Water control structure level	OS benchmark level	Temporary benchmark level	
18.50 to 18.75	19.50 to 19.75	20.50 to 20.75	21.50 to 21.75	22.50 to 22.75	23.50 to 23.75	24.50 to 24.75	25.50 to 25.75
18.75 to 19.00	19.75 to 20.00	20.75 to 21.00	21.75 to 22.00	22.75 to 23.00	23.75 to 24.00	24.75 to 25.00	25.75 to 26.00
19.00 to 19.25	20.00 to 20.25	21.00 to 21.25	22.00 to 22.25	23.00 to 23.25	24.00 to 24.25	25.00 to 25.25	26.00 to 26.25
19.25 to 19.50	20.25 to 20.50	21.25 to 21.50	22.25 to 22.50	23.25 to 23.50	24.25 to 24.50	25.25 to 25.50	Data to m AOD

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Land within Scarfe Meadows is considerably lower (largely at 19.5-19.75mOD), with lower sections to the northeast and south (adjacent to the river), down to 20mOD. Several ditches run through the Meadows which are occasionally culverted to allow tractor access into adjoining fields. To the north of Scarfe Meadows the agricultural fields were observed to rise significantly.

To the south of the Meadows is the River, including a weir (at 17.98mOD) which retains water at a higher level upstream (east, Photo 8). The weir may also be useful as a temporary benchmark.

Photo 8: Weir

Table 4: Temporary benchmarks

TBM	Description	Photo	Height (m OD)
OSBM	Ordnance Survey Benchmark - Old Mill House, Hopton Road		25.13

TBM1	On top of lower hinge pin of gate at Old Mill House		23.79
TBM2	North east corner of concrete trough		23.75
TBM3	South west corner of footbridge		21.46
TBM4	Cleaned, centre brick of bridge on western side of Hopton Road		20.24

TBM5	Central 'T' in concrete utilities cover west of Hopton Road		23.72
TBM6	Northwest corner of concrete bridge		20.61
TBM7	On top of concrete post near house entrance		21.37
TBM8	South east corner of concrete block next to northern gate post		20.21

5. NATIONAL VEGETATION CLASSIFICATION SURVEY

5.1 Survey objective and method

The fieldwork brief defines the objective of the survey as:

- To provide a baseline survey of the vegetation of Scarfe Meadows, using the National Vegetation Classification.

The National Vegetation Classification (NVC) is the common standard for defining types of vegetation and describing them within a British and European context (JNCC 2011). The classification is widely used by Natural England and has been employed to describe the vegetation of much of the Little Ouse valley, including other LOHP sites.

The survey methodology is described in detail in Rodwell (2006). In summary, the types of vegetation at Scarfe Meadows are distinguished by the broad class of habitat (e.g. grassland, swamp and inundation, aquatic habitat) and by their plant species composition. The main vegetation types are described by selecting a number of representative plots (usually of 2 x 2 metres, depending on the habitat being sampled). Each plot is assessed for the presence and areal cover of all plants, including mosses and lichens, and for other attributes such as height of the vegetation and the amount of bare ground or depth of standing water.

The sample plots for each vegetation type are then grouped together to show the common and typical characters of the vegetation type. Each type of vegetation is then compared with the published NVC accounts (Rodwell 1991-2000). An interpretation of the site's vegetation can then be developed using the published accounts, other fieldwork and also expert knowledge.

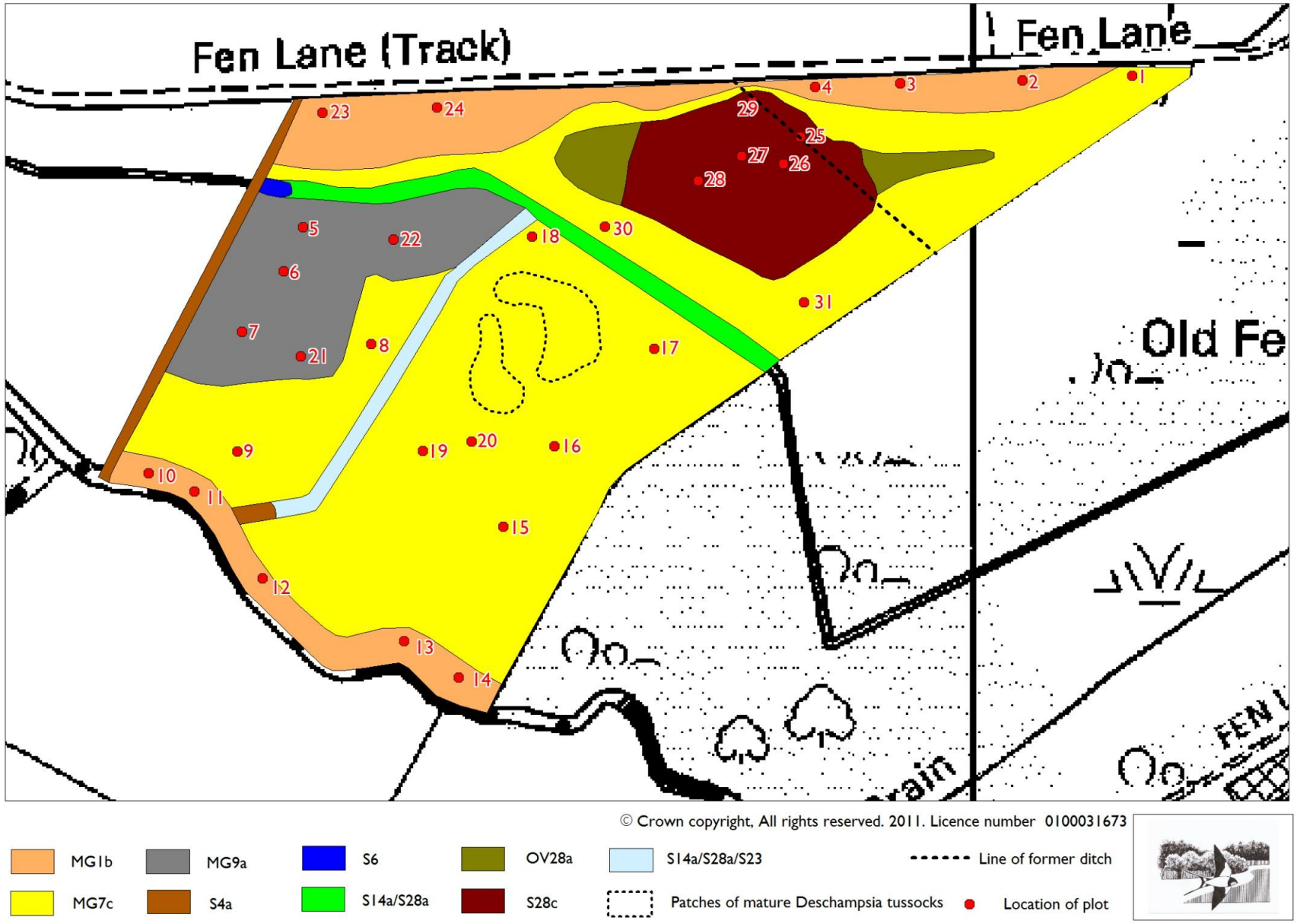
The survey was undertaken in early June 2011 at the end of a notable drought period. Scarfe Meadows is divided into three fields, which are referred to as the northern, western and eastern fields. The fields are separated by wet ditches, which were assessed using expert judgement.

5.2 Results

Scarfe Meadows is sub-divided into four habitats: Aquatic vegetation in the wet ditches, and three grassland habitats, Floodplain Grassland, Wet Grassland and Dry Grassland. The distribution of vegetation types in these habitats is shown in Figure 6. As is evident in Table 5, there is considerable overlap in species composition between the three grasslands and it is sometimes the relative abundance of species, rather than their presence or absence, which defines the NVC community to which they are assigned.

Floodplain grasslands are found where grass swards are maintained on mineral topsoils in the Little Ouse valley. Such grasslands develop on soils with impeded drainage, where a combination of precipitation and flood waters saturate the root zone for several months each year.

Figure 6. Distribution of vegetation types



At Scarfe Meadows, two distinct grassland communities are recognised in this habitat:

Grassland type	**Code**	**NVC community title**
Flood pasture	MG7c	*Lolium perenne – Alopecurus pratensis – Festuca pratensis* grassland
Tufted Hair-grass Grassland	MG9a	*Holcus lanatus-Deschampsia cespitosa* grassland, *Poa trivialis* sub-community

As shown in Table 5, both Floodplain Grassland types share a number of species in common, and lack the suites of herbs normally associated with flood pastures of this character. In addition, the extent of Tufted Hair-grass, the character species of *Holcus-Deschampsia* grassland, occurs not only as a solid block in the western field, but also in clusters and as individual tussocks throughout large parts of the eastern and northern fields. This is illustrated in Figure 6. Also, some species such as False Oatgrass and Creeping Thistle are constant whose prevalence is probably due to the drainage conditions and recent relaxed husbandry.

Table 5. Synoptic summary of main habitat vegetation types.
The table lists the component species of each vegetation type by frequency of occurrence in samples: V = > 80 %; IV = 60-80 %; III = 40-60 %; II>20 %. Species occurring in <20 % samples are omitted.

Habitat	**Floodplain grassland**		**Wet grassland**	**Dry grassland**	
Main vegetation type	MG9a	MG7c	S28c	MG1b	MG1b
Holcus lanatus	V	V	V	V	V
Agrostis stolonifera	III	V	V	IV	V
Alopecurus pratensis	II	V	III	III	II
Poa trivialis	IV	V	V		V
Dactylis glomerata	III	IV		V	IV
Arrhenatherum elatius	II	V		V	II
Urtica dioica		III		III	V
Bromus hordeaceus hordeaceus		II		II	II
Cirsium arvense	V	V		III	
Festuca pratensis	IV	II		II	
Elytrigia repens			II	II	V
Lolium perenne		III			V
Festuca rubra	V	III	III		
Phalaris arundinacea	II	II	V		
Deschampsia cespitosa	V	II	IV		
Poa pratensis		II			
Glechoma hederacea				III	
Veronica chamaedrys				III	
Conium maculatum					V
Juncus inflexus			V		
Ranunculus repens			III		
Festuca arundinacea			II		
Alopecurus geniculatus			II		
Juncus effusus			II		

The ***Flood Pasture*** occupies the entire eastern field and the surrounding margins of the western and northern fields. It is characterised by abundant Meadow Foxtail, Yorkshire Fog and Rough Meadow-grass, with scattered Meadow Fescue and Perennial Ryegrass (see Table 6). This sward, in patches, can readily be referred to seasonally flooded pastures of the *Lolium-Alopecurus-Festuca* grasslands (MG7c). However, as mentioned above, mature tussocks of Tufted Hair-grass occur in groups and in isolation far into the surrounding grasslands, which emphasises its close relation to the Tufted Hair-grass grassland in the western field. In addition, the character of the sward is affected by a high frequency of Creeping Thistle and False Oatgrass, often with scattered Nettle. This form of the grassland is particularly evident in the southern part of the eastern field, which is grading towards the Nettle sub-community of False Oatgrass *Arrhenatherum elatius* grassland (MG1b). Here, the peat is known to thin, and has undergone considerable disturbance in the past[3].

Table 6. Flood Pasture (MG7c)

Plot No.		1	8	9	15	16	17	18	19	20	30	31		
Alopecurus pratensis		6	8	8	7	8	5	7	5	7	6	4	V	(4-8)
Poa trivialis		8	6	7	6	7	5	4	4	4	7	6	V	(4-8)
Holcus lanatus		3	8	7	7	6	6	6	4	4	5	7	V	(3-8)
Agrostis stolonifera		7	5	5	6	4	6	3	3	5	7	5	V	(3-7)
Cirsium arvense		2	3	4	3	2	3	3	8	6	4	5	V	(2-8)
Arrhenatherum elatius		2	3	4	5	4	3	3	2	2		3	V	(2-5)
Dactylis glomerata		2	2	3	1	2	2					3	IV	(1-3)
Festuca rubra						3	5	7	4	6		4	III	(3-7)
Lolium perenne			4	6			4		2		4	2	III	(2-6)
Urtica dioica			2	2	3	4	1					1	III	(1-4)
Festuca pratensis									1	5	2	4	II	(1-5)
Poa pratensis			2	2				2			2		II	(2)
Bromus hordeaceus hordeaceus			2				1				1	2	II	(1-2)
Deschampsia cespitosa									4		2	1	II	(1-4)
Phalaris arundinacea		3						1			1		II	(1-3)
Elytrigia repens							5					2	I	(2-5)
Festuca arundinacea												4	I	(4)
Carex hirta												2	I	(2)
Brachythecium rutabulum		2											I	(2)
Juncus inflexus												1	I	(1)
Ranunculus repens									1				I	(1)
Taraxacum agg.												1	I	(1)
Cirriphyllum piliferum												1	I	(1)
Sonchus asper		1											I	(1)
Sward height (cm)		15	45	40	20	25	20	20	50	25	35	30		
Herb cover (%)		95	95	90	85	90	80	85	90	80	85	85		
Bryophyte cover (%)		1	0	0	0	0	0	0	0	0	0	0		
Litter cover (%)		5	15	15	10	10	10	10	15	15	10	5		
Bare ground (%)		15	20	25	25	15	25	20	15	20	35	30		
No. of species		10	11	10	8	9	12	9	11	8	11	19	Av.	10.7

[3] The Ordnance Survey 1st Edition Sheet [accessed on 22.06.2011 from http://www.historic-maps.norfolk.gov.uk/Emap/EMapExplorer] shows the eastern field as formerly subdivided into four strips by ditches that were filled in, and trees and scrub cleared from their margins, after 1988, as shown on an aerial photograph of that date.

Much of the western field, particularly towards the north and west margins, is overwhelmingly dominated by ***Tufted Hair-grass Grassland***. See Table 7. This species forms patches of dense tussocks, separated by a very patchy lawn of Yorkshire Fog and Red Fescue, overtopped by a thin canopy of False Oatgrass, Meadow Foxtail and the occasional tuft of Meadow Fescue. This is the Yorkshire Fog-Tufted Hair-grass community (MG9). The abundance of Rough Meadow-grass suggests that the stand should be placed in the *Poa trivialis* sub-community (MG9a), though the paucity of herbs and relative frequency of False Oatgrass indicate that the sward also has some affinity to the rather more species-poor drained form of the community, represented as the *Arrhenatherum elatius* sub-community (MG9b).

Table 7. Tufted Hair-grass Grassland (MG9a)

Plot No.	5	6	7	21	22		
Deschampsia cespitosa	8	9	6	9	8	V	(6-9)
Holcus lanatus	7	6	8	4	4	V	(4-8)
Festuca rubra	5	6	6	2	4	V	(2-6)
Cirsium arvense	2	1	2	1	2	V	(1-2)
Poa trivialis	5	5	6	5		IV	(5-6)
Festuca pratensis	3	3	2		3	IV	(2-3)
Agrostis stolonifera			4	3	6	III	(3-6)
Dactylis glomerata	1		1	1		III	(1)
Alopecurus pratensis			2	2		II	(2)
Arrhenatherum elatius		1		2		II	(1-2)
Phalaris arundinacea	1	2				II	(1-2)
Carex hirta	2					I	(2)
Urtica dioica	1					I	(1)
Sward height (cm)	55	60	55	60	60		
Herb cover (%)	90	95	85	90	85		
Bryophyte cover (%)	0	0	0	0	0		
Litter cover (%)	25	25	20	10	10		
Bare ground (%)	10	5	30	30	35		
No. of species	10	8	9	9	6	Av.	8.4

The ***Dry Grasslands*** of the terrace and valley margins are typically dominated by Yorkshire Fog (see Table 8). The sward is often thin and kept low by cattle grazing supplemented by rabbits, and is uniformly species-poor. There are almost no typical annuals occupying gaps in the sward, and the grasslands are best regarded as a grazed variant of the Nettle sub-community of the False Oatgrass grassland (MG1b). Indeed, Nettle and Creeping Thistle are common in places along the valley margin. On the terrace beside the River Little Ouse, Nettle and Hemlock are frequent colonists, and in places have developed into patches with occasional sprawls of Bramble referable to the Nettle-Creeping Thistle community (OV25b).

In the northern field, the Floodplain Grassland has an abrupt and well-defined boundary with an extensive inundation area occupied by ***Wet Grasslands*** with Creeping Bentgrass and Reed Canary-grass. The boundary between the two vegetation-types is often marked by scattered Tufted Hair-grass and the locally frequent Hard Rush and Tall Fescue tussocks. The latter is only occasionally found on the meadows, and the largest tussocks are of considerable age.

The central part of the inundation is dominated by a grazed sward of Reed Canary-grass, particularly in the lowest-lying areas (see Table 9). Here, the large grass can form an almost pure stand, notably in the hollows created along the line of the infilled ditch. Surrounding the hollows, and extending over much of the inundated area, the grass forms part of a grazed sward with Creeping Bent-grass, Yorkshire Fog and Rough Meadow-grass. Couch grass (a glaucous form), Plicate Sweet-grass and Marsh Foxtail help to distinguish the sward from the surrounding pasture. Where Reed Canary-grass is dominant, the sward can be referred to a grazed form of the *Elymus repens – Holcus lanatus* sub-community *of Phalaris arundinacea* tall-herb fen (S28c).

Table 8. Dry Grasslands (MG1b)

	Valley Margin					River Terrace						
Plot No.	2	3	4	23	24	10	11	12	13	14		
Holcus lanatus	6	9	8	8	9	8	5	9	10	9	V	(5-10)
Agrostis stolonifera	5		7	6	6	7	5	3	4	6	V	(3-7)
Dactylis glomerata	2	3	3	3	2	4	3	3		2	V	(2-4)
Urtica dioica		2	3	2		4	2	3	3	3	IV	(2-4)
Arrhenatherum elatius	8	5	3	2	1				2	4	IV	(1-8)
Elytrigia repens		1		3		2	2	6	3	7	IV	(1-7)
Poa trivialis				4		5	7	3	5	5	III	(3-7)
Lolium perenne				2		2	4	1	3	2	III	(1-4)
Conium maculatum						3	1	1	1	2	III	(1-3)
Alopecurus pratensis	2	2		1					1	2	III	(1-2)
Bromus hordeaceus hordeaceus		3	2				2			3	II	(2-3)
Glechoma hederacea	1			3	1		1				II	(1-3)
Cirsium arvense	3	1	1								II	(1-3)
Veronica chamaedrys		2	2	1							II	(1-2)
Festuca pratensis	2				2						I	(2)
Festuca rubra	7										I	(7)
Poa annua				2							I	(2)
Persicaria maculosa									1		I	(1)
Carduus crispus								1			I	(1)
Sisymbrium officinale								1			I	(1)
Cerastium glomeratum					1						I	(1)
Anisantha sterilis		1									I	(1)
Stellaria media		1									I	(1)
Sward height (cm)	30	20	20	20	25	15	15	15	10	15		
Herb cover (%)	90	95	85	90	95	90	70	90	95	95		
Bryophyte cover (%)	0	0	0	0	0	0	0	0	0	0		
Litter cover (%)	10	15	15	10	10	10	5	10	5	10		
Bare ground (%)	25	15	25	40	30	25	50	25	10	5		
No. of species	9	11	8	12	7	8	10	10	10	11	Av.	9.6

To the west, and in a small area on the east side of the stand, the creeping grasses, accompanied by Creeping Buttercup, form a low sward with only scattered Reed Canary-grass. The decline and absence of the character species indicates that the low swards are better assigned to the *Agrostis stolonifera – Ranunculus repens* community (OV28a).

Open stretches of the waterbody separating the northern field from those adjacent to the Little Ouse river support several forms of Aquatic Vegetation, with almost all plant cover composed of a

single, dominant species. Marginal Reed Canary-grass, recognised as the dominant of its own *Phalaris arundinacea* community (S28a), surrounds a central strip dominated by Branched Bur-reed. Like the Reed Canary-grass, pure stands of this species are recognised as a distinct community, *Sparganium erectum* swamp (S14a). Greater Pond-sedge forms a discrete stand across the waterbody at its western end; *Carex riparia* swamp (S6). Much of the bankside is dominated by False Oatgrass grassland with much nettle (MG1b), but where Alder and Grey Willow remain along the bank, scattered Remote Sedge survives under partial shade.

The side ditch separating the southern fields is largely made up of fragmentary stands of Reed Canary-grass (S28a) and Branched Bur-reed (S14a), with scattered patches of Fool's Water Parsley representing 'Other water margin vegetation' (S23). These species have few associates. There is a small stand of pure Reed swamp (S4a) at the southern end of the ditch.

Table 9. Wet grasslands – Reed Canary-grass (S28c)

Plot No.		25	26	27	28	29		
Phalaris arundinacea		10	9	10	9	6	V	(6-10)
Agrostis stolonifera		5	6	5	6	5	V	(5-6)
Poa trivialis		4	5	2	5	8	V	(2-8)
Holcus lanatus		2	4	3	2	5	V	(2-5)
Juncus inflexus		1	4	1	1	1	V	(1-4)
Deschampsia cespitosa		1		1	1	1	IV	(1)
Ranunculus repens			3	2		2	III	(2-3)
Festuca rubra		2			2	2	III	(2)
Alopecurus pratensis		1	2		1		III	(1-2)
Elytrigia repens		3		2			II	(2-3)
Alopecurus geniculatus			2	2			II	(2)
Festuca arundinacea				1	4		II	(1-4)
Juncus effusus			1			1	II	(1)
Persicaria maculosa		3					I	(3)
Festuca pratensis					2		I	(2)
Carex hirta					2		I	(2)
Glyceria notata			2				I	(2)
Lolium perenne					1		I	(1)
Arrhenatherum elatius		1					I	(1)
Taraxacum agg.						1	I	(1)
Sward height (cm)		15	15	20	15	20		
Herb cover (%)		95	95	95	95	95		
Bryophyte cover (%)		0	0	0	0	0		
Litter cover (%)		20	15	20	25	20		
Bare ground (%)		40	40	40	30	50		
Water depth (cm)		6	2	5	0	0		
No. of species		11	10	10	12	10	Av.	10.6

5.3 Interpretation of existing vegetation

Interestingly, both the Ryegrass flood pasture (MG7c) and the Yorkshire Fog-Tufted Hair-grass grassland (MG9b) survive on the floodplain as distinct entities, defined largely by a small number of vigorous and tall grasses. An almost total lack of seedling and moss growth may reveal an issue of shading from an over-development of tussocks, thatching and tall-herb growth. As shown in Figure 6, there is an extensive palimpsest of Tufted Hair-grass tussocks, which may indicate a marked retreat of this community in recent times to the deeper peats in the northern part of the western field.

Notwithstanding, the grass fields have a marked lack of floristic diversity, emphasised by the lack of herbs besides Creeping Thistle and Nettle. This is likely to be an effect of the application of broadleaved herbicide at some time in the past. The infrequent and very limited representation by other herbs may also reflect only limited opportunities to recolonize Scarfe Meadows.

The proliferation of Creeping Thistle and Nettle, along with False Oat-grass, is likely to reflect the character of management in recent years. The expansion of these species typically accompanies a combination of relaxed husbandry combined with sub-optimal grazing management and water levels. The stoloniferous habit of the herbs has favoured their survival and patch-forming habit, while the thick tussocks of the False Oat-grass produce sufficient plant litter and shade to overcome many establishing seedlings.

Similarly, disturbances associated with scrub removal and ditch infilling since 1988 in the eastern field may provide a rationale for interpreting the proliferation of Creeping Thistle and Nettle, particularly over the thinner peats of the southern part of this field.

In the northern field, the Flood Pasture sward is often quite diverse in species along the southern margin of the field (over the deeper peats), but is more weedy on raised areas and to the eastern corner. The Wet Grasslands appear to occupy a seepage area that also collects standing rainwater. The proliferation of Reed Canary-grass probably originates from the infilled ditch, which presumably acted to drain the seepage. The feature is likely to be very old, as the margin of this area abuts, and has eaten into, the valley margin. As elsewhere in the Meadows, the lack of herbs gives a marked species-poverty to vegetation that in many situations would be more diverse.

Although the stands of Aquatic Vegetation in the ditches are dominated by single species, and few associates are present, this may simply be the effect of strong shade cast by these tall emergent plants, and the apparently clean water should be accorded a significant conservation value within the site. It is noted that Alec Bull has recorded Water Whorl-grass *Catabrosa aquatica* from the on-stream pond to the west of the site.

6. VEGETATION MONITORING

6.1 Methodology

The Little Ouse Headwaters Project recognises the importance of monitoring the development of the vegetation on each of its acquisitions. A Vegetation Monitoring Programme was initially developed to aid the ecological restoration of Bleyswyck's Bank and Parkers Piece on the banks of the Little Ouse at Blo-Norton in Norfolk. The development, methodology and functions of the programme were described in detail in the Monitoring Plan (ELP 2010) for those sites.

The objectives of this initial monitoring survey at Scarfe Meadows are:

1. To establish permanent monitoring plots in two specified vegetation types on Scarfe Meadows, using the protocols developed in the Monitoring Plan.

2. To undertake the initial monitoring survey, using the 'full' Fieldwork Protocols.

3. To interpret the fieldwork results, and provide guidance on the establishment of initial target conditions.

The reporting follows the prescriptions of the Monitoring Plan (ELP 2010) and broadly follows the format given in the initial Fieldwork Report for Parker's Piece and Bleyswyck's Bank (ELP 2009). This fieldwork report records the 'full' survey protocol, using the four Fieldwork Elements summarised in Table 10.

Table 10. Summary of survey techniques

Survey intensity	**Fieldwork Element**		**Function within the Survey**
Rapid	1	Locating Monitoring Plots	To establish locations for the Monitoring Plots
	2	Photographic Record	To produce a record surveillance images showing the condition of the developing fen vegetation
Full	3	Vegetation structural characters	To record features of the vegetation structure against which management requirements can be established.
	4	Floristic sub-sampling	To record the floristic composition of the plot in order to judge to success of the restoration measures against target floristic conditions.

In line with the Monitoring Plan, the vegetation structural characters were sampled from each quarter of the 10 x 10 metre monitoring plot, and twenty 1 x 1 metre sub-samples were taken of the floristic composition of the whole plot.

6.2 Results

The survey was carried out on 23rd June 2011 during overcast and showery conditions after an intense drought that had characterised the previous months.

6.2.1 Locating the Monitoring Plots

Each plot is located within a stand of vegetation identified and characterised by the vegetation survey described in section 5.

Plot S01 Wet Grassland
This plot is located in the northern field in the centre of the Wet Grassland area. The plot records the Reed Canary-grass vegetation (S28c) in the wetter part of the stand. It is anticipated that the plot vegetation would be sensitive to changes in stock management and hydrology.

Plot S02 Flood Pasture Grassland
This plot was selected to lie adjacent to the Tufted hair-grass Grassland (MG9a) in a reasonably diverse area of Flood Pasture Grassland (MG7c). It is anticipated that the plot vegetation would identify changes in the boundaries and composition of these two Floodplain Grasslands.

The vegetation survey described in section 5 provides a context for the plant species composition and vegetation characters within each stand. In establishing the Monitoring Plots, this initial survey of each plot provides a set of vegetation data against which the results of future repeat surveys can be compared. An initial interpretation of the data is given in section 6.3, which can be elaborated and refined in subsequent years.

Plots were established using the method given in the Monitoring Plan. Temporary posts were located in the position of the permanent plot markers. Posts are 3 cm in diameter and 1.2 m long. The tops of all posts are painted white. The plot marker posts look like the example shown in Photo 9.

Location details of the plot markers are given in Table 11 and shown in Figure 7.

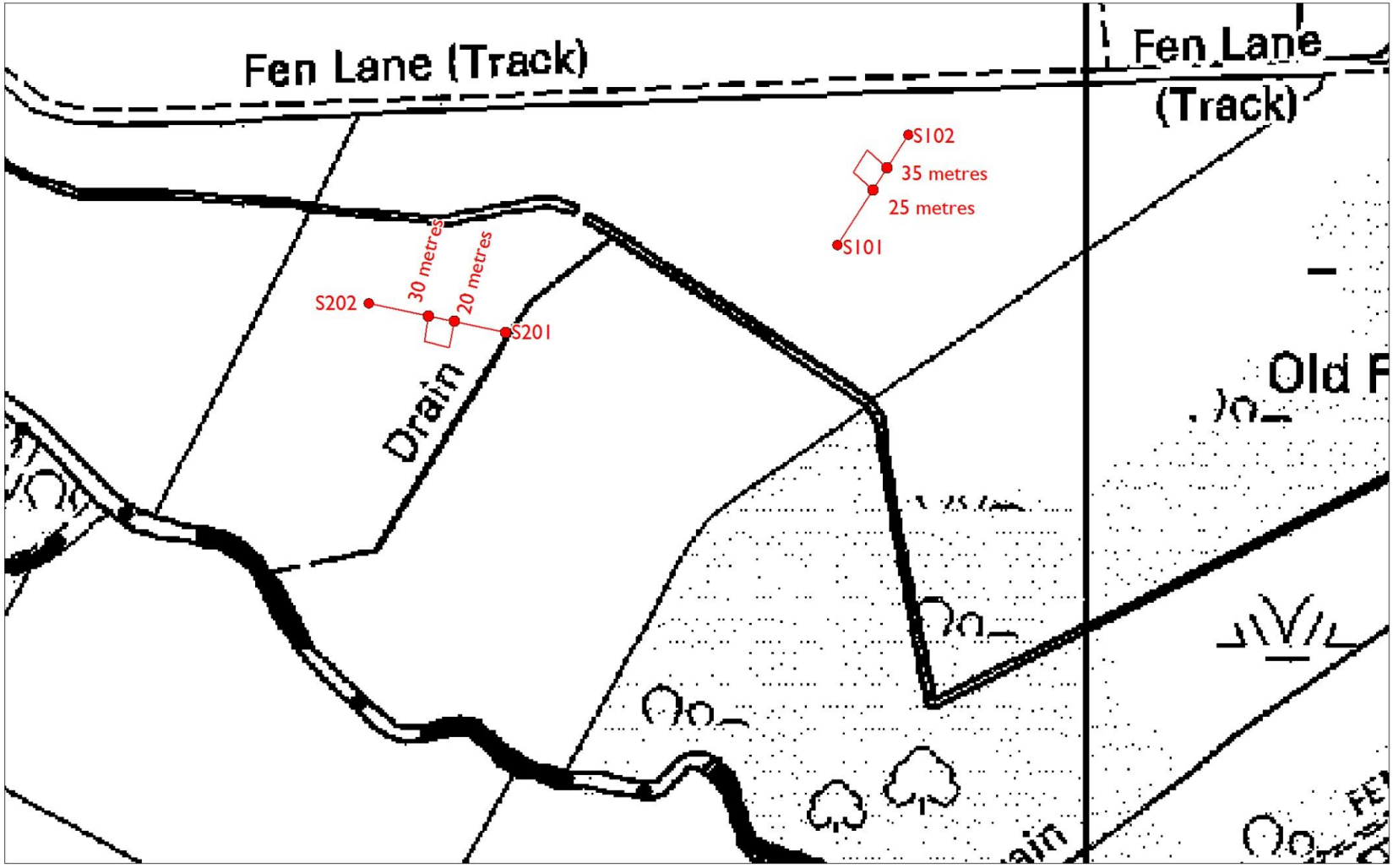
Table 11. Details of permanent monitoring plot locations

VEGETATION TYPE	PLOT CODE	MARKER POSTS	Marker Post Location	EASTING	NORTHING	Plot location (see Figure7)
Wet Grassland	**S01**	S01-01	Freestanding near southern margin of Wet Grassland	99901	80819	Southern corner 25 metres northwest of S01-01; plot on northwest side
		S01-02	Freestanding near valley margin in line with Poplar tree	99928	80861	
Flood Pasture	**S02**	S02-01	On fenceline on eastern side of western field	99775	80786	Northeast corner of plot at 20 metres west of S2-01; plot on southern side.
		S02-02	Freestanding with MG9a grassland	99723	80797	

Each plot is 10 m x 10 m in size, and lies between the two permanent marker posts. The precise location of the monitoring plot is re-established by stretching a 50 metre tape between the posts. From known lengths along this baseline, the plot is reconstructed at right angles to it. It should be noted that the precise locations of some monitoring plots may be affected by the installation of the permanent marker posts following the survey.

Photo 9. Grassland marker post type

Figure 7. Location of vegetation monitoring plots



6.2.2 Wet Grassland Monitoring Plot Report

Plot code	S01
Treatment type	**Summary of preceding Monitoring Plot Report**
Wet Grassland	This is the initial Monitoring Plot Report

Vegetation structure

● The ground surface is slightly undulating, with hollow tracks; depth of standing water 0-4 cm, at least partly from rainfall. Silty clay texture.

● Bryophytes are absent and plant litter is patchily local giving a high proportion of bare ground.

● The ground surface is thinly mantled in a low, sprawling mat of largely stoloniferous grass, beneath ubiquitous tufts of Reed canary-grass, height 15-35 cm.

● Scattered cattle trampling with very occasional dunging.

Floristics

• Reed Canary-grass tufts are abundant over a thing Creeping Bent-grass ground-cover.

• Other species are occasional Hard and Soft Rush tussocks, scattered wetland-tolerant grasses and occasional Creeping Buttercup.

Summary of records and events

• Not available at time of reporting. Field evidence suggests that the plot vegetation has developed within an inundation area (perhaps) supplemented by seepage, where a previous attempt at drainage has long been abandoned.

Relation to past and target conditions

• This survey initiates the Vegetation Monitoring Programme and provides a baseline for assessing subsequent Wet Grassland vegetation development.

• Vegetation characters suggest active grazing maintaining the Reed Canary-grass sub 50 cm in height, but grazing levels insufficient to prevent this very palatable species from colonising much of the stand.

• Grazing would appear to be sufficient to maintain the area of Wet Grassland given sufficient rainfall and continued seepage input.

Plot code S01	Photographic Record

Monitoring Plot Field Form – Vegetation structural characters

Monitoring Plot	**S01**
Recorder	**Jonny Stone OHES**
Survey Date	**23rd June 2011**

Character of the ground surface
● The ground surface is slightly undulating, with hollow tracks; depth of standing water 0-4 cm, at least partly from rainfall. Silty clay texture.

Soil wetness

Dry, dusty	Dry, firm	Slightly damp	Moist	Wet	Saturated
				I	I I I

	ATTRIBUTE		SAMPLE							AVERAGE
			1		2		3		4	
Layer height	Standing water (cm)		0		4		3		2	2.5
	Plant litter (cm)		1		0		0		0	0
	Woody seedlings (cm)		0		0		0		0	0
	Large sedges / rushes (cm)		85		65		0		0	75
	Reed-like grasses (cm)		25		35		15		20	25
	Woody saplings (cm)		0		0		0		0	0
Cover value	Standing water (%)		0		100		100		50	60
	Trampling (%)		0		5		0		5	2.5
	Dunging (%)		0		+		+		+	+
	Bare ground (%)		40		60		60		60	55
	Plant litter (%)		30		0		0		0	7.5
	Bryophytes (%)		0		0		0		0	0
	Woody seedlings (%)		0		0		0		0	0
	Large sedges / rushes (%)		5		1		0		0	1.5
	Reed-like grasses (%)		60		90		100		90	85
	Woody saplings (%)		0		0		0		0	0

Monitoring Plot Field Form – Floristic sub-sampling

Monitoring Plot	**S01**
Recorder	**Jonny Stone OHES**
Survey Date	**23rd June 2011**

This data is collated from the 20 1 x 1 metre sub-samples given in Appendix 2.

Species	**2011**	
	[ex 20]	
Wet grassland		
Phalaris arundinacea	20	
Agrostis stolonifera	20	
Ranunculus repens	6	
Glyceria notata	6	
Floodplain Grassland		
Poa trivialis	4	
Holcus lanatus	5	
Carex hirta	5	
Festuca pratensis	4	
Juncus effusus	2	
Juncus inflexus	3	

6.2.3 Flood Pasture Grassland Monitoring Plot Report

Plot code	S02
Treatment type	**Summary of preceding Monitoring Plot Report**
Flood Pasture	This is the initial Monitoring Plot Report

Vegetation structure

● Slightly uneven silty clay ground surface.
● Absence of bryophytes and only a thin, very scattered plant litter cover, giving a high proportion of bare ground.
● Thick tufted and stoloniferous grass growth, producing a two-tier canopy (Yorkshire Fog predominant at time of survey) with very thin ground layer, usually heavily shaded. Weedy tall herbs scattered throughout.
● Trampling and scattered dunging evident throughout.

Floristics

● Thick tufted sward of Yorkshire Fog, Rough Meadow-grass and Creeping Bent-grass, interspersed with Meadow Foxtail, False Oat-grass and occasional meadow Fescue.
● Tufted Hair-grass present but rare.
● Herbs almost entirely Creeping Thistle, with some Nettle.

Summary of records and events

● Not available at time of reporting. Sward currently grazed with cattle; stocking rate sufficient to head-back current foliage, but mature growth in this vegetation type suggests stock now grazing spring growth rather than summer re-growth.
● Areas of the eastern field and terrace margin more strongly grazed, especially along the eastern side, indicating supplementary rabbit grazing.

Relation to past and target conditions

• This survey initiates the Vegetation Monitoring Programme and provides a baseline for assessing subsequent Parched Open Grassland development.
• Current floristics indicate that many of the Flood Pasture grasses are present, but showing the effects of a sub-optimal grazing regime for promoting smaller grasses; lack of regeneration beneath their tufted and tussocky habit also indicates a sub-optimal condition.
• The limited potential for immigration of characteristic Flood Pasture herbs and bryophytes should also be considered.

Plot code S02	Photographic Record

Monitoring Plot Field Form – Vegetation structural characters

Monitoring Plot	**S02**
Recorder	**Jonny Stone OHES**
Survey Date	**23rd June 2011**

Character of the ground surface
● Slightly uneven silty clay ground surface. ● Not shallow 'crater' near southwest corner of plot.

Soil wetness

Dry, dusty	Dry, firm	Slightly damp	Moist	Wet	Saturated
		I I	I I		

	ATTRIBUTE	SAMPLE				AVERAGE
		1	2	3	4	
Layer height	Standing water (cm)	0	0	0	0	0
	Plant litter (cm)	1	1	1	1	1
	Woody seedlings (cm)	0	0	0	0	0
	Large sedges / rushes (cm)	0	0	0	0	0
	Reed-like grasses (cm)	0	0	0	0	0
	Woody saplings (cm)	0	0	0	0	0
Cover value	Standing water (%)	0	0	0	0	0
	Trampling (%)	10	20	10	20	15
	Dunging (%)	+	0	+	0	+
	Bare ground (%)	60	50	55	60	55
	Plant litter (%)	10	20	15	10	12.5
	Bryophytes (%)	0	0	0	0	0
	Woody seedlings (%)	0	0	0	0	0
	Large sedges / rushes (%)	0	0	0	0	0
	Reed-like grasses (%)	0	0	0	0	0
	Woody saplings (%)	0	0	0	0	0

Monitoring Plot Field Form – Floristic sub-sampling

Monitoring Plot	**S02**
Recorder	**Jonny Stone OHES**
Survey Date	**23rd June 2011**

This data is collated from the 20 1 x 1 metre sub-samples given in Appendix 3.

Species	**2011**	
	[Ex 20]	
Floodplain grassland		
Holcus lanatus	20	
Agrostis stolonifera	20	
Alopecurus pratensis	20	
Poa trivialis	18	
Lolium perenne	6	
Ranunculus repens	4	
Dactylis glomerata	2	
Elytrigia repens	**2**	
Festuca pratensis	1	
Deschampsia cespitosa	1	
Taraxacum agg.	1	
Festuca rubra	1	
Negative Indicators		
Cirsium arvense	15	
Arrhenatherum elatius	12	
Urtica dioica	6	

6.3 Interpretation of the vegetation in the Monitoring Plots

Plot S01 – Wet grassland

This plot is located in the northern field in the centre of the Wet Grassland area. The plot records the Reed Canary-grass vegetation (S28c) in the wetter part of the stand. It is anticipated that the plot vegetation would be sensitive to changes in stock management and hydrology.

Field evidence suggests that the plot vegetation has developed within an inundation area (perhaps) supplemented by seepage, where a previous attempt at drainage has long been abandoned.

Vegetation characters suggest active grazing maintaining the Reed Canary-grass sub 50 cm in height, but grazing levels insufficient to prevent this very palatable species from colonising much of the stand. Grazing would appear to be sufficient to maintain the area of Wet Grassland given sufficient rainfall and continued seepage input.

Recorded species from the plot have been separated into two groups, Wet Grassland (Favourable) and Floodplain Grassland (Unfavourable) Indicators.

Plot S02 – Flood Pasture Grassland

This plot was selected to lie adjacent to the Tufted hair-grass Grassland (MG9a) in a reasonably diverse area of Flood Pasture Grassland (MG7c). It is anticipated that the plot vegetation would identify changes in the boundaries and composition of these two Floodplain Grasslands.

The sward is currently grazed with cattle; stocking rate appears to be sufficient to head-back current foliage, but the high proportion of mature growth in this vegetation type suggests that the cattle are now grazing the earlier spring growth rather than the summer re-growth. It is also noted that areas of the eastern field and terrace margin are more strongly grazed, especially along the eastern side, indicating supplementary rabbit grazing.

The current floristics appear to indicate that many of the Flood Pasture grasses are present, but that the vegetation character is showing the effects of a sub-optimal grazing regime in recent years for promoting smaller grasses. Furthermore, the lack of regeneration beneath their tufted and tussocky habit of the strong-growing grasses also indicates a sub-optimal condition.

An additional factor determining the floristics of the vegetation may be the limited potential for immigration of characteristic Flood Pasture herbs and bryophytes from adjacent habitats.

Recorded species from the plot have been separated into two groups, Floodplain Grassland species (Favourable) and a small group of Negative Indicators.

7. RECOMMENDATIONS

Protected Species

1. Signs of probable water vole activity were found adjacent to one drain within Scarfe Meadows, and subsequently confirmed by a later survey undertaken by Suffolk Wildlife Trust. Therefore, if any works are proposed to the ditches/river banks or to raise water levels, a mitigation plan should be drawn up encompassing known populations areas, using designs consented by natural England, where works are deemed possible and necessary.

2. Historically otters (*Lutra lutra*) have also been shown to be present within the river corridor (National Biodiversity Network Gateway, with records as recent as 2009). Therefore consideration should be given to this species (listed in Schedule 5 of the Wildlife and Countryside Act, 1981 and Annex 2 and 4 of the EC Habitats Directive 92/43) prior to any river works and mitigation measures to protect otters and their habitat from disturbance and/or harm should be imposed.

3. Nesting birds should be given consideration during vegetation clearance. Under the Wildlife and Countryside Act 1981 (as amended) it is an offence to disturb a bird whilst building or using a nest. Therefore the bird breeding season of March to August should be avoided. If work is required within this period a breeding bird survey should be completed by an ecologist to identify any active nests and ensure they are protected until the young have fledged.

4. All native British species of reptiles are listed in Schedule 5 of the Wildlife and Countryside Act, 1981, and as such are protected from deliberate killing or injury. Therefore, given that this habitat is considered suitable for reptiles (in particular grass snakes and common lizard) any works that would risk the disturbance/harm to these species or loss of habitat should be preceded by a reptile survey and suitable mitigation plans.

5. Great crested newts are listed in both Annex 4 of the EC Habitats and Species Directive and in Schedule 5 of the Wildlife and Countryside Act, 1981. It is therefore an offence to kill, injure or disturb a great crested newt; or to damage, destroy or obstruct access to its habitat. Therefore, should any works be proposed to the pond in the north of Broomscot Common (or land within 250m of the pond) an assessment of the pond for great crested newt suitability and presence may be required. A presence survey must be completed between April and May. If great crested newts are found to be present then a European Protected Species (EPS) development licence, issued by Natural England (NE), may be required prior to any works taking place which would disturb newts or their habitat.

6. A badger latrine was identified within Scarfe Meadows (as shown on Figure 2). Badgers and their habitats are protected from harm, damage and disturbance by Schedule 5 of the Wildlife and Countryside Act, 1981. However, no further signs of badger activity were noted, such as setts or paths, so it is likely that this area is not frequently used by badger and that the latrine is the result of an individual passing through the site. There is local anecdotal evidence (Reg Langston pers. comm. 30/03/11) that the badger sett is believe to be on higher ground, beyond the survey area Provided the proposed works will not lead to a significant change of land use, or prevent access for badgers no further surveys are required. Mitigation measures to protect any badgers that may pass through the site during the works must include:

- Any trenches that are created and left open overnight should have an escape route for badgers should they fall in. This can either be an open end or a shallow angled, wide plank which the badgers may use to crawl out on (badgers will continue to follow paths, which may lead across the car park, even after the work has started).
- Any temporarily exposed open pipe systems should be capped to prevent badgers gaining access whilst contractors are off-site.
- All machinery and materials should be stored in a central fenced area over night. This is to prevent badgers damaging themselves on machinery/chemicals and to prevent damage to machinery by badgers. The fencing should be a suitable, strong metal mesh (maximum mesh of 25mm x 50mm, gauge 2.50) which is no more than 5cm above ground level and is a minimum of 1m high. The fence should be inspected daily to ensure it is intact and there are no access points for badgers.
- Materials and machinery should be removed from the area as soon as possible after completion of works.
- Water sources should be safeguarded to ensure they are not contaminated.
- All contractors and sub-contractors of the workforce should be fully briefed on the work recommendations.

7. If any mature trees are proposed for felling then these will need to be assessed for bat roost potential by a licensed bat worker prior to any works. Bats are protected species and they and their habitats are protected from harm, damage and disturbance by Schedule 5 of the Wildlife and Countryside Act, 1981.
8. If any protected species are seen on site during works, all work should cease immediately and an appropriately qualified ecologist should be consulted.

Vegetation Management

9. Overall, the Meadows display a rather muted and subtle diversity of vegetation with the essential character of floodplain grassland, and it is likely that appropriate management would lead to a gradual (re)colonisation of floodplain grassland species, particularly herbs, where these are present in the area or introduced by wildfowl. It is recommended that grazing management is maintained, and that husbandry is targeted at reducing the proliferation of Creeping Thistle and at ensuring that the swards are in a condition of promote regeneration from seed.

Vegetation Monitoring

10. It is recommended that, in line with the Parker's Piece and Bleyswyck Bank Fieldwork Report 2009, the Vegetation Monitoring Programme is adopted at Scarfe Meadows by those responsible for ensuring appropriate management of the floodplain and its vegetation.

11. It is recommended that a vegetation compartment map is drawn up incorporating the results of the vegetation survey shown in Figure 6, and that target vegetation states for the Floodplain Grassland (as a whole) and the Wet Grassland area are drawn up using the Floristic Sub-sampling lists, against which surveys of the Monitoring Plots can be compared to assess the success of management.

12. It is recommended that the Monitoring Plots are re-surveyed within the next two years by the 'full' survey protocols, and the results are used to directly inform and review vegetation management.

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Appendix 1 : Log of Soil Cores

Coring numbers are recorded as centimetres below the ground surface

Core	Easting	Northing	Surface water	Silt loam	Silty clay	Hemic peat A	Hemic peat B	Sand	Initial water table	Base of core	Final water table	Vegetation
1	99769	80858						0		54		Dryland grass
2	99734	80807		0		36	100	299	40	305	28	Deschampsia tussocks with occ. C.a
3	99716	80770		0		45		63	45	85	37	Grass with occ. D.c and C.a
4	99692	80722		0		43		56	49	69	46	Grass with occ. C.a and D.c
5	99739	80674		0	22	36		83	54	97	48	Dryland grass with occ. U.d
6	99769	80727		0		45	100	108	45	119	35	Grass with scattered D.c
7	99804	80787		0		42	104	281	44	299	29	Grass with frequent D.c
8	99860	80853	+2	0	25	43		67	43	103	17	Short grass with occ. J.i
9	99768	80672		0	22			31	70	79	70	Dryland grass with occ. U.d
10	99810	80721		0	22	47	104	153	47	171	34	Grass with occ. D.c and C.a
11	99861	80760		0	27	46	108	237	49	252	28	Grass with occ. J.i, D.c and C.a
12	99919	80792		0	30	47	111	313	60	318	27	Grass with D.c, J.i, C.a
13	99938	80845	+5	0	28	45		109	45	122	11	Stand of Phalaris
14	99974	80853		0	27	54	100	119	54	127	24	Short grass, occ. P.a, no J.i
15	00027	80868		0		46		72	46	118	37	Grass with occ. C.a

Vegetation: D.c.= Tufted Hair-grass : J.c.= Hard Rush : C.a. = Creeping Thistle : U.d. = Nettle : P.a. = Reed Canary-grass

Appendix 2. Field record for Wet Grassland permanent plot (S01)

P = present in sub-sample

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	2011
Phalaris arundinacea	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	20
Agrostis stolonifera	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	20
Glyceria notata		P	P		P	P	P		P												6
Ranunculus repens			P		P	P			P	P	P										6
Holcus lanatus												P		P	P		P	P			5
Carex hirta														P		P	P		P	P	5
Festuca pratensis												P			P		P	P			4
Poa trivialis													P		P	P		P			4
Juncus inflexus			P	P		P															3
Juncus effusus															P		P				2

Number of species	2	3	5	3	4	5	3	2	4	3	3	4	3	4	6	4	6	5	3	3

Appendix 3. Field record for Flood Pasture permanent plot (S02)

P = present in sub-sample

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	2011
Holcus lanatus	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	20
Agrostis stolonifera	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	20
Alopecurus pratensis	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	20
Poa trivialis	P	P		P	P	P	P	P	P		P	P	P	P	P	P	P	P	P	P	18
Cirsium arvense			P			P	P	P	P	P	P	P	P	P	P	P	P	P		P	15
Arrhenatherum elatius					P		P	P		P	P	P		P	P		P	P	P	P	12
Urtica dioica											P		P	P	P		P	P			6
Lolium perenne	P		P	P		P	P	P													6
Ranunculus repens							P					P			P	P					4
Dactylis glomerata									P	P											2
Elytrigia repens								P					P								2
Festuca pratensis			P																		1
Taraxacum agg.							P														1
Deschampsia cespitosa				P																	1
Festuca rubra		P																			1

Number of species	5	5	6	6	5	6	9	8	6	6	7	7	7	7	8	6	7	7	5	6