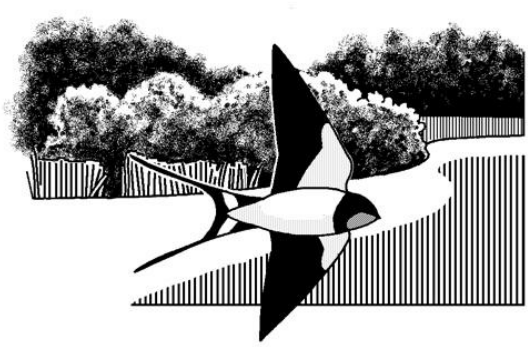

Fieldwork to Support Habitat Restoration Work at Webb's Fen, Thelnetham

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

heritage lottery fund

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Contents

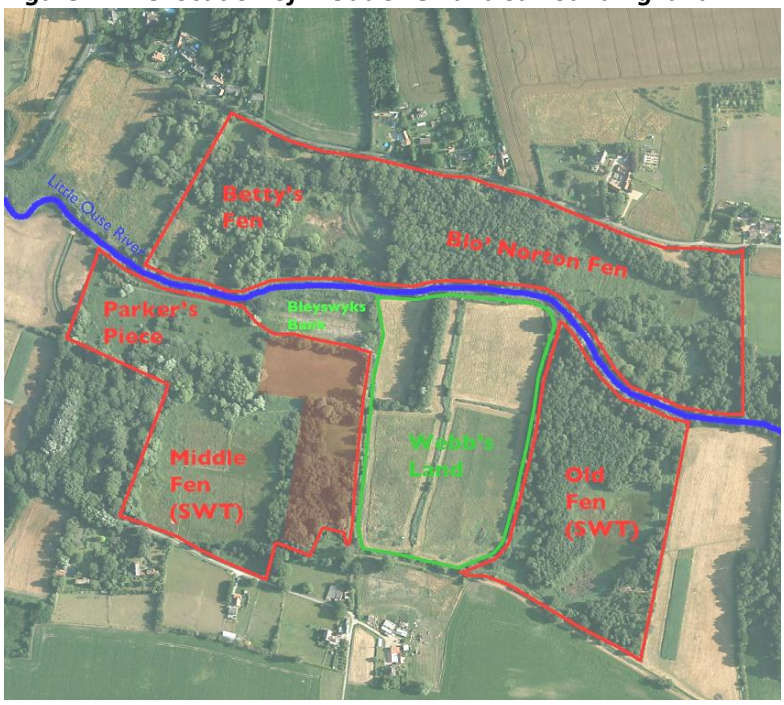
1. INTRODUCTION

1.1 The Site

Webb's Fen was recently acquired by the Little Ouse Headwaters Partnership (LOHP) with support from the Heritage Lottery Fund. The Fen is a block of 5.7 ha of drained peatland lying between the two remaining fragments of Thelnetham Fen, which are part of the Waveney and Little Ouse Valley Fens SAC. As shown in Figure 1, it also adjoins the LOHP Bleyswycks Bank and Parkers Piece sites and is on the opposite side of the river from the LOHP's Blo' Norton Fen, which is also part of the SAC.

Webb's Fen was drained in the 19th Century and converted to arable at some time in the 20th. It is understood to have been re-sown to grassland in the 1990s and was managed (it is thought by cutting) until recently. The Fen has been colonised by a suite of fen meadow species in the more low-lying areas, but much of the site remains dry.

Figure 1. The location of Webb's Fen and surrounding land



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 Webb's Fen:

- 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 surroundings.
- 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 1) were searched for signs of water vole activity on 18th 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.

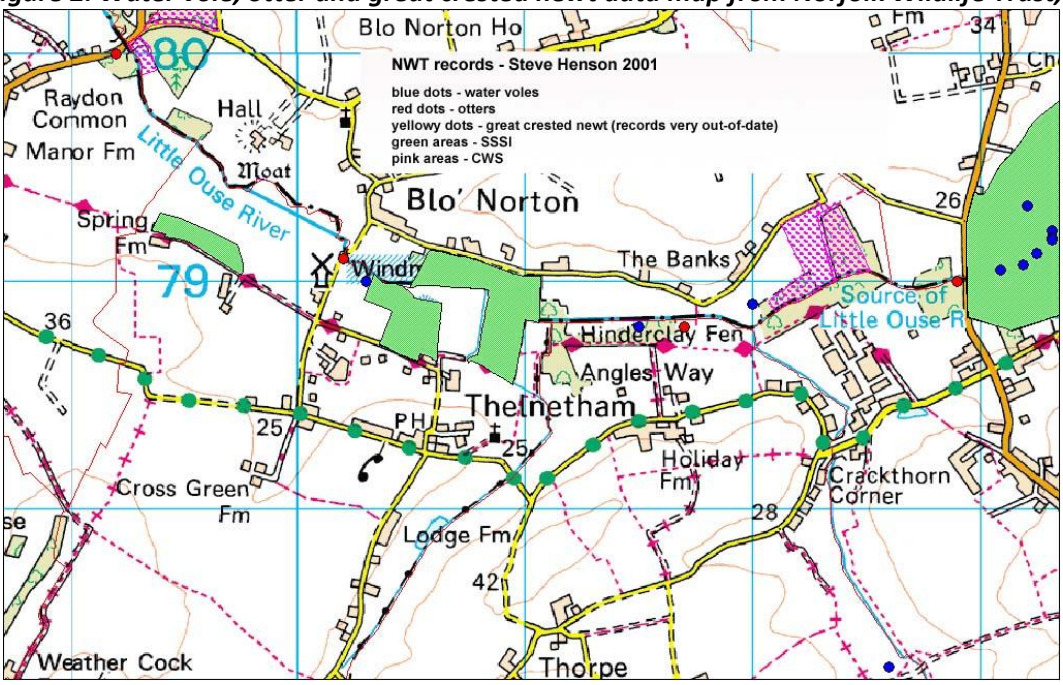
Table 1: Weather conditions for water vole survey

Date	Air temperature (°C)	Cloud cover	Wind	Precipitation
18/03/11	8	4/8	Still	Dry

2.2 Results

The National Biodiversity Network was searched for records of water vole within the tetrad TM 07. Water vole records are present within this tetrad as recently as 2008 (although the exact location is not given). Helen Smith (of Little Ouse Headwaters Project) liaised with Norfolk and Suffolk Wildlife Trusts regarding further records for this species. Subsequently, water vole records were provided by Norfolk Wildlife Trust (in 2001) for Parkers Piece (immediately west of Webb's Fen, see Figure 2 below). There are also local records from Norfolk Wildlife Trust for otter (*Lutra lutra*, also a protected species) both upstream and downstream of the site on the River.

Figure 2. Water vole, otter and great crested newt data map from Norfolk Wildlife Trust, 2001

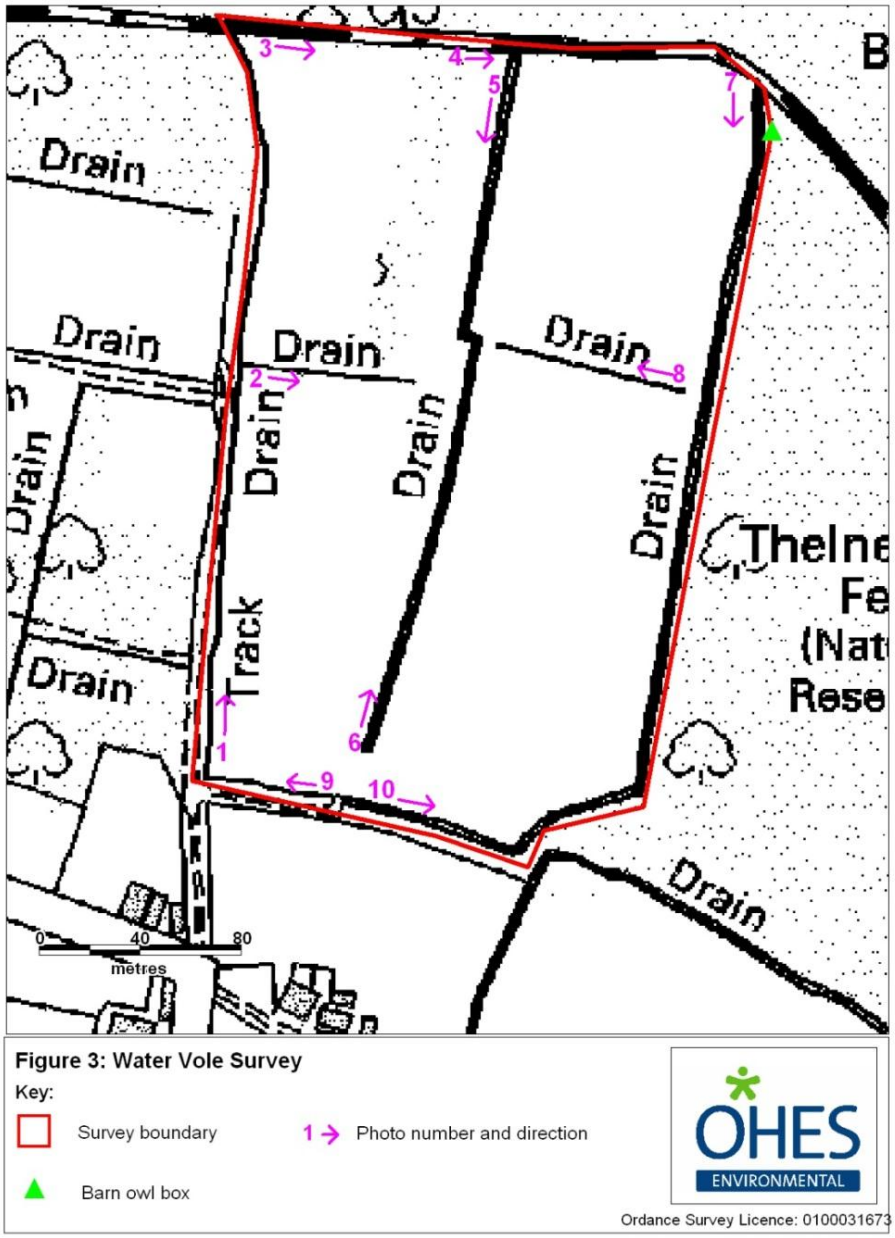


Reg Langston has provided anecdotal evidence (pers. comm. 30/03/11) of water vole tracks at Parkers Piece, Hinderclay Fen and the Lows. Reg reports three mink rafts on the river (eastern end of Hinderclay Fen, Thelnetham, in conjunction with Suffolk Wildlife Trust, and near the Ford at Parkers Piece) although there have been no signs of mink for the last three years.

2.3 Interpretation

The results of the water vole survey are shown in Figure 3 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 3) and are shown in Photos 1 to 10.

Figure 3. Water Vole survey – March 2011



All the water courses had natural, soft, earth banks. In some areas scrub and young trees that were overhanging the banks had been recently cut back. Several areas of ditches were considered to be suitable water vole habitat (e.g. where the banks were grassy and not scrubby and there was in stream vegetation for food and shelter). However, a large proportion were considered unsuitable for water voles as they were either densely shaded by trees, had scrubby banks or no suitable vegetation for feeding. The river banks were difficult to survey due to their steep angle, undercutting and overhanging, lodged vegetation which prevented access to the bank edges at some locations.

In summary, no signs of water vole activity were seen along any of the waterbodies within the survey area in March 2011. A barn owl box was identified immediately north east of the surveys area (as shown in Figure 3) and is discussed further in the Recommendations section.

A further survey was conducted of the Fen and along the River Little Ouse in May 2011 by Penny Hemphill (Suffolk Wildlife Trust). Undertaken at a more favourable time of year, this survey recorded water voles from along the river between Thelnetham Road and Blo' Norton Fen, as shown in Figure 4. However, examination of the internal dykes of Webb's Fen also failed to find any signs of water vole activity.

Figure 4. Water vole activity May 2011 (Suffolk Wildlife Trust)

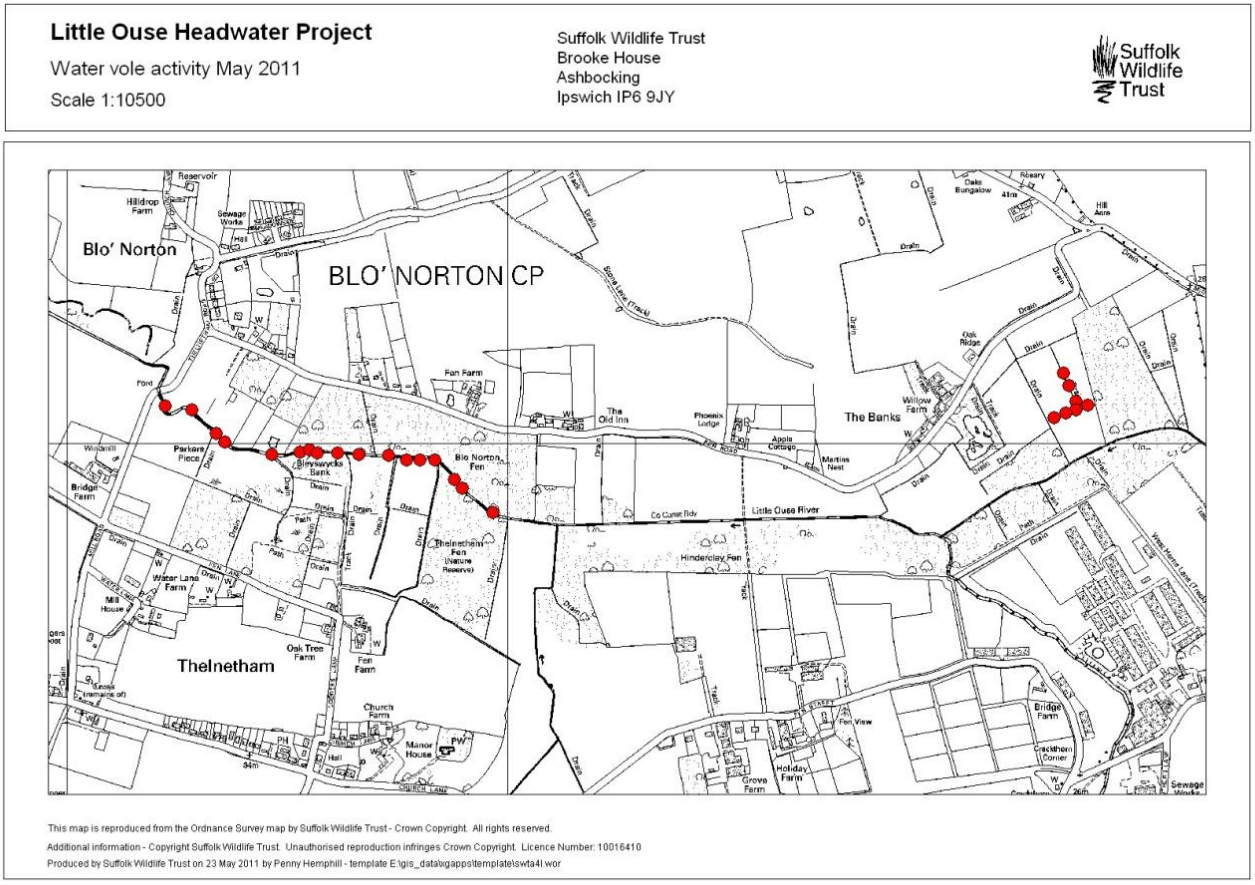


Photo 1: Ditch

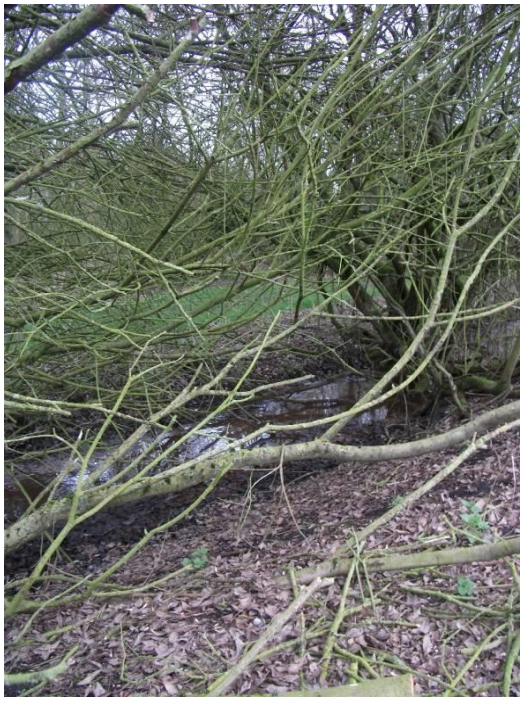


Photo 2: Ditch

Photo 3: River

Photo 4: River

Photo 5: Ditch

Photo 6: Ditch

Photo 7: Ditch

Photo 8: Ditch

Photo 9: Ditch

Photo 10: Ditch

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 identify areas of 'good' fen peat and 'poor' fen peat

As described by Mathers et al (1993), soils of this section of the Little Ouse valley floor are formed in 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 peat as covering almost the whole of Webb's Fen, giving way on the upland margin to hillwash deposits (clayey sand and sandy clay) with the possibility of a thin terrace bed of sands and gravel overlying it.

The methodology for this survey is therefore:

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

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

3. To identify and assess the wetness and condition of the peat in terms of the degree of decomposition following drainage.

The results of the survey can provide an indication of the potential for rewetted and/or reprofiled peat to support fenland vegetation.

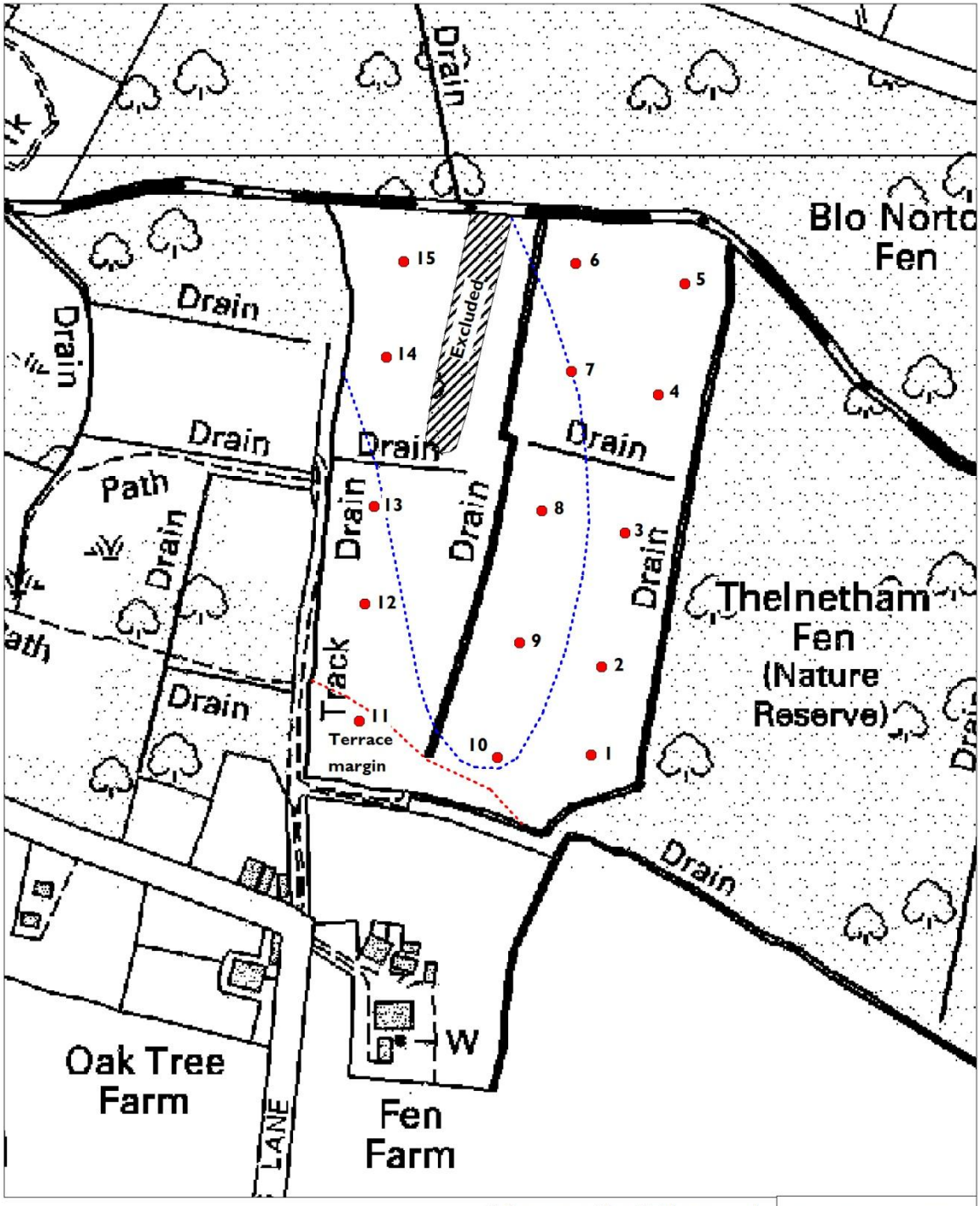
The survey was carried out on 10th February 2011 in moderate to poor light conditions in gentle rain, following several weeks of low insolation levels and low rainfall.

In accordance with the topography suggested by the Ordnance Survey 1:25 000 Series Sheet 230, transects were selected running roughly south to north, so as to sample each field. As shown in Figure 5, cores were taken at roughly equal distances along each transect, at apparently typical locations. 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 the Log of Soil Cores given in 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, where sands were encountered in each core.

On the upland margin, occasional shallow cores were also taken to confirm the presence of sands and gravels at the surface.

Figure 5. Location of soil cores and site features



Cores

Indicative boundary of peat types

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.

A field assessment of peat condition has been developed by Ecology Land and People, and was employed in a recent survey of sites in the Waveney and other valleys for the Broads Authority (ELP 2009). The relevant stages in peat decomposition, and the field features of decomposing peats, are defined in Table 2.

Table 2. Terms used to describe peat condition

Fibric peat	This type of peat is typically composed of visible fragments of fen mosses, plants and pieces of wood suspended in a straw-coloured liquid. Rarely encountered in East Anglia and only at depth. Its presence indicates part of the peat body that has remained virtually anaerobic since its formation.
Hemic peat	This type of peat has been partially decomposed so that much of the softer plant remains are no longer more than 'fossil' traces left in a watery mid-brown paste that also suspends fragments of wood and other harder plant remains. Hemic peat is initially recognised by its mid-brown colour. Secondary forms of recognition are by squeezing a sample (confirming a watery paste) and by locating plant fragments.
Liquid peat	Many cores through hemic peat record a sudden change in consistency as the semi-solid hemic peat became a mid-brown coloured 'slop'. This liquid peat indicates the build-up of groundwater within the peat body. Although the auger cannot retrieve this watery material, it was usually possible to locate the mineral surface below it.
Earthy peat	Found above the hemic peat, and usually forming the ground surface of the peat body, earthy peat is the very dark grey-brown to black-coloured form of peat exposed to the atmosphere. Called 'earthy' peat to signify the ripening, or maturing, of the peat near the ground surface, the material is dust-like when dry. As the dust cannot return to the gel-like consistency when wet, it typically ponds rainwater after a shower. Moisture held in the peat topsoils therefore becomes increasingly different from the groundwater. In fen peats, this is reflected in the vegetation that develops. For example, Hard rush *Juncus inflexus* tends to colonise drain sides influenced by calcareous groundwater while Soft rush *J. effusus* colonises the normal ground surface, reflecting the influence of the more acidic rainwater.

A subjective assessment of the condition of the peat body is made using the criteria given in Table 3. This assessment relies on features of the subsurface and surface peats, as well as the location of groundwater within the peat body; it is based solely on observed features and is not intended to be definitive.

Table 3. Indicative criteria for the subjective assessment of the condition of peat bodies

Condition	Indicative criteria
Pristine	Well-preserved subsurface peats Active peat formation Watertable fluctuating around surface
Excellent	Well-preserved subsurface peats Hemic peat topsoil; sometimes thin earthy peat topsoil Favourable watertable depth
Good	Subsurface peats intact, largely in good condition Thin earthy peat topsoil Mainly favourable watertable depth
Fair	Subsurface peats intact, with no significant detractors Rather degraded topsoil, with potential rewetting problems Largely unfavourable watertable depth
Poor	Subsurface peats absent or, if intact, with significant detractors Degraded topsoil with no potential for re-wetting Unfavourable watertable depth

3.2 Results

The locations of cores are given in Figure 5, 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 5), a number of other readings are recorded, defined below in Table 4.

Table 4. 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 depths of > 200 cm in all but 2 cores. 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 organic and mineral materials encountered by each sample core is described in Table 5. The substrate that is not overlain by other materials is listed first, followed in sequence by those over which it is superimposed.

Table 5. General field characters of geological materials

Material	Field characters
Sandy loam	Mid-brown humic silty loam with sand grains and occasional stones evident. Likely to be hillwash.
Earthy peat	Typically forming the ground surface, this degraded peat is very dark-grey to black, rather silty in texture, forming a gel-like mass when wet and prone to crumbing on drying. Frequent sand grains and occasional small sub-angular flint stones evident in cores near the upland.
Hemic peat A	Forming a diffuse boundary with the darker peat above, this peat is uniformally very dark brown, and lacks woody inclusions, and only rarely were plant fragments recognised (typically reed stems). While quite firm, the peat lacks the gel-like character of very 'earthy' or largely decayed peat, or the abundant plant fragments of peat B. On drying, the peat develops a red-brown hue, indicating high levels of iron.
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, leading to difficulties in extraction.
Organic silt	A mid-brown organic silt, with an abrupt boundary with the peat and subtending sand. Rather grainy in texture, presenting as a massive but water-filled structure containing root section, seeds and other small plant fragments. Only extracted from cores in the shallower part of the peat body – but may be present elsewhere.
Sands	Light grey in colour, this medium sand is stoneless in the upper part with no organic matter evident.

Table 5 presents a sequence of substrate types present in almost all cores. From the surface, it can be seen that the peat has degraded severely following drainage, though the lower part of the peat body is in markedly better condition. The basal parts of the peat typically lose cohesion with depth below the watertable to form a peat slurry. At the base of the peat in a number of cores, a distinct organic silt was extracted, which may have been present but not detected where the peat body is thicker. The upper surface of the basal sands was encountered beneath the body of organic materials in all cores.

When the log of soil cores is taken into account, the survey results show that the body of organic material is typically 196-241 cm thick away from the southern margin, but deepens on the western side of the fen as the basement sands form a hollow centred on cores 9, 12 and 13. Here, the organic sediments were recorded at thicknesses of 314-379 cm.

In the southwest corner of Webb's Fen, this sequence is broken by core 11, where a relatively thin layer of peat is overlain by a sandy loam unit along the margin of the survey area.

The separation of the organic deposits into the material types described in Table 5 can be employed to give an indication of the condition of the peat (see section 3.3). The boundary between the Earthy and Hemic peat A substrates is visible in the field, but it is important to recognise that this upper part of the peat body represents a gradation from complete peat breakdown at the surface, to the

depth at which peat degradation is only partial, represented by the upper surface of Hemic peat B. The surface layer of earthy peat was recorded across the fen, though it varies widely in thickness. Many cores proved values within a range of 26-49 cm, which accords with the zone most affected by typical ploughing. At the base of the earthy peat, the transition to hemic peat typically occurs over 5-10 cm. The difference between the earthy and hemic peats is recognised in the lighter colour with depth, and with a change in texture as the peat is more clearly composed of plant fragments. The appearance of the upper surface of Hemic peat A varies widely across the site, with 6 of the 15 cores proving this material within 30 cm of the ground surface in a broad track between cores 10 and 15.

The distinction between the upper (A) and lower (B) hemic peats is less pronounced than the boundary with the dark-grey to black earthy peat, and also occurs over the space of several centimetres. It is related to an increase in recognisable plant fragments and the appearance of pieces of wood. The depth of transition from hemic peats A to B also describes a broad track across the fen from the centre of the terrace margin. These cores were also notably wetter at depth than those from the surrounding fen; typically, hemic peat B gives way to a peat slurry at 100-120 cm bgl, and could not be extracted.

The recorded layer of organic silt at the base of the peat units is typically encountered at depths of 187-236 cm bgl. and is only 4-9 cm thick. The silt was recorded from the eastern side of the fen, and from cores 9 and 10. Core 9 is unusual in the upper surface of the silt being encountered at 289 cm bgl, and the depth of silt being 90 cm. Although no organic silt was recorded from the western and much of the northern areas of the fen, this broadly co-incides with the dissolution of the lower part of the peat body into a liquid form, and the silt may have been present but not extracted.

The initial watertable records fall into two groups. Cores lying along the broad track described above recorded watertable depths of 49-55 cm bgl, shallowing to 27-28 cm in cores 7 and 15. Core 7 atypically had standing water on the ground surface. The watertable was encountered at, or slightly above, the boundary between the two hemic peats.

The second group of initial watertable records was typically recorded at depths of 68-74 cm bgl. Core 5, near the river, recorded a watertable at a depth of 87 cm. Several core watertable depths lay at or above the boundary between the two peats, but lay within hemic peat B in cores 4, 5 and 6.

The final watertable depth, taken at the end of augering, ranged 21-32 cm bgl. Cores with the shallowest final watertable depths (21-27 cm bgl) lay within the broad track previously described. Excluding core 7, rises in the watertable during augering were pronounced. Cores within the broad track typically rose 25-34 cm (excluding core 15) and those surrounding it by 37-43 cm, except core 5 which rose by 55 cm.

3.3 Interpretation

The coring results confirm the presence of a peat body mantling almost the entire fen. The sub-surface topography of the basement sands describes a deepening slope running west to northwest across the fen, which is broadly matched by the watertable surface and by the trending of the different peats described in Table 5.

The character of the peat body varies considerably through the site. In particular, differences in the depth of earthy peat are notable. Outside the typical thickness range of 26-49 cm, the remaining cores give markedly different results. Core 5 in the northwest corner of the site, near the river, proved a thickness of 61 cm for earthy peat. This anomaly suggests the effects of much deeper

drainage, and is a typical result of low river flows acting to drawdown the watertable. In contrast, much shallower depths of earthy peat (2-17 cm) were recorded in a groups of cores (9, 8, 7 and 15) that lie along a tract leading from the deepest area of peat towards the northwest corner of the fen, shown in Figure 5. This may result from a depressed ground surface, less effective land drainage, or the effect of groundwater seepage, maintaining the peat in relatively better condition.

A thin layer of organic silt was recorded from the base of the peat on the eastern and southeast sides of the fen; although the layer thickened markedly in one the cores in deeper peat, loss of coherence of these subsurface materials meant that organic silt was not recovered from this part of the fen. The presence of organic silt (although only positively identified in some cores) would indicate that Webb's Fen may occupy part of the southeast shoreline of the relict lake identified by Tallentire (1969; West 2009). The lake formed in the centre of the Thelnetham-Blo-Norton basin within the enlarged floor of this section of the valley.

From the evidence described in the previous section, the consistently varying characters of the cores highlight what could be a seepage zone in the centre of the fen. From the initial assessment of the vegetation, core locations supporting Hard Rush and Blunt-flowered Rush (cores 8, 9, 10, 13 and 14) may also provide an indication of groundwater seepage.

Webb's Fen is known to have been drained during the 19th Century and was ploughed up and cultivated in the 20th. Although seeded to grass in the last decade of the century, and apparently left unmanaged in recent years, the upper surface of the peat – corresponding to the surficial earthy peat layer – has clearly degraded over much of the site through cultivation and exposure through drainage. Notwithstanding, the overall condition of Webb's Fen is far from uniformly damaged by its proximity to the river and its management history.

With reference to Figure 6 and Table 3, it is apparent that much of the peat margin can be assessed as being in ***Fair*** condition:

- Subsurface peats intact, with no significant detractors
- Rather degraded topsoil, with potential rewetting problems
- Largely unfavourable watertable depth

The exception is recorded by core 5, which, by virtue of its location, the depth of degraded peat and the low initial watertable, is assessed as ***Fair-Poor***, in recognition of the following criteria:

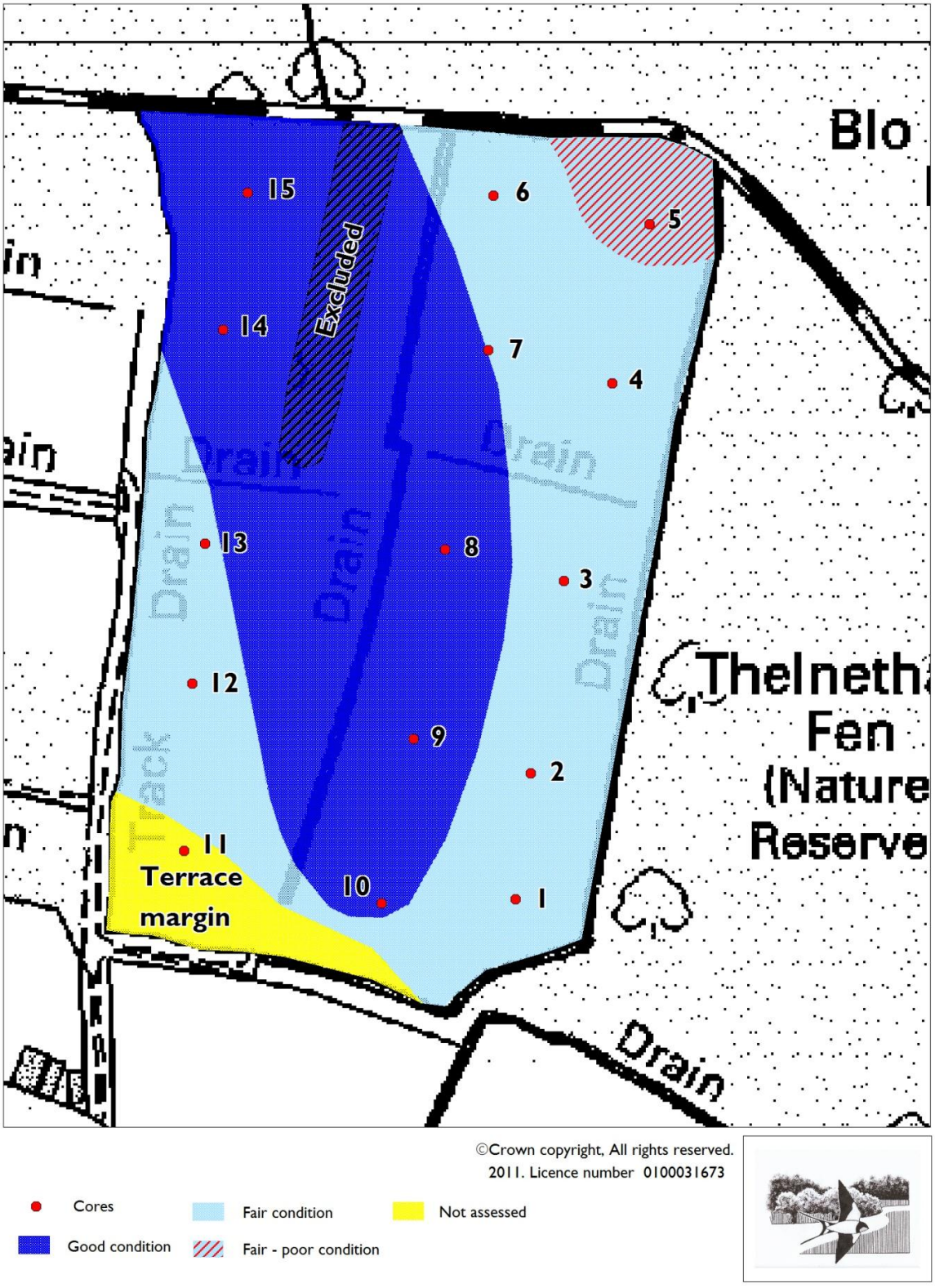
- Subsurface peats absent or, if intact, with significant detractors
- Degraded topsoil with no potential for re-wetting
- Unfavourable watertable depth

The group of cores that define the 'broad track' refered to in the previous section is better irrigated and the peat body is not as strongly altered by drainage and management. It is assessed as being in ***Good*** condition, in recognition of its distinct features, though its boundaries with the surrounding peat are diffuse and poorly defined:

- Subsurface peats intact, largely in good condition
- Thin earthy peat topsoil
- Mainly favourable watertable depth

The terrace margin on the southern fringe of the site is excluded from the assessment; the buried peat layer is defined as hemic peat, but no watertable was recorded within 82 cm of the ground surface.

Figure 6. Peat condition assessment



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 Webbs Fen. In addition, access permission was granted by local residents to survey the topography of their adjacent residential and agricultural land and assets immediately south of Fen Lane (to include Fen Farm, Oak Tree Farm, Reed Farm and Willow House). Water features within this residential and agricultural land were also assessed. 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 previous temporary benchmarks set by OHES (incorporating ELP) in 2008.

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 7. Table 6 provides detail on the Temporary Benchmarks (TBMs) set throughout the site.

4.3 Interpretation

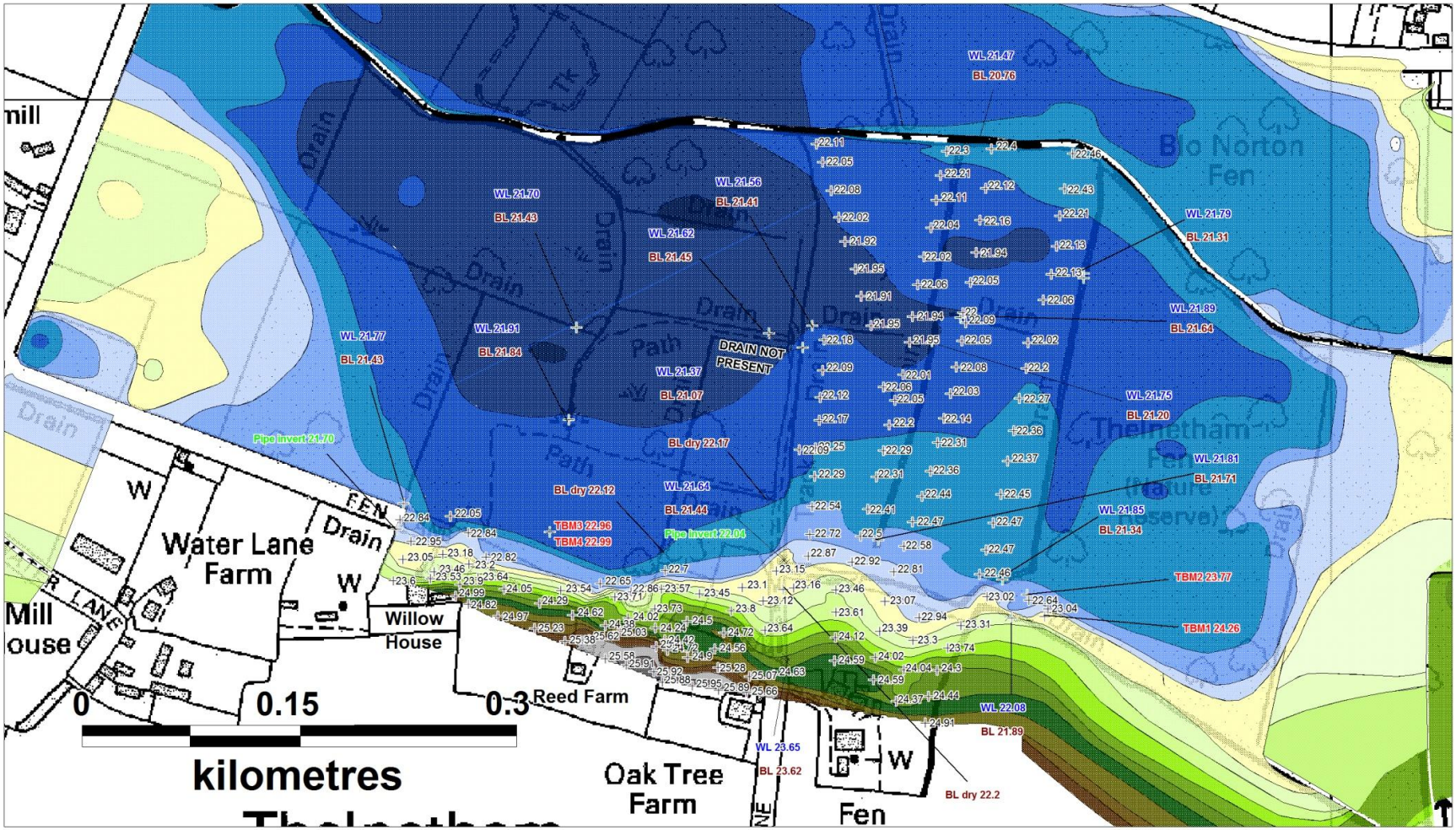
Webbs Fen land was noted to be relatively low lying (21.75-22.5mOD) with little variation throughout the Fen. The adjacent agricultural and residential land to the south of the site was considerably higher, grading up to 26.0m OD and above in the south (in the gardens of Oak Tree Farm and Reed Farm).

The height of Fen Lane ranged from 22.95mOD in the west of the survey area to 24.60mOD in the east of the survey area. Land was observed to decrease in elevation rapidly to the north of Fen Lane towards the adjacent Fen.

The lowest elevation recorded in a residential garden was at 22.96mOD, within the garden of Willow House (although the property itself stood at a minimum altitude of 23.53mOD). Land was also noted to be lower in the sheep paddock of Oak Tree Farm north of Fen Lane (down to 22.3mOD).

All ditches were observed to be free-flowing (some were dry at the time of survey). The water level (and therefore direction of flow) and bed level (either to soft bed if silty, or to hard bed) of the ditches is shown in Figure 7. It is important to recognise that the ditch flowing from the west to the east on the eastern half of Webbs Fen is connected to, and flows into, the bordering south-north ditch (they are shown to be unconnected on the OS map). Only two culverts were noted within the survey area; the first at Fen Farm where a drainage ditch passes beneath the access track; and the second was beneath Fen Lane near Willow House - their pipe invert levels are noted in Figure 7.

Figure 7. Topography and Water Features



Key:

0.00	Land level	0.00	Water level	0.00	Bed level	0.00	Soft bed level	0.00	Water control structure level	0.00	Temporary benchmark level		
	21.50 to 21.75		22.25 to 22.50		23.00 to 23.25		23.75 to 24.00		24.50 to 24.75		25.25 to 25.50		26.00 to 26.25
	21.75 to 22.00		22.50 to 22.75		23.25 to 23.50		24.00 to 24.25		24.75 to 25.00		25.50 to 25.75		Data to m AOD
	22.00 to 22.25		22.75 to 23.00		23.50 to 23.75		24.25 to 24.50		25.00 to 25.25		25.75 to 26.00		

OHES ENVIRONMENTAL

There is a ditch marked on the OS map (to the west of Webbs Fen) which is not present on the ground. This is labelled as 'Drain not present' on Figure 7.

Table 6: Temporary Benchmarks

TBM	Description	Photo	Height (m OD)
TBM1	On top of dipwell 'TM07 252'		24.26
TBM2	On top of Suffolk Wildlife Trust information post		23.77

TBM3	On top of dipwell 'TM07 256a'		22.96
TBM4	On top of dipwell 'TM07 256b'		22.99

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 Webbs Fen, 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 Webbs Fen are distinguished by the broad class of habitat (e.g. grassland, swamp and fen meadow) 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. Webbs Fen is divided into two fields separated by a wet ditch running across the peat from the valley margin to the Little Ouse. Each field is itself subdivided by a ditch, though these were dry at the time of survey. All areas were surveyed and the main stands sampled. Several minor types of vegetation, either associated with disturbed ground or of a simple species composition, were assessed using expert judgement.

5.2 Results

Much of the fen is covered in a limited number of tall grasses and herbs, typical of unmanaged drained fenland. In particular, the tussocks of False Oatgrass are ubiquitous, often accompanied by the smaller tufts of Yorkshire Fog and Cock's-foot. Two tall herbs, Creeping Thistle and Nettle are also frequent and these species, along with Rough Meadow-grass and Couchgrass, form the primary associates throughout much of the site. Sample locations and the vegetation stands recognised are shown in Figure 8.

The narrow strip of valley margin is raised above the level of the peatland and is mantled by tall herb vegetation dominated by Nettle and Creeping Thistle. This is the *Urtica dioica - Cirsium arvense* community, *Rumex obtusifolius - Artemisia vulgaris* sub-community (OV25b). Similar vegetation has colonised the spoil heap in the southwest corner.

The southern part of both fields lacks wetland species and shifts from the Nettle-Creeping Thistle vegetation to a dry ***Tussock Grassland*** where both species are still frequent (see Table 7).

Figure 8. Distribution of vegetation types

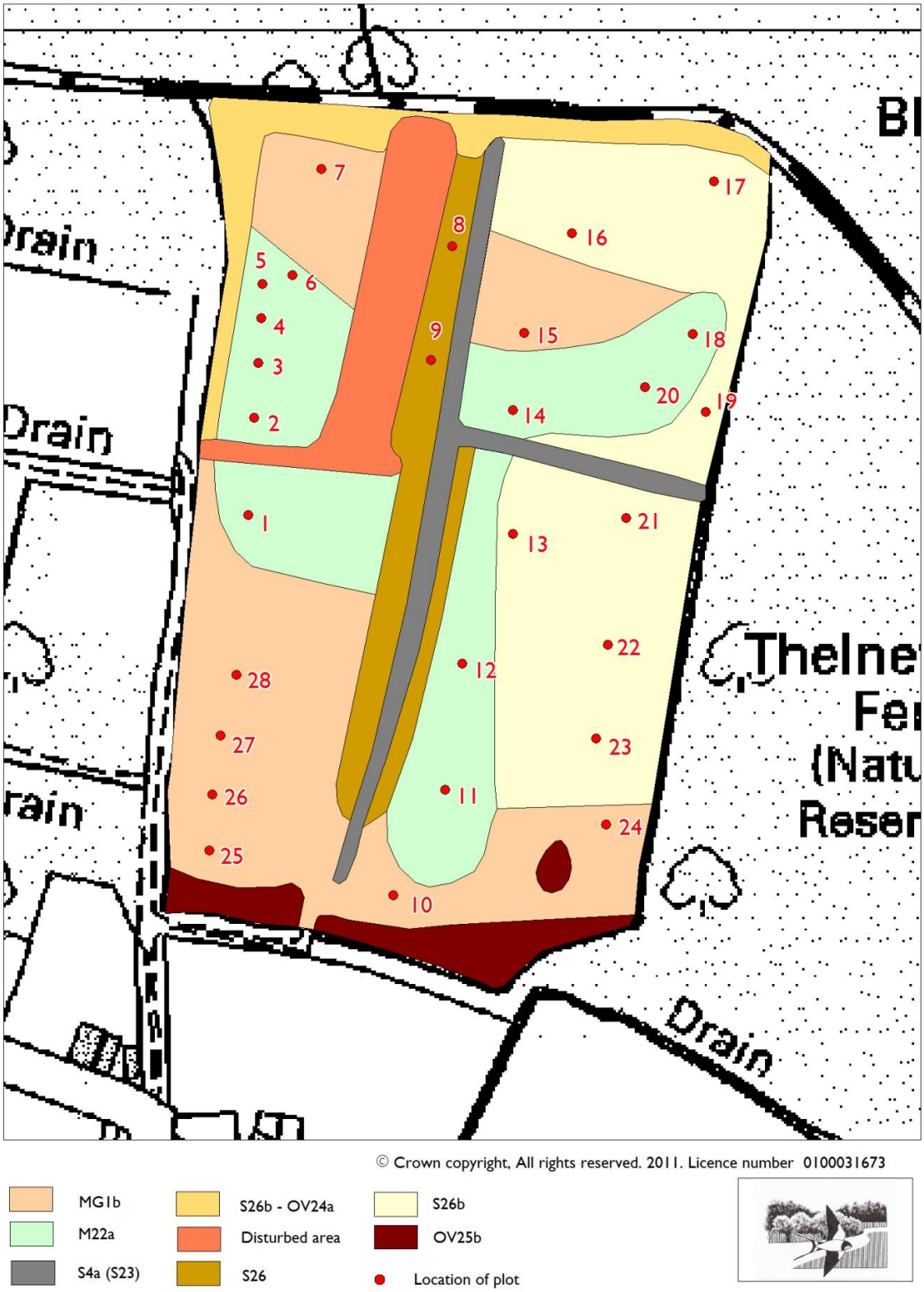


Table 7. Tussock Grassland (MG1b)

Plot No.	7	10	15	24	25	26	27	28		
Arrhenatherum elatius	10	5	10	10	8	8	10	9	V	(5-10)
Urtica dioica	2		3	2	7	8	2	5	V	(2-8)
Elytrigia repens		7	2	4	3	2	2	4	V	(2-7)
Cirsium arvense	4	6		2	1		1	5	IV	(1-6)
Dactylis glomerata	2	5	4	2	2		1		IV	(1-5)
Persicaria amphibia	3	5		2	1		2	2	IV	(1-5)
Galium aparine	2			1	2	2	2	2	IV	(1-2)
Poa trivialis	2	4	3	2			3		IV	(2-4)
Holcus lanatus		6		3	2	1		4	IV	(1-6)
Alopecurus pratensis		3	2	2	2		1		IV	(1-3)
Glechoma hederacea	3				2	3		2	III	(2-3)
Agrostis stolonifera	2		2						II	(2)
Juncus effusus			4						I	(4)
Calystegia sepium		2							I	(2)
Ranunculus repens			2						I	(2)
Sonchus arvensis						1			I	(1)
Lythrum salicaria			1						I	(1)
Linaria vulgaris	1								I	(1)
Heracleum sphondylium							1		I	(1)
Veronica chamaedrys						1			I	(1)
Lamium album			1						I	(1)
Sward height (cm)	55	45	60	75	80	80	85	75		
Herb cover (%)	95	95	95	95	95	95	95	95		
Bryophyte cover (%)	0	0	0	0	0	0	0	0		
Litter cover (%)	65	70	65	70	45	40	70	55		
Bare ground (%)	5	0	5	0	25	30	0	15		
No. of species	10	9	11	10	10	8	10	8	Av.	9.5

This stand extends far into the western field and here boundary with fen meadow vegetation is quite abrupt, with a shift in the frequency and composition of species occurring over a few metres. To the east, the Tussock Grassland is more limited in extent and the change to wetter vegetation is rather diffuse. The boundaries shown in Figure 8 reflect the appearance of Hard Rush and Common Reed, and the gradual additions of species that tolerate wetter conditions.

Much of the Tussock Grassland vegetation is dominated by False Oatgrass, with varying contributions from other grasses, including Couch-grass, Yorkshire Fog, Meadow Foxtail and Cock's-foot, and the tall, stand-forming herbs, Creeping Thistle and Nettle. Over much of the stand, the vegetation is readily placed within the Nettle sub-community of False Oatgrass grassland (MG1b). False Oatgrass and the tall herbs typically produce a sward of slim tussocks intermingled with the slender herb stems to a height of 85-105 cm. Beneath this canopy, and in patches where this cover is broken, Yorkshire Fog and Couch-grass form a secondary layer, with occasional Ground Ivy and the terrestrial form of Amphibious Bistort. There are few other associates in this vegetation.

A similar stand of tussock grassland is also included with this vegetation. Rather incongruously, it is found in a belt across both fields in the northern half of the fen immediately adjacent to the wetter areas. At the time of survey, the ground was noted as firmer, drier and slightly raised above the wetter areas.

In the eastern field, the Tussock Grassland gives way on slighter moister ground to a ***Grassy Reedbed***, where Reed forms a thin canopy over the False Oatgrass tussocks (see Table 8). Creeping Thistle and Ground Ivy are here replaced by a number of thinly scattered wetland species, including Marsh Woundwort, Hemp Agrimony and the constant Hedge Bindweed. The boundary with the Tussock Grassland broadly corresponds to changes in management. Another distinguishing feature with the neighbouring Fen Meadow is the relative absence of rush species.

False Oatgrass is particularly dominant in this vegetation, and this is recognised in the NVC as the *Arrhenatherum elatius* sub-community of *Phragmites australis – Urtica dioica* tall-herb fen (S26b). Nettle is constant and its proliferation within this kind of vegetation on the shallow river and ditch bunds has produced patches of the *Urtica dioica – Galium aparine* community (OV24a) within the Reed-Nettle vegetation.

The Grassy Reedbed, with the exception of the bund vegetation, is restricted to the eastern field, and skirts the wettest vegetation, which can be broadly assigned to *Juncus subnodulosus – Cirsium palustre* ***fen meadow*** (M22a) and is represented by four distinct stands occurring in each quarter of the fen (see Table 9).

In the eastern field, scattered Hard Rush and Blunt-flowered Rush tussocks mark the broad 'seepage track' discussed in section 3.3. The appearance of Water Mint and Marsh Horsetail amidst the False Oat-grass tussocks indicates a shift in species composition away from the Tussock Grassland, though elements of this vegetation persist deep into the stand. North of the cross-ditch, large rush patches have established in low ground, and here typical fen meadow species, such as Meadow Vetchling, Tufted Vetch and Marsh Bird's-foot Trefoil occur in low numbers. Soft Rush accompanies Blunt-flowered Rush here, which suggests the influence of standing water rather than groundwater.

A grassy form of fen meadow vegetation occupies the ground south of the cross-ditch in the western field. Here, there is a distinct break with the Tussock Grassland, with a marked decline in False Oatgrass, Cock's-foot and Nettle, and the appearance of Water Mint, Marsh Horsetail, Meadow Fescue and Wild Angelica in low numbers. North of the cross-ditch, fen meadow vegetation is most clearly developed in a strip between the western ditch and its associated spoil vegetation, and the edge of the former plantation. Here, Blunt-flowered Rush is ubiquitous in the low ground, with Soft Rush replacing Hard Rush in the central and northern parts of the stand. In this stand, species of the Tussock Grassland and Grassy Reedbed stands coalesce and are added to by thinly scattered fen meadow species including Ragged Robin, Water Mint and Tufted Vetch, among others. Two Southern Marsh Orchids were found on the eastern side of this stand[1].

The central ditch separating the western and eastern fields is occupied by tall Reed, with occasional associates of Hedge Bindweed and Hop. This vegetation extends into the cross ditch in the eastern field. In the central ditch, breaks in the Reed canopy allow scattered marginal plants, such as Fool's Water Parsley and Tufted Forget-Me-Not, to develop, described by the NVC as S23 'Other water margin vegetation'. The Reed swamp itself is referred to the *Phragmites australis* reedswamp (S4a).

[1] Located at TM 01680/78906 and 01683/78920

Strips of marginal Reed vegetation have been allowed to develop beside the central ditch. Samples taken from the stand suggest that the species composition of this young reedbed broadly follows that of the neighbouring stands, and the vegetation is assigned to the *Phragmites-Urtica* tall-herb fen community (S26), rather than to specific sub-communities.

Table 8. Grassy Reedbed (S26b)

Plot No.	13	16	17	19	21	22	23		
Arrhenatherum elatius	8	9	9	10	10	10	10	V	(8-10)
Phragmites australis	6	5	6	5	5	5	4	V	(4-6)
Poa trivialis	2	2	1	2	2		2	V	(1-2)
Calystegia sepium		4	5	1	5	4	3	V	(1-5)
Elytrigia repens	6	2	2		2		3	IV	(2-6)
Urtica dioica	1	2	7			2	4	IV	(1-7)
Persicaria amphibia	2			1		1	1	III	(1-2)
Stachys palustris					1	2	2	III	(1-2)
Dactylis glomerata		2		1			2	III	(1-2)
Festuca rubra	3						3	II	(3)
Juncus subnodulosus		2		3				II	(2-3)
Galium aparine			2				2	II	(2)
Ranunculus repens				2			2	II	(2)
Cerastium fontanum		1		1				II	(1)
Eupatorium cannabinum	1		1					II	(1)
Juncus effusus		4						I	(4)
Linaria vulgaris		3						I	(3)
Glechoma hederacea							2	I	(2)
Agrostis stolonifera			2					I	(2)
Sonchus arvensis	2							I	(2)
Mentha aquatica	1							I	(1)
Angelica sylvestris					1			I	(1)
Cirsium arvense					1			I	(1)
Erysimum cheiranthoides	1							I	(1)
Iris pseudacorus	1							I	(1)
Senecio vulgaris	1							I	(1)
Filipendula ulmaria				1				I	(1)
Sward height (cm)	180	190	185	190	190	175	180		
Herb cover (%)	90	95	95	95	95	95	95		
Bryophyte cover (%)	0	0	0	0	0	0	0		
Litter cover (%)	70	70	70	70	70	70	70		
Bare ground (%)	0	0	0	0	0	0	0		
No. of species	13	11	9	10	8	6	13	Av.	10.0

Table 9. Fen Meadow (M22a)

Plot No.	1	2	3	4	5	6	11	12	14	18	20		
Arrhenatherum elatius	4	6	9	4	2	8	8	4	2	9	7	V	(2-9)
Juncus subnodulosus		8	4	10	7	5	4	3	4	7	10	V	(3-10)
Poa trivialis	7	5	3	3	7	4	5	4	5		4	V	(3-7)
Elytrigia repens	3	4	3		2	2	8	8	7	3		V	(2-8)
Holcus lanatus	5	4		2	3	1	2	5	2		3	V	(1-5)
Equisetum palustre	2	3	2	2	2	1		5				IV	(1-5)
Phragmites australis		2	3	3	4			5	3			III	(2-5)
Calystegia sepium			5	3	4	1			3	3		III	(1-5)
Juncus effusus	4				5	4			7	4		III	(4-7)
Galium aparine	1	3	1	2			1					III	(1-3)
Stachys palustris		2	1		1	3		1				III	(1-3)
Glechoma hederacea	2	1		1	3	2						III	(1-3)
Ranunculus repens		1	1	1		2					2	III	(1-2)
Urtica dioica					1	1	1	2	1			III	(1-2)
Juncus inflexus		4					4	4	4			II	(4)
Phleum pratense	5	2					4	4				II	(2-5)
Agrostis stolonifera	2		2		4	2						II	(2-4)
Sonchus arvensis		3	3		4			1				II	(1-4)
Mentha aquatica	3	2				1		2				II	(1-3)
Lythrum salicaria				2	1				1		1	II	(1-2)
Cerastium fontanum	2				1	1	1					II	(1-2)
Alopecurus pratensis	6							4	2			II	(2-6)
Festuca pratensis	3						2				2	II	(2-3)
Festuca rubra				1				5			3	II	(1-5)
Angelica sylvestris	2		1		2							II	(1-2)
Poa pratensis								2			2	I	(2)
Dactylis glomerata				1		6						I	(1-6)
Cirsium arvense	1					3						I	(1-3)
Persicaria amphibia							2	1				I	(1-2)
Eupatorium cannabinum				1				2				I	(1-2)
Erysimum cheiranthoides								2	1			I	(1-2)
Iris pseudacorus					1				1			I	(1)
Myosoton aquaticum					1				1			I	(1)
Vicia cracca				1		1						I	(1)
Stellaria media					1			1				I	(1)
Lotus pedunculatus					6							I	(6)
Carex acutiformis									4			I	(4)
Linaria vulgaris										3		I	(3)
Bromus hordeaceus	2											I	(2)
Lolium perenne	1											I	(1)
Cirsium palustre	1											I	(1)
Cirsium vulgare									1			I	(1)
Lathyrus pratensis											1	I	(1)
Geranium dissectum				1								I	(1)
Rumex obtusifolius								1				I	(1)
Lychnis flos-cuculi					1							I	(1)
Vicia sepium							1					I	(1)
Sward height (cm)	50	75	85	75	70	80	80	20	70	85	75		
Herb cover (%)	95	95	95	95	95	95	95	85	95	95	95		
Bryophyte cover (%)	0	0	0	0	0	0	0	0	0	0	0		
Litter cover (%)	30	40	70	20	25	70	70	25	40	70	40		
Bare ground (%)	40	30	0	50	45	0	0	50	30	0	30		
No. of species	19	15	13	16	22	18	13	20	17	6	10	Av.	15.4

5.3 Interpretation of existing vegetation

Webb's Fen is understood to have been re-seeded from arable at some time during the 1990s. There is little evidence of the species sown, and likely that the suite of grasses now present represents an overwhelming colonisation from nearby seed sources. Similarly, it is assumed that the fen meadow rushes and herbs are also derived from nearby sources, although it is possible that some recolonisation may have occurred from the ditch edges. Nonetheless, the vegetation on the fen is composed of mixtures of weedy, fast-colonising species with scattered and localised wetland plants that have broadly assembled in response to the moisture gradients indicated by the peat and levelling surveys.

Two recent aerials[2] (although undated) indicate that parts or all of the fen have been cut in recent times, and also emphasise the visual heterogeneity of the vegetation. Notwithstanding, the three main communities present on the site, Fen Meadow, Grassy Reedbed and Tussock Grassland all share a common suite of species: False Oatgrass, Couch-grass, Rough Meadow-grass, Nettle and Cleavers. This group of plants is typical of drained, fertile peat. They form the primary constituent of the Tussock Grassland, and indicate that the area occupied by this vegetation is insufficiently wet at any time of year at the ground surface to support wetland vegetation.

The colonisation of Reed, with Hedge Bindweed, Marsh Woundwort and Hemp Agrimony into the Tussock Grassland indicates the area of the fen suitable for these species, but also confirms that conditions are not very dissimilar to the drier parts of the site. The *Phragmites-Urtica* tall-herb fen (S26b) is noted by Haslam (1965) as a typical cover of dry and disturbed fens. At Webbs Fen, it may currently be little more than a response to low intensity management of the Tussock Grassland. Conversion of this area to mature reedbed without raising the watertable would tend to promote a cycle of growth of the same species, from open conditions after cutting to a closed Reed canopy with only a sparse understorey.

The Fen Meadow stands are sufficiently distinct from the preceding communities to be distinguished as true wetland vegetation. However, the False Oatgrass species group is only ousted in the lowest lying areas by thick rush growth, and it is most likely that these areas are currently saturated by surface waters. Nonetheless, it is very encouraging that many fen meadow species have colonised these stands and it is expected that appropriate management would promote their proliferation. Figure 8 indicates the parts of the fen where Fen Meadow vegetation would be expected to develop in time, though the character of this vegetation would be expected to retain its variability across the site.

In terms of vegetation development, therefore, the two primary environmental variables are the wetness of the surface peat, and its chemistry. Raising the watertable alone would tend to favour the Reedbed at the expense of the Tussock Grassland, and allow populations of wetland species to colonise and expand, largely into the lowest lying hollows and to some extent to fill the Fen Meadow area indicated in Figure 8. The chemistry of the surface peat would be altered by raising the watertable, but the degraded peat is likely to release nutrients and limit vegetation development to existing types of eutrophic fen. Where excavations are carried out within the Fen Meadow area, the removal of eutrophic peat would tend to promote less eutrophic types of vegetation. In combination, raising the watertable and lowering the ground level has the potential to increase the influence of groundwater on vegetation development.

[2] http://maps.google.co.uk and http://gridreferencefinder.com (accessed 29thJune 2011)

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 Webbs Fen are:

1. To establish permanent monitoring plots in two specified vegetation types on Webbs Fen, 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 m monitoring plot, and twenty 1 x 1 metre sub-samples from the whole plot were taken of the floristic composition.

6.2 Results

The survey was carried out on 21st June 2011 during the start of a period of humid, 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 W01 Fen Meadow
This plot is located in the western field north of the cross-ditch. The plot records vegetation in perhaps the most developed area of fen meadow on the site, but an area where the suite of drained peatland species are also evident. As the focus of the known area of fen meadow, the plot is likely to be subject to all vegetation and hydrological management measures, and will record the extent to which populations of fen meadow species can expand, and the degree to which the drained peatland vegetation will decline in this area.

Plot W02 Fen meadow – Tussock Grassland
This plot was selected to represent a transitional area between Fen Meadow vegetation and Tussock Grassland in the eastern field. Here, the plot is deliberately adjacent to one of the rushy hollows, but on notably drier ground dominated by False Oat-grass with a very thin scatter of fen meadow species. Reed is almost absent. It is anticipated that the plot will provide a record of the extent to which species associated with the Fen Meadow and Grassy Reedbed vegetation will colonise following vegetation and hydrological management measures.

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 fen meadow posts look like the example shown in Photo 11.

Location details of the plot markers are given in Table 11 and shown in Figure 9.

Table 11. Details of permanent monitoring plot locations

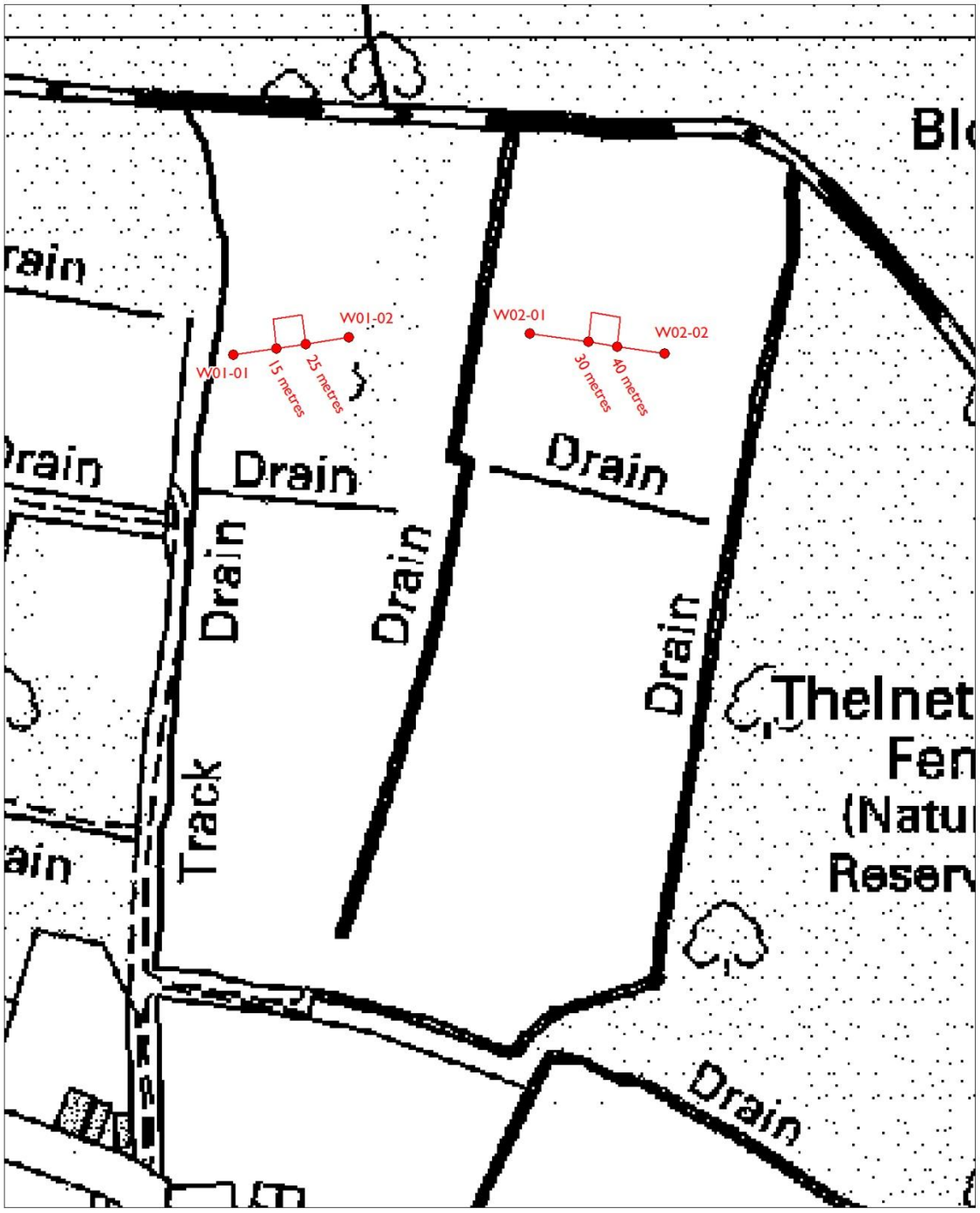
VEGETATION TYPE	PLOT CODE	MARKER POSTS	Marker Post Location	EASTING	NORTHING	Plot location (see Figure 9)
Fen Meadow	**W01**	W01-01	This post is placed beside the ditch, just to the south of the willow tree.	01645	78898	The southwest corner of the plot is 15 metres east of W01-01
		W01-02	This post is placed on uncut vegetation on the edge of the cleared plantation.	01685	78892	

Fen Meadow – Tussock Grassland	**W02**	W02-01	This post is placed beside the ditch.	01734	78908	The southwest corner of the plot is 30 metres east of W02-01
		W02-02	This freestanding post is located close to the northeast edge of the Soft Rush hollow.	01779	78898	

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 11. Fen Meadow marker post type

Figure 9. Location of vegetation monitoring plots



6.2.2 Fen Meadow Monitoring Plot Report

Plot code	WF01
Treatment type	**Summary of preceding Monitoring Plot Report**
Fen Meadow	This is the initial Monitoring Plot Report

Vegetation structure

● The ground surface is uneven, perhaps related to subsidence within the plough layer, with black earthy structureless peat.
● A thick plant litter layer obscures the ground surface and mantles the entire plot; seedlings and bryophytes are absent.
● Rush tussocks form the dominant structure, with abundant narrow grass tussocks and scattered herbs producing a secondary field layer with a marked supra-canopy. Reed is present as scattered plants. Several sprawling species intertwine patches of the field layer.
● Apart from human trampling, the vegetation is undisturbed with no signs of dunging.

Floristics

• Fen Meadow Rushes (Blunt-flowered, Soft and Hard Rush) are ubiquitous, with a relatively extensive suite of fenland grasses and herbs, including Meadow Vetchling and Marsh Horsetail. Reed and Branched Bur-reed indicate sufficiently wet conditions to support these swamp species.
• Notwithstanding, the plot has markedly high numbers of a few 'weedy' species, notably False Oat-grass, Couchgrass and Perennial Sowthistle.
• The plot does not contain species associated with inundation, trampling or disturbance.

Summary of records and events

• Not available at time of reporting. Field evidence suggests that the plot vegetation has not been disturbed in 2011, but the sward is known to have been cut recently.

Relation to past and target conditions

• This survey initiates the Vegetation Monitoring Programme and provides a baseline for assessing subsequent fen meadow vegetation development.
• Vegetation characters suggest that the plot can be regarded as young, rushy fen meadow overstood by False Oat-grass but with the potential to stabilise and diversify through management.

Plot code WF01	Photographic Record

Monitoring Plot Field Form – Vegetation structural characters

Monitoring Plot	**WF01**
Recorder	**Jonny Stone OHES**
Survey Date	**28th June 2011**

Character of the ground surface
● The ground surface is uneven, perhaps related to subsidence within the plough layer, with black earthy structureless peat.

Soil wetness

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

	ATTRIBUTE	SAMPLE from each quarter of the plot				AVERAGE
		1	2	3	4	
Layer height	Standing water (cm)	0	0	0	0	0
	Plant litter (cm)	8	4	3	2	4
	Woody seedlings (cm)	0	0	0	0	0
	Large sedges / rushes (cm)	90	95	90	90	90
	Reed-like grasses (cm)	145	145	145	140	145
	Woody saplings (cm)	0	0	0	0	0
Cover value	Standing water (%)	0	0	0	0	0
	Trampling (%)	0	0	0	0	0
	Dunging (%)	0	0	0	0	0
	Bare ground (%)	0	0	0	0	0
	Plant litter (%)	70	70	70	70	70
	Bryophytes (%)	0	0	0	0	0
	Woody seedlings (%)	0	0	0	0	0
	Large sedges / rushes (%)	75	75	90	80	80
	Reed-like grasses (%)	+	5	+	10	<5
	Woody saplings (%)	0	0	0	0	0

Monitoring Plot Field Form – Floristic sub-sampling

Monitoring Plot	**WF01**
Recorder	**Jonny Stone OHES**
Survey Date	**21st June 2011**

This data is collated from the 20 1x1 m sub-samples given in Appendix 2.

Species	**2011**	
	[ex 20]	
Fen Meadow species		
Juncus subnodulosus	19	
Agrostis stolonifera	16	
Juncus effusus	15	
Poa trivialis	15	
Festuca rubra	13	
Holcus lanatus	13	
Ranunculus repens	9	
Equisetum palustre	7	
Lathyrus pratensis	7	
Persicaria amphibia	7	
Calystegia sepium	6	
Phragmites australis	6	
Hypericum tetrapterum	5	
Lythrum salicaria	5	
Sparganium erectum	5	
Stachys palustris	5	
Lychnis flos-cuculi	4	
Rumex conglomeratus	3	
Vicia cracca	3	
Cerastium fontanum	2	

Dactylis glomerata	2	
Epilobium adenocaulon	2	
Juncus inflexus	2	
Calliergonella cuspidata	1	
Eupatorium cannabinum	1	
Negative indicators		
Arrhenatherum elatius	20	
Sonchus arvensis	14	
Elytrigia repens	11	
Geranium dissectum	2	

6.2.3 Fen Meadow-Tussock Grassland Monitoring Plot Report

Plot code	WF02
Treatment type	**Summary of preceding Monitoring Plot Report**
Fen Meadow – Tussock Grassland	This is the initial Monitoring Plot Report

Vegetation structure

● The ground surface is uneven, perhaps related to subsidence within the plough layer, with black earthy structureless peat.
● A thick plant litter layer obscures the ground surface and mantles the entire plot; seedlings and bryophytes are absent.
● Abundant narrow grass tussocks form the dominant structure with a marked supra-canopy, with rush tussocks and scattered herbs producing a secondary field layer.
● Apart from human trampling, the vegetation is undisturbed with no signs of dunging.

Floristics

● The plot is overwhelmingly dominated by False Oatgrass tussocks, with occasional Soft Rush tussocks and sprawling Hedge Bindweed. The thin ground layer is largely composed of trailing Couchgrass tillers.
● Fen Meadow species are no more than occasional, including Marsh Thistle, Tufted Vetch and Purple Loosestrife.

Summary of records and events

• Not available at time of reporting. Field evidence suggests that the plot vegetation has not been disturbed in 2011, but the sward is known to have been cut recently.

Relation to past and target conditions

• This survey initiates the Vegetation Monitoring Programme and provides a baseline for assessing subsequent Fen Meadow development.

• The plot shows the area of transition between a species-poor Tussock Grassland, with occasional Fen-Meadow species, and the slightly more species-rich margin of the Fen Meadow stand. It is hoped that the vegetation will have the sensitivity to demonstrate the effect of restoration management.

Plot code W02	Photographic Record

Monitoring Plot Field Form – Vegetation structural characters

Monitoring Plot	**W02**
Recorder	**Jonny Stone OHES**
Survey Date	**21st June 2011**

Character of the ground surface
● The ground surface is uneven, perhaps related to subsidence within the plough layer, with black earthy structureless peat.

Soil wetness

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

	ATTRIBUTE		SAMPLE from each quarter of the plot								AVERAGE
			1		2		3		4		
Layer height	Standing water (cm)		0		0		0		0		0
	Plant litter (cm)		6		12		7		5		7.5
	Woody seedlings (cm)		0		0		0		0		0
	Large sedges / rushes (cm)		110		105		110		100		107
	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 (%)		0		0		0		0		0
	Dunging (%)		0		0		0		0		0
	Bare ground (%)		0		0		0		0		0
	Plant litter (%)		70		70		70		70		70
	Bryophytes (%)		0		0		0		0		0
	Woody seedlings (%)		0		0		0		0		0
	Large sedges / rushes (%)		20		5		10		5		10
	Reed-like grasses (%)		0		0		0		0		0
	Woody saplings (%)		0		0		0		0		0

Monitoring Plot Field Form – Floristic sub-sampling

Monitoring Plot	**WF02**
Recorder	**Jonny Stone OHES**
Survey Date	**21st June 2011**

This data is collated from the 20 1x1 m sub-samples given in Appendix 3.

Species	**2011**	
	[ex 20]	
Fen Meadow species		
Juncus effusus	8	
Lythrum salicaria	8	
Dactylis glomerata	8	
Calystegia sepium	7	
Agrostis stolonifera	5	
Poa trivialis	5	
Holcus lanatus	3	
Alopecurus pratensis	2	
Juncus subnodulosus	1	
Festuca rubra	1	
Ranunculus repens	1	
Cirsium palustre	1	
Phragmites australis	1	
Vicia cracca	1	
Epilobium adenocaulon	1	
Brachythecium rutabulum	1	
Negative indicators		
Arrhenatherum elatius	20	

Elytrigia repens	20	
Urtica dioica	5	
Galium aparine	2	
Lamium album	1	
Galeopsis tetrahit	1	

6.3 Interpretation of the vegetation in the Monitoring Plots

Plot WF01 - Fen Meadow

This plot is located in the western field north of the cross-ditch. The plot records vegetation in perhaps the most developed area of fen meadow on the site, but an area where the suite of drained peatland species are also evident. Vegetation characters suggest that the plot can be regarded as young, rushy fen meadow overstood by False Oat-grass but with the potential to stabilise and diversify through management. Field evidence suggests that the plot vegetation has not been disturbed in 2011, but the sward is known to have been cut recently.

As the focus of the known area of fen meadow, the plot is likely to be subject to all vegetation and hydrological management measures, and will record the extent to which populations of fen meadow species can expand, and the degree to which the drained peatland vegetation will decline in this area.

Recorded species from the plot have been separated into two groups, Fen Meadow and Negative indicators.

Plot WF02 – Fen Meadow – Tussock Grassland

This plot was selected to represent a transitional area between Fen Meadow vegetation and Tussock Grassland in the eastern field. Here, the plot is deliberately adjacent to one of the rushy hollows, but on notably drier ground dominated by False Oat-grass with a very thin scatter of fen meadow species. Reed is almost absent. Field evidence suggests that the plot vegetation has not been disturbed in 2011, but the sward is known to have been cut recently.

It is anticipated that the plot will provide a record of the extent to which species associated with the Fen Meadow and Grassy Reedbed vegetation will colonise following vegetation and hydrological management measures. It is hoped that the vegetation will have the sensitivity to demonstrate the effect of restoration management.

Recorded species from the plot have been separated into two groups, Fen Meadow and Negative indicators.

7 RECOMMENDATIONS

Protected species

1. Historically otters have been shown to be present within the river corridor. 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.

2. 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.

3. 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 the habitat of Webb's Fen is considered suitable for reptiles (in particular grass snakes) 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.

4. There is anecdotal evidence (Reg Langston pers. comm. 30/03/11) of water shrews (*Neomys fodiens*) being present, prior to 2001, within the river corridor adjacent to Blo Norton Fen (outside the survey area and beyond the scope of this work). Water shrews are a Biodiversity Action Plan species in Suffolk (although not Norfolk) and therefore should be considered prior to any works at Webb's Fen.

5. 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.

6. There is also anecdotal evidence (Reg Langston pers. comm. 30/03/11) of harvest mice (M*icromys minutus*) being present, on reed/sedge of Hinderclay Fen (outside the survey area and beyond the scope of this work). Harvest mice are a Biodiversity Action Plan species in Suffolk (although not Norfolk) and therefore should be considered prior to any works at Webb's Fen - if some sedge habitat was retained at Webbs Fen and linked to Hinderclay Fen then this would be suitable for harvest mice.

7. A barn owl box was identified in a mature oak tree immediately to the north east of the site (as shown in Figure 3), and splashing was apparent on branches of the tree suggesting that the box is occupied. Barn owls are a Schedule 1 bird of the Wildlife and Countryside Act, 1981 and are therefore afforded protection (both the bird and its roost) from disturbance. Suffolk Barn Owl Project (Suffolk Wildlife Trust) should be consulted to determine if the box is inhabited and any mitigation measures required.

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. It is recommended that Webb's Fen is regarded as a degraded peatland which, although it formerly supported fen vegetation, has only recently begun to recover. Although a good rate and range of re-colonisation has occurred, restoration of the peat, in terms of its wetness and chemistry, is required to overcome some of the constraints limiting the development of fen vegetation.

10. It is recommended that rewetting is undertaken by reducing the flow of the central ditch so as to hold sub-surface water within the site nearer the ground surface for longer in the year.

11. It is recommended that an area of the degraded surface peat is removed from within the Fen Meadow vegetation, to allow for, and monitor, the development of fen vegetation in wetter, less eutrophic peat.

12. It is recommended that cutting and/or mowing management is resumed to favour the development of the Fen Meadow and Reedbed vegetation types in their existing areas, and to extend them into the Tussock Grassland areas.

Vegetation Monitoring

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

14. It is recommended to the managers of the fen vegetation that a vegetation compartment map is drawn up incorporating the results of the vegetation survey shown in Figure 8, and that target vegetation states for each compartment 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.

15. 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	Standing water	Sandy loam	Earthy peat	Hemic peat A	Hemic peat B	Slurry	Organic silt	Sand	Initial water table	Base of core	Final water level	Vegetation
1	01780	78704			0	49	76		187	196	68	203	28	Rough grass with nettle + creeping thistle (no rush)
2	01789	78766			0	41	71		215	222	71	232	29	Rough grass with scattered reed
3	01790	78822			0	37	70		236	241	70	255	30	Rough grass below thick reed
4	01807	78886			0	39	67		227	233	73	251	30	Rough grass with scattered reed
5	01817	78944			0	61	68		219	225	87	247	32	Rough grass below thick reed
6	01778	78945			0	35	55	103		227	74	238	31	Rough grass with some soft rush and reed
7	01758	78904	+1		0	2	26	83		229	27	239	27	Rough grass with soft rush and lesser pond sedge
8	01747	78831			0	14	51	69		234	51	252	24	Rough grass with occ. Blunt-flowered rush below thick reed
9	01741	78777			0	17	55	94	289	379	55	392	21	Rough grass with scattered hard rush and reed
10	01725	78709			0	35	49		203	208	49	219	24	Rough grass with hard rush and some soft rush
11	01659	76713		0		53				71		82		Rough grass with nettle (no rush)
12	01666	78765			0	48	74	99		336	74	341	31	Rough grass with nettle (no rush)
13	01669	78818			0	29	72	92		314	68	321	30	Rough grass with scattered hard rush and reed canary grass
14	01669	78878			0	26	61	85		286	55	304	25	Rough grass with soft + blunt-flowered rush, lesser pond sedge; reed canary grass patches
15	01677	78954			0	9	28	63		261	28	279	22	Rough grass with scattered reed

Appendix 2. Field record for Fen Meadow permanent plot (WF01)

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
Arrhenatherum elatius	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	20
Juncus subnodulosus	P	P	P		P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	19
Agrostis stolonifera	P	P	P	P	P	P	P	P		P	P	P	P	P	P	P		P			16
Juncus effusus	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P						15
Poa trivialis	P	P	P	P	P	P	P	P	P	P	P	P	P	P					P		15
Sonchus arvensis	P	P	P	P	P	P	P	P	P	P	P	P	P			P					14
Festuca rubra			P	P	P	P	P	P	P	P				P	P		P	P		P	13
Holcus lanatus			P	P	P	P	P	P	P	P			P	P			P	P	P		13
Elytrigia repens	P	P	P	P	P		P	P	P	P	P	P									11
Ranunculus repens	P	P	P	P	P		P	P	P	P											9
Equisetum palustre													P		P	P	P	P	P	P	7
Persicaria amphibia		P	P		P	P	P			P	P										7
Lathyrus pratensis					P	P	P		P	P	P	P									7
Calystegia sepium						P			P	P	P	P	P								6
Phragmites australis							P	P	P	P	P	P									6
Sparganium erectum														P	P		P	P		P	5
Hypericum tetrapterum													P		P	P			P	P	5
Stachys palustris											P		P	P	P		P				5
Lythrum salicaria															P	P	P		P	P	5
Lychnis flos-cuculi														P		P		P	P		4
Rumex conglomeratus			P	P		P															3
Vicia cracca							P	P	P												3
Epilobium adenocaulon						P	P														2
Dactylis glomerata							P	P													2
Juncus inflexus				P	P																2
Cerastium fontanum			P		P																2
Geranium dissectum						P	P														2
Calliergonella cuspidata																	P				1
Eupatorium cannabinum										P											1

Number of species	8	9	13	11	14	14	17	13	13	15	12	10	11	10	10	8	9	8	8	7

Appendix 3. Field record for Fen Meadow – Tussock Grassland permanent plot (WF02)

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
Arrhenatherum elatius	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	20
Elytrigia repens	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	20
Dactylis glomerata											P	P		P	P	P		P	P	P	8
Juncus effusus		P		P	P		P	P	P		P	P									8
Lythrum salicaria			P	P	P	P	P	P	P	P											8
Calystegia sepium		P	P	P	P	P		P	P												7
Poa trivialis		P	P							P				P				P			5
Urtica dioica														P	P		P	P	P		5
Agrostis stolonifera	P			P	P										P	P					5
Holcus lanatus									P	P	P										3
Alopecurus pratensis	P												P								2
Galium aparine																	P		P		2
Juncus subnodulosus						P															1
Phragmites australis							P														1
Festuca rubra							P			P	P										1
Vicia cracca										P											1
Cirsium palustre								P													1
Lamium album																P					1
Galeopsis tetrahit													P								1
Ranunculus repens													P								1
Epilobium adenocaulon												P									1
Brachythecium rutabulum																	P				1

Number of species	4	5	5	6	6	5	6	6	6	7	6	5	5	5	5	5	5	5	5	3	