

Fieldwork to Support Habitat Restoration Work at Oak Tree Fens, Thelnetham



NVC survey and initiation of Vegetation Monitoring Programme July 2017

Undertaken on behalf of the Little Ouse Headwaters project

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SUMMARY

1. The core of the Little Ouse Headwaters Project (LOHP) area lies within the Blo' Norton and Thelnetham Fens SSSI, which forms part of the Waveney and Ouse Valley Fens Special Area of Conservation (SAC). Oak Tree Fens is situated between the two remaining fragments of Thelnetham Fen, which are part of the Special Area of Conservation. 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.
2. LOHP has requested that a National Vegetation Classification survey is carried out prior to the initiation of site restoration, and that two permanent monitoring plots are established on the site grasslands as part of the Vegetation Monitoring Programme. The initial survey of the plots will provide a baseline for assessing the changes that may occur in the structure and composition of the swards during site restoration.
3. Two grassland NVC communities were identified, corresponding to Alluvial Grassland (MG15a *Alopecurus pratensis-Poa trivialis-Cardamine pratensis* grassland, *Agrostis stolonifera* sub-community) and Ordinary Damp Grassland (MG7b *Lolio-Plantaginion* Sissingh 1969 p.p., *Lolium perenne – Poa trivialis* grassland)
4. The small wooded area was divided into two kinds of wet woodland, a swamp woodland (W5a *Alnus glutinosa – Carex paniculata* woodland, *Phragmites australis* sub-community) and a drier, slightly raised stand of W6d *Alnus glutinosa – Urtica dioica* woodland, *Sambucus nigra* sub-community. It is noted that Wet Woodland is listed as a Habitat of Principal Importance (priority habitats) in Section 41 of The Natural Environment and Rural Communities (NERC) Act 2006. One notable plant species was recorded in the woodland, Tufted Sedge *Carex elata*. This species is classified as 'Locally Scarce' on the Rare Plant Register for Suffolk. Nationally, it is classified as "Near Threatened" due to a reduction in its 'extent of occurrence' in England.
5. Permanent monitoring plots were established in the two grassland units in the survey area, in locations intended to represent both the typical characters of each sward and also in swards that would be sensitive to some combination of management and hydrological influence.
6. *Plot E01 Alluvial Meadow* can be regarded as a grass-dominated Alluvial Meadow, with Amphibious Bistort, Reed Canary-grass and Wild Angelica indicating periodic topsoil saturation.
7. *Plot E02 Ordinary Damp Meadow* can be regarded as a grass-dominated Ordinary Damp Meadow with no species indicating more than occasional topsoil saturation, borne out by occasional tussocks of Soft Rush elsewhere in the stand.
8. The Fieldwork Report makes three recommendations, that:
 - a) The Vegetation Monitoring Programme is adopted at Oak Tree Fens as an aid to management decision-making;
 - b) Target conditions for each sward should be devised, based on the initial descriptions of grassland types and character given in the Fieldwork Report;
 - c) Monitoring surveys should be repeated regularly, and the results incorporated into management decision-making.

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Appendix 4. NVC WOODLAND COMMUNITIES

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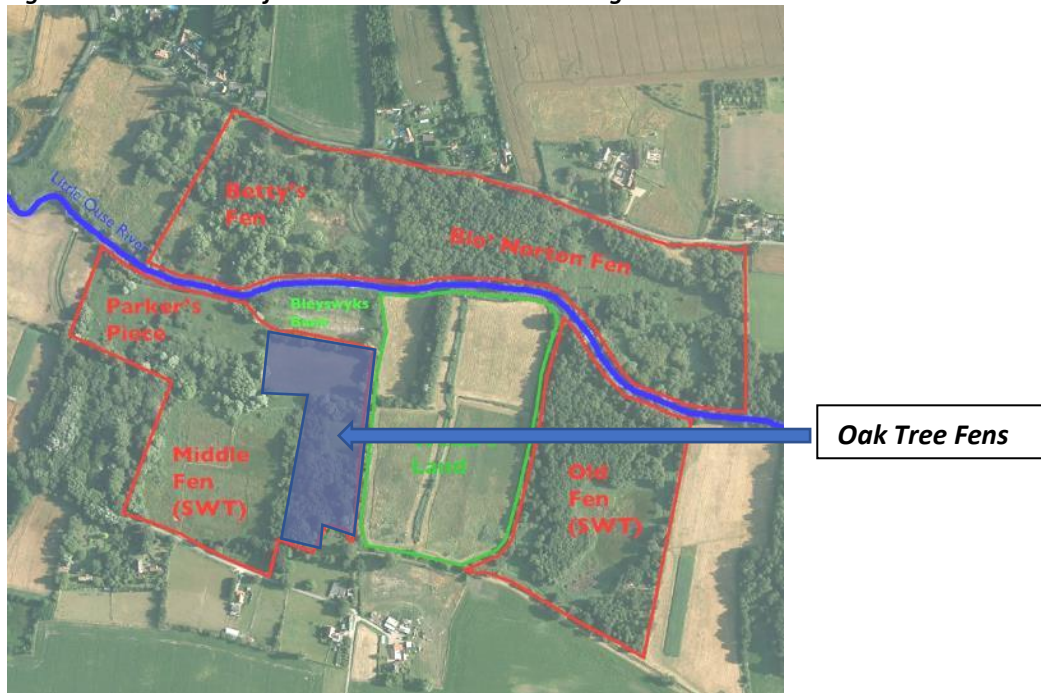
1. INTRODUCTION

1.1 Background

The Little Ouse Headwaters Project (LOHP) was formally constituted as a Charitable Company in 2002 to restore and link fenland remnants along the upper Little Ouse Valley, and to promote access and enjoyment of the wildlife and landscape of the valley. The core of the project area lies within the Blo' Norton and Thelnetham Fens SSSI, which forms part of the Waveney and Ouse Valley Fens Special Area of Conservation (SAC). These valley fens are remnants of what was formerly more extensive habitat, for which East Anglia had one of the most important concentrations in Western Europe.

Oak Tree Fens, Thelnetham is a largely drained fen purchased by LOHP in 2015 as a 1.90 ha block consisting of two small grassland fields and a wooded area. As shown in Figure 1, the Fens is situated between the two remaining fragments of Thelnetham Fen, which are part of the Special Area of Conservation. 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.

Figure 1. The location of Oak Tree Fens and surrounding land



1.2 Survey requirements and objectives

Following purchase, and prior to the initiation of site restoration, LOHP have requested that two vegetation surveys are carried out on this land-holding.

The first requirement is for a National Vegetation Classification survey, with the objective of establishing the character of grassland and woodland vegetation making up the survey area. The NVC is now the common standard for defining types of vegetation and describing them within a British and European context. The classification is widely used by Natural England and has been

employed to describe the vegetation of much of the nature conservation interest in the Waveney-Little Ouse valley corridor.

The second requirement is to extend the vegetation monitoring programme established on other LOHP sites with the objective of providing a baseline for the grassland swards of the Fens in order to assess the changes that may occur in the structure and composition of the swards during site restoration.

1.3 Survey reporting

Jonny Stone has been commissioned by LOHP to undertake these vegetation surveys on the Oak Tree Fens. The NVC and vegetation monitoring methodologies are summarised in Section 2. The NVC survey results and their evaluation are given in Sections 3 and 4. Section 5 gives management considerations.

The results of the initial survey for the new vegetation monitoring plots are given in the 2017 Fieldwork Report in section 6.

2. SURVEY METHODOLOGIES

2.1 NVC survey methodology

The National Vegetation Classification (NVC) is the common standard for defining types of vegetation and describing them within a British and European context (Rodwell et al. 2001; Rodwell et al. 2007). The classification (Rodwell 1991, 1992) is widely used by Natural England and has been employed to describe the vegetation of many semi-natural sites in Suffolk and over the rest of the United Kingdom. Although not designed as a scientific or strict monitoring tool, it is particularly useful for placing the current character of the habitats within a national spectrum of grassland or woodland types, and for interpreting the natural and management-induced changes over time.

Fieldwork followed the methodology set out in the JNCC NVC Users' Handbook (Rodwell 2006). General habitat characters were assessed by an initial walkover to establish the location and extent of distinctive community types. Sample plot locations were selected to represent typical vegetation characters within each type of community. Five or more sample plots were selected for each vegetation-type where possible, and are shown in **Figure 2. Location of NVC survey plots**. Each plot was geo-referenced and listed in Appendix 1.

The grassland swards were sampled using 2 x 2m plots, including photographs taken at oblique and vertical angles. All plots were assessed for their floristic composition and species cover/abundance and for the range of variables characterising their structure including vegetation height and the relative coverage of the constituent plant groups. Definitions for each attribute are given in Table 1.

The woodland and tall scrub were sampled by standard canopy plots of 50 x 50m, with nested field and ground layer plots. Owing to the small size of the woodlot, a total of five plots were used to assess the floristic composition of the two constituent communities.

All vascular plants are named following Stace (2010); the bryophyte flora follows Hill et al. (2008). Species recorded in NVC sample plots are listed in Appendix 2.

Field data was tabulated in Microsoft Excel are then grouped by floristic similarity to show the common and typical characters; each type was then compared with the published NVC accounts (Rodwell 1991-1992). For the grassland swards, this comparison was refined following the recent revision of the plant communities of floodplain meadows (Rothero et al. 2016; Wallace & Prosser 2017), which provides clarification of the relationships between the moist grasslands on the drained valley peats and the European phytosociological framework recently adopted by the International Association for Vegetation Science (Mucina et al. 2016). Field data is presented in Appendices 3 and 4.

Table 1. Definitions of the attributes used to assess plot character

Sward height (cm)	This variable is defined as the average height of the top of the main leaf canopy of the sward. Sward height is therefore not the height of the tallest stem, nor is it the average height of flowering stems, unless these form that canopy layer.
% Total veg. cover	This is the average of values given in each plot for the proportion of the plot, when viewed from overhead, which is covered by the foliage and flowering stems of vascular plants, rather than by bryophytes or lichens. The combined values for these three groups of plants may exceed 100 per cent as, frequently, lichens and mosses may grow beneath the other plants.
% Bryophyte cover	This is the average of the estimated cover values for all mosses and liverworts recorded in the plot.
% Lichen cover	This is the average of the estimated cover values for all ground-dwelling lichens recorded in the plot.
% Plant litter	Litter is defined as dead plant material, and the cover value is that proportion of the <u>ground surface</u> of the plot that is covered either by dead stems retained in the growing position, or by materials lying prostrate on or near the ground surface. Plant litter cover is difficult to estimate, particularly in swards where tussock-forming species are prevalent, and here only refers to dead material lying prostrate on or above the ground surface. The values given are not, therefore, identical to those required by the current condition assessment protocols used by Natural England, which assess only thick, continuous thatches.
% Bare ground	This variable is defined as an estimate of the proportion of the ground surface that is not directly mantled by plant litter or bryophytes, and not occupied by shoots and other living aerial plant matter as they pass through that surface. The estimate therefore includes bare ground covered by prostrate stems or other living plant material lying on or near the ground surface. It is always a greater figure than that required for Natural England's condition assessment, which only refers to non-vegetated areas.
Species No.	This metric is simply an average of the numbers of listed species occurring in each plot.

2.2 Vegetation monitoring survey methodology

Documentation for a Vegetation Monitoring Programme was initially developed for LOHP to aid the ecological restoration of Bleyswyck's Bank and Parkers Piece in 2010. The development, methodology and functions of the programme were described in detail in the Monitoring Plan (ELP 2010) for those sites and is not repeated here.

The methodology was applied to Oak Tree Fens to establish two permanent plots, with the following objectives:

1. To establish permanent monitoring plots in two specified grassland types, 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.

This initial fieldwork report followed the prescriptions of the Monitoring Plan (ELP 2010) and records the ‘full’ survey protocol, using the four Fieldwork Elements summarised in Table 2.

Table 2. 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 of surveillance images showing the condition of the developing 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 addition to the photographic record, the structural characters of the vegetation were assessed from each quarter of the two 10 x 10 m plots. Floristic composition was tabulated by stratified sub-sampling of the monitoring plots using twenty 1 x 1 metre sub-samples. The field records for floristic sampling are given in Appendices 5 and 6.

2.3 Limitations to the surveys

Both surveys were carried out in June 2017 at an optimal time of year for both grassland and woodland vegetation. No access issues were encountered. Although it is possible that some plant species were not recorded by the sampled plots, this is not considered to have significantly affected the conclusions of this report.

There were no limitations affecting the location of grassland NVC sample plots, but the small size of the wooded area constrained the number of woodland plots, though samples taken were sufficient to assess the character of the two sampled woodland types.

The general locations of each permanent monitoring plot were established during on-site discussions with LOHP. The subsequent emplacement of permanent marker posts matched the locations of the temporary posts used to carry out the baseline survey.

3. VEGETATION SURVEY RESULTS

3.1 Character of the survey area

Oak Tree Fens lie across thinning peat near the edge of the Blo-Norton-Thelnetham Lake Basin (Tallentire 1969; West 2009). The margin of the peat basin was not investigated, but it is anticipated that slightly raised ground in the woodland to the south of the survey area represent the degraded terrace beneath thin peat. This abuts a shallow depression forming the western side of the woodland, drained by an occluded ditch. The drainage pattern was set out to take waters to the western ends of the woodland and both grassland fields, and hence northwards to the river.

Published in 1783, Hodskinson's Map of Suffolk (Dymond 2003) shows a track leading northward onto the marshes from the junction of Fen Lane with Loggers Lane. The modern line of this track marks the eastern boundary of the survey area, and, indeed, the eastern edge of Thelnetham Fen at that time.

The modern field layout is first recorded by the Ordnance Survey following the 1883 and 1885 surveys for the Ordnance Survey Six-inch England and Wales series, 1842-1952¹. Here, land use is also indicated:

- a) The northern grassland is unmarked, indicating that the land was in normal agricultural use at the time of survey, though there is no indication as whether this was grazed or mown grassland – or, indeed, cultivated land.
- b) The remaining fields, now wooded with a second, smaller area of grassland, are separated into 'Rough Pasture' by the upland, and 'Osier' and 'Marsh' to the north. Osiers are clearly marked along what is today the drier area on the eastern side, surrounding a small area of 'Marsh' contiguous with Thelnetham Middle Fen.

This separation of land uses reflects the modern distribution of habitats. The area of 'Marsh' corresponds with the centre of an area of wet woodland; the 'Rough Pasture' occupies land nearer the upland and grading onto the valley terrace; the 'Osier' lies largely on drier soils of the terrace margin where it intrudes into the valley floor; and the unmarked field to the north lies on drained peats described as 'Liable to flood'.

At the time of survey, the ground surface of the earthy peats in both grassland areas was found to be slightly damp to moist, following several months of normal rainfall levels².

3.2 NVC survey results

As shown in **Figure 2. Location of NVC survey plots**, 16 sample plots were selected from representative locations within the woodland and grasslands. Floristic and physiognomic data were recorded from each plot, and the raw data is provided separately as an electronic spreadsheet. Appendix 1 lists the National Grid references taken by GPS; Appendix 2 gives the species recorded. Common names are given in the description of the NVC communities, but scientific names are retained for the plant community titles.

¹ The Ordnance Survey historic maps are not reproduced here as no copyright was sought; they can be viewed on the National Library of Scotland website [<http://maps.nls.uk> (accessed 28th September 2017)]

² Final NCIC (National Climate Information Centre) data based on the Met Office 5km gridded rainfall dataset derived from rain gauges (Source: Met Office © Crown Copyright, 2017).

Figure 2. Location of NVC survey plots

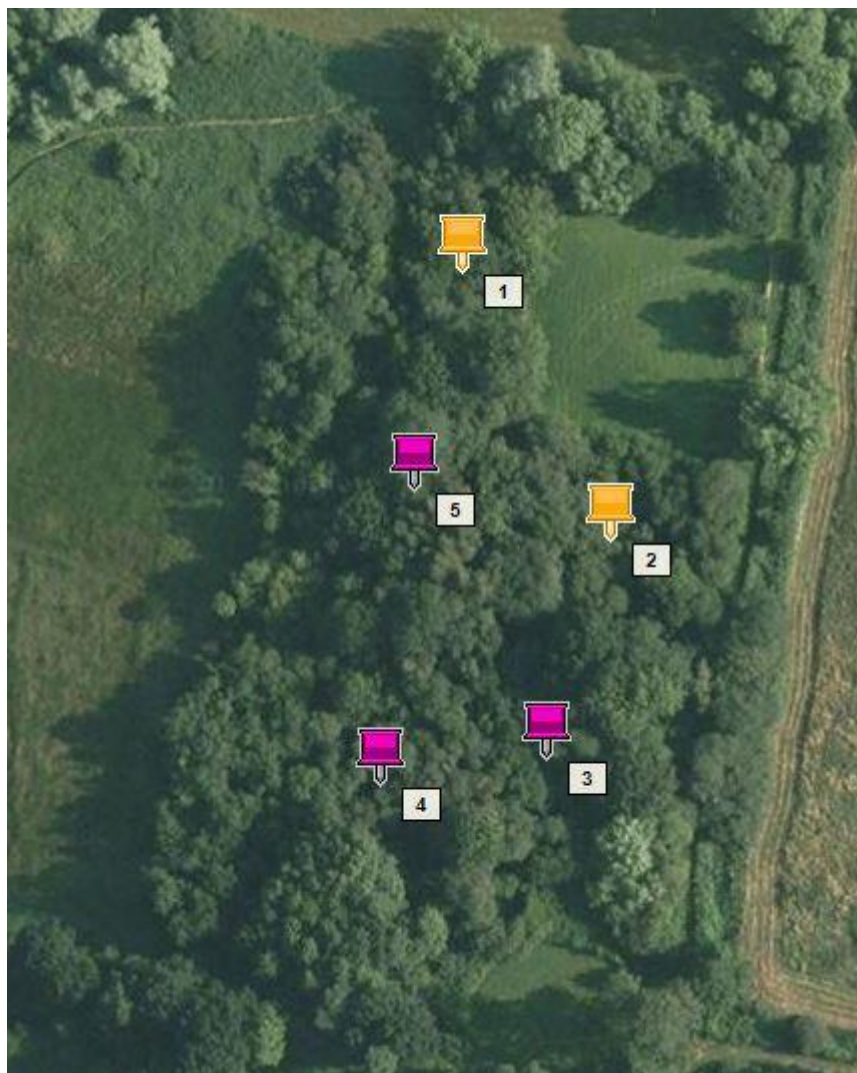
Stand A



Stand B



**Woodland
vegetation**



Four NVC communities were identified, and are listed in Table 3 and shown in **Figure 3. Location of NVC plant communities.**

Table 3. NVC communities recorded from Oak Tree Fens

NVC code	Community title	Area (ha)
MG15a	<i>Alopecurus pratensis</i> - <i>Poa trivialis</i> - <i>Cardamine pratensis</i> grassland, <i>Agrostis stolonifera</i> sub-community	0.8 ha
MG7b	<i>Lolio-Plantaginion</i> Sissingh 1969 p.p., <i>Lolium perenne</i> – <i>Poa trivialis</i> grassland	0.3 ha
W5a	<i>Alnus glutinosa</i> – <i>Carex paniculata</i> woodland, <i>Phragmites australis</i> sub-community	0.4 ha
W6d	<i>Alnus glutinosa</i> – <i>Urtica dioica</i> woodland, <i>Sambucus nigra</i> sub-community	0.5 ha

Full floristic and physiognomic data tables are given in Appendix 3 for each community.

Figure 3. Location of NVC plant communities.



3.2.1 Synopsis of grassland communities

A summary of the floristic characters of each grassland type is given in Table 4. The relative frequency of occurrence of each species in the sample plots is given using Roman numerals according to the following scale:

- V = 81-100 per cent
- IV = 61-80 per cent
- III = 41-60 per cent
- II = 21-40 per cent

Species occurring in 20 per cent or fewer sample plots are excluded from this table. They are listed in the community tables in Appendix 3.

Table 4. Synopsis of surveyed grasslands

Stand code NVC code	A MG15a	B MG7b
Grassland constants		
<i>Poa trivialis</i>	V	V
<i>Holcus lanatus</i>	V	V
<i>Agrostis stolonifera</i>	V	V
<i>Phleum pratense</i>	V	V
<i>Lolium perenne</i>	V	IV
<i>Alopecurus pratensis</i>	V	III
<i>Cerastium fontanum</i>	III	III
Stand A differentials		
<i>Persicaria amphibia emersa</i>	V	
<i>Ranunculus repens</i>	III	
<i>Taraxacum officinale agg</i>	III	
<i>Ranunculus acris</i>	II	
<i>Arrhenatherum elatius</i>	II	
Stand B differentials		
<i>Carex hirta</i>		III
<i>Cirsium palustre</i>		II
<i>Juncus effusus</i>		II
<i>Trifolium repens</i>		II

As shown in Table 4, both grassland types – Stand A and Stand B – are dominated by a suite of grass species. Of these, Rough Meadow-grass and Yorkshire Fog typically dominate, with an understorey of Creeping Bent-grass. This group is strongly preferential for moist grasslands, typical of fertile floodplain situations. Rough Meadow-grass is a particularly aggressive colonist of the earthy eutro-amorphous soils developed in the black, calcareous humified peat on the valley floor. As a thickly tufted ‘bottom’ grass, the species can greatly reduce successful colonisation in under-managed swards.

With Timothy, Meadow Foxtail and Perennial Ryegrass also constant in the sward, both stands can be described as ‘Meadow Foxtail grasslands’. Following the JNCC Phase 1 Habitat Survey classification, they can also be regarded as Poor Semi-improved Grasslands, though Stand A appears to have developed on rather moister soils. This type of grassland is often the result of a sown seed-mixture designed for moister soils, including Rough Meadow-grass and Timothy.

In Rodwell (1992), Meadow Foxtail grasslands were subsumed within a compendious group of mostly species-poor grasslands (MG7 *Lolio-Plantaginion* Sissingh 1969 pp). However, as indicated by Rodwell et al. (2000), floodplain grasslands were not represented by a large number of samples, and the range of variation in this habitat required further consideration. This was achieved by the collation of a large, European-wide sample dataset by the Floodplain Meadows Partnership, which included the existing NVC vegetation samples, and the preparation of a more comprehensive classification spanning the group of vegetation alliances defining floodplain grasslands (Rothero et al. 2016; Wallace & Prosser 2017).

Meadow Foxtail grasslands were found to lie towards the drier end of the range of hydrological conditions found in floodplains, and the Floodplain Meadows Partnership followed a number of European authors (e.g. Kryszak et al. 2015) in splitting these grasslands into wetter and drier variants.

MG15a *Alopecurus pratensis*-*Poa trivialis*-*Cardamine pratensis* grassland, *Agrostis stolonifera* sub-community

Stand A, adjacent to Bleyswyck's Bank, is a relatively homogeneous grassland, prone, in shallow hollows, to colonisation by Reed Canary-grass. When compared to Stand B, the presence of Creeping Buttercup and the terrestrial form of Amphibious Bistort are indicative of seasonal waterlogging. Bistort is better known as an aquatic species but here its terrestrial growth form is a distinctive feature of the sward. This rhizomatous perennial has finely to coarsely pubescent lanceolate leaves and may be mistaken for the annual Redshank *Persicaria maculosa*, though Bistort only has dark chevron-shaped blotches on its early and immature leaves. The species is often common in floodplain grasslands (Ellenberg 1988; Wallace & Prosser 2017) and is particularly adapted to changing water-levels (Partridge 2001). Its deep rhizomes (0.5 m) ramify amongst other components of the sward, producing a scattered distribution of shoots.

The sample plots give an average sward height of just under 40 cm with a high sward cover. There was no evidence for management earlier in the season, and this would be a favourable sward height if the grassland had been unmanaged. The high sward cover is due to thick tangles of Rough Meadow-grass, which would be expected to reduce in vigour if stock-grazed and trampled. The ground covers of plant litter and bare ground are negligible, and the lack of a bryophyte cover is typical of these strong-growing swards. With an average 10.8 species in the sample plots it is likely that the potential species-richness is subdued by strong grass growth, though the records for such species as Meadow Buttercup, Red Clover and Cuckooflower are encouraging evidence that the sward has potential to be improved for nature conservation.

Stand A Alluvial Grassland – representative oblique view [11th June 2017]



Stand A Alluvial Grassland – representative vertical view [11th June 2017]



Stand A can be placed within Ratcliffe's (1977) 'Alluvial Meadows', though floristically it represents only the core of this type of neutral grassland, and lacks many distinctive species. In Rodwell (1992), Stand A bears closest affinity to the *Lolium perenne*-*Alopecurus pratensis* grassland (MG7d). However, the work of Wallace & Prosser (2017) provides comparable floristic data sufficient to indicate that floristically Stand A is best placed within the *Agrostis stolonifera* sub-community of the MG15 *Alopecurus pratensis*-*Poa trivialis*-*Cardamine pratensis* grassland. This occupies positions in the floodplain where the fertile topsoil is frequently saturated, and Rough Meadow-grass is typically abundant.

MG7b *Lolio-Plantaginion* Sissingh 1969 p.p., *Lolium perenne* – *Poa trivialis* grassland

Stand B is a smaller area of grassland on what was the location of part of an osier bed on the 1885 Ordnance Survey map (section 3.1). Here, Meadow Foxtail is much less abundant than in Stand A, though Rough Meadow-grass and Yorkshire Fog are similarly abundant. In comparison to Stand A, however, this small grassland largely lacks indicators of wet grassland, though occasional plants of Marsh Thistle and Soft Rush are present. Here, the equivalent species to the rhizomatous Amphibious Bistort is Hairy Sedge, which does not tolerate prolonged or frequent saturation in the topsoil, though is often associated with drier, open gaps in Meadow Foxtail grassland (e.g. Kryszak et al. 2015).

At 38 cm, the average sward height is almost identical to Stand A though sward cover is slightly less. Plant litter is also more evident. A rather more marked distinction, however is the lower average species-richness, at 8.4 species per plot.

The lack of wet grassland indicators and the lower species-richness indicate a shift in grassland type to Ratcliffe's (1977) 'Ordinary Damp Meadows' which, with abundant Yorkshire Fog and Rough Meadow-grass, is largely recognised from peaty soils with a high watertable but not impeded drainage. Although much of this kind of vegetation is referred to Rodwell's (1992) MG10 *Holco-Juncetum effusi* Page 1980 rush pasture, the paucity of Soft Rush in Stand B confirms that it is best

placed within the *Lolium perenne*-*Poa trivialis* leys, a sub-community of the MG7 *Lolio-Plantaginion* Sissingh 1969 p.p..

Stand B Ordinary Damp Grassland – representative oblique view [11th June 2017]



Stand B Ordinary Damp Grassland – representative vertical view [11th June 2017]



3.2.2 Synopsis of woodland communities

The woodlot has sharp boundaries except along its western side, where it grades into sallow carr across the boundary with Thelnetham Middle Fen. The boundary ditch cuts across the margin of the fen giving the woodlot a shallow depression along much of its western edge. This is the focus for alder regeneration which is a feature of this side of the woodlot. Eastwards and northwards, the ground surface rises gently to form a slight platform with shallower hollows to the south. This hydrological variation between the western depression and the eastern floodplain surface is reflected in the development of two distinct woodland types. These are quite distinct in the wettest and driest areas, but the characters of the woodland that has developed in the shallow depressions on the terrace are somewhat transitional between the two.

W5a *Alnus glutinosa* – *Carex paniculata* woodland, *Phragmites australis* sub-community

The area of 'swamp' woodland where alder regenerates freely is restricted to the small area of former 'Marsh' (see section 3.1) and the line of the partly occluded western boundary ditch. Here, Pond Sedge and occasionally scatters of Tufted Sedge form the matrix of a wetland field layer, often accompanied by Flag Iris. On slightly drier parts of the stand, Ash and occasional Birch are present, and the field layer grades to include Nettle and Hemp Agrimony. The shrub layer is frequently less well developed than on the drier ground to the east, and Grey Willow is accompanied by Blackcurrant, Redcurrant and occasional Hawthorn and a single mature Buckthorn.

Small hollows in the drier part of this stand are notable for the occasional proliferation of other wetland species, including the Endive Pellia liverwort and Marsh Valerian. The Endive Pellia, in particular, is a sensitive indicator of substrate reaction and is typical of situations where calcareous groundwater occurs at or near the ground surface (e.g. Bosanquet 2014).

The stands of Alder are generally c.15 m tall, while the areas of scattered Ash and Birch canopy can reach c.15-20 m in height, with a sub-canopy of Grey Willow seldom exceeding c.8 m.

This stand fits comfortably within the W5 *Alnus-Carex* community and can be considered against the Common Reed and Yellow Loosestrife sub-communities. As discussed by Rodwell (1991), the presence of Common Reed throughout, and the rather impoverished form of the field layer indicates that the stand is best placed within the *Phragmites australis* sub-community, though it is evident from tree-throw pits and the sides of the ditches that small pockets of the *Lysimachia vulgaris* sub-community may also be present.

W6d *Alnus glutinosa* – *Urtica dioica* woodland, *Sambucus nigra* sub-community

On the drier parts of woodland, Grey Willow and Hazel are the predominant shrubs which form a large proportion of the sub-canopy. There are several Pedunculate Oaks along the boundary, and scattered Birch, Ash and Alder forming a thin and patchy canopy. Both shrubs are over-mature, with Grey Willow either sprawling or fallen. Hawthorn, Elder and the occasional Blackthorn are also present.

The field layer is dominated by shade-affected Nettle where there is sufficient light, often accompanied by Rough Meadow-grass, Herb Robert and Ground Ivy. In deeper shade, especially in the northern part of this stand, the ground is almost bare, and here Garlic Mustard sprouts are prolific. The most frequent moss species are Common Feather-moss and Rough-stalked Feather-moss, and the ground surface is too dry to support wet woodland species.

The height of the canopy varies greatly depending on the presence of the boundary oaks, but is typically c.8-10 m where Grey Willow and Sallow predominate, and c.15 m where other tree species are present.

While this stand is clearly associated with W6 *Alnus-Urtica* woodland, and is best placed within one of the drier sub-communities, it is assigned to the *Sambucus nigra* (Elder) sub-community by default rather than a clear floristic imperative.



4. EVALUATION OF HABITATS AND SPECIES

Following discussion of the character of the survey area in terms of its constituent habitat and species in section 3.2, an indication of the ecological value of features present can be given (IEEM 2006; CIEEM 2016).

4.1 Habitat evaluation

The habitats recorded from the survey area are evaluated against the guidelines given in Table 5 (IEEM, 2006).

Table 5. Levels of Value of Ecological Resource

Level of Value	Examples
International	Internationally designated or proposed sites such as Ramsar Sites, Special Protected Areas, Biosphere Reserves and Special Areas of Conservation, or otherwise meeting criteria for international designation. Sites supporting populations of internationally important species in internationally important numbers, numbers i.e. Annex 1 of Birds Directive, migratory species on migration routes, or in breeding, moulting, wintering or staging areas.
National	SSSI or NNR designated or qualifying sites holding species or assemblage of national importance. Sites supporting viable breeding populations of Wildlife and Countryside Act Schedule 1 Species and supplying critical elements of their habitat requirements. Sites supporting nationally important numbers of a single species (>1% UK population). Species contributing to the integrity of an SPA or SSSI but which are not cited as species for which the site is designated.
Regional	Sites not meeting SSSI criteria but comfortably exceeding SINC criteria. Species subject to special conservation measures in UK BAP or sites holding viable breeding populations or supplying critical elements of their habitat requirements. Sites containing regionally important numbers of a single species (>1% regional population).
High Local	Sites meeting the criteria for a county area designation (SINC), Designated Local Nature Reserves holding viable populations of any key species identified in the Local BAP. Sites supporting viable breeding populations of substantial number of species known to be Red or Amber List Species of Conservation Concern and supplying critical elements of their habitat requirements.
Moderate Local	Undesignated sites, or features considered to appreciably enrich the habitat resource within approximately 10 km radius from the site. Sites supporting viable breeding populations of a small number of species listed as Red list or Amber list Species of Conservation Concern or supplying critical elements of their habitat requirements.
Low Local	Undesignated sites, species or areas considered to enrich the species richness within the immediate environs of the site.
Negligible	Areas with a poor species richness and none of the above. Any other species.

Evaluated against the criteria given in Table 5, the ecological value of the habitats in the surveyed area is indicated in Table 6.

It should be noted that Wet Woodland is listed under the Section 41 habitats of principal importance (priority habitats) requirement published by Natural England in August 2010. Section 41 (S41) of The Natural Environment and Rural Communities (NERC) Act 2006 requires the Secretary of State to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England. The S41 list is used to guide decision-makers such as public bodies, including

local and regional authorities, in implementing their duty under section 40 of the Natural Environment and Rural Communities Act 2006, to have regard to the conservation of biodiversity in England, when carrying out their normal functions.

Table 6. Level of ecological value (geographic scale of importance

	Ecological feature
Moderate Local	1. Wet woodland W5a <i>Alnus glutinosa</i> – <i>Carex paniculata</i> woodland, <i>Phragmites australis</i> sub-community
Low Local	2. Wet woodland W6d <i>Alnus glutinosa</i> – <i>Urtica dioica</i> woodland, <i>Sambucus nigra</i> sub-community 3. Floodplain grassland MG15a <i>Alopecurus pratensis</i> - <i>Poa trivialis</i> - <i>Cardamine pratensis</i> grassland, <i>Agrostis stolonifera</i> sub-community (including stand of Reed Canary-grass
Negligible	4. Floodplain grassland MG7b <i>Lolio-Plantaginion</i> Sissingh 1969 p.p., <i>Lolium perenne</i> – <i>Poa trivialis</i> grassland

4.2 Notable plant species

One notable plant species was recorded during the survey, Tufted Sedge *Carex elata*. This species is on the Rare Plant Register for Suffolk (Suffolk Biological Records Centre 2005). As such, it is classified as Locally Scarce. The Register notes “about 30 records from fens and marshes mainly in Breckland and the Waveney/Ouse valley”. Nationally, it is classified as “Near Threatened” due to a reduction in its ‘extent of occurrence’ in England.

Tufted Sedge *Carex elata* All.

Status¹ - none

GB Red List² - Threat Status: Least Concern

England Red List³ - Threat Status: Near Threatened

¹ Stewart et al. (1994)

² Cheffings et al. (2005)

³ Stroh et al. (2014)

5. MANAGEMENT CONSIDERATIONS

5.1 As part of the landscape unit

Oak Trees Fens are composed of an isolated woodlot with associated moist grasslands largely situated on floodplain peats which grade onto the valley terrace along the southeast margins. It abuts Thelnetham Middle Fen on its western boundary, incorporating a small area of the wet fen peat underlying Middle Fen. To the north and east, the Fens share boundaries with Bleyswyck's Bank and Webb's Fen; the latter is thought to exhibit features of a seepage track leading to the northeast corner of the Fen.

Oak Tree Fens can be considered of particular importance at this scale in enabling the surrounding land to be considered as a single unit, with the facility to modify hydrological pathways and management compartments.

5.2 At the site-scale

Oak Tree Fens can be regarded as consisting of three primary units.

- a) The smallest of these – and the most significant – is the area of former marsh now occupied by regenerating alder and tussock sedges. At the site scale, the nature conservation evaluation in section 4.1 is targeted at the quality of the swamp woodland as an example of the NERC S41-listed Habitats of Principal Importance. The location of this woodland is likely to be part of the same hydrological unit as the neighbouring land at Middle Fen and, if this is the case, can be treated as a valuable extension to it. Here, the driver of favourable conditions is hydrology, rather than the structure of the vegetation.
- b) The second area is the thinning peat abutting the terrace. This area is roughly marked out by the area of W6 *Alnus-Urtica* woodland and potentially by the Stand B grassland. This area is likely to have limited potential for restoring to wetland *per se*, but increases the area of transitional habitat on the valley margin under nature conservation management.
- c) The third area is defined by the deep peats grading through Stand B to Stand A. The potential for enhancing this area is likely to be dependent upon similar approaches to those employed on Parker's Piece, Bleyswyck's Bank and Webb's Fen. On these sites, shallow excavation to remove a proportion of the earthy peat topsoil is undertaken to allow the encroachment of a wetland flora, ideally without permitting the dominance of tussock species.

6. VEGETATION MONITORING PROGRAMME – FIELDWORK REPORT

Fieldwork to establish the permanent plots and undertake the initial vegetation survey was undertaken on 11th June 2017.

6.1 Locating the Monitoring Plots

Monitoring plots were established in the two grassland units described in section 3.2 as Stand A - Alluvial Meadow and Stand B – Ordinary Damp Meadow, following Ratcliffe (1977). The plots were readily established using the method given in the Monitoring Plan; each plot is 10 m x 10 m in size, and lies between two permanent marker posts. The post locations were established using temporary marker posts placed near the edge of each grassland unit. These posts were subsequently replaced by permanent posts by LOHP. The location of the permanent marker posts is given in Figure 4. 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, as indicated in Table 7.

Figure 4. Location of permanent marker posts

Source: Map data c 2017 Google Imagery, GigitalGlobe, Getmapping plc, Infoterra Ltd & Bluesky



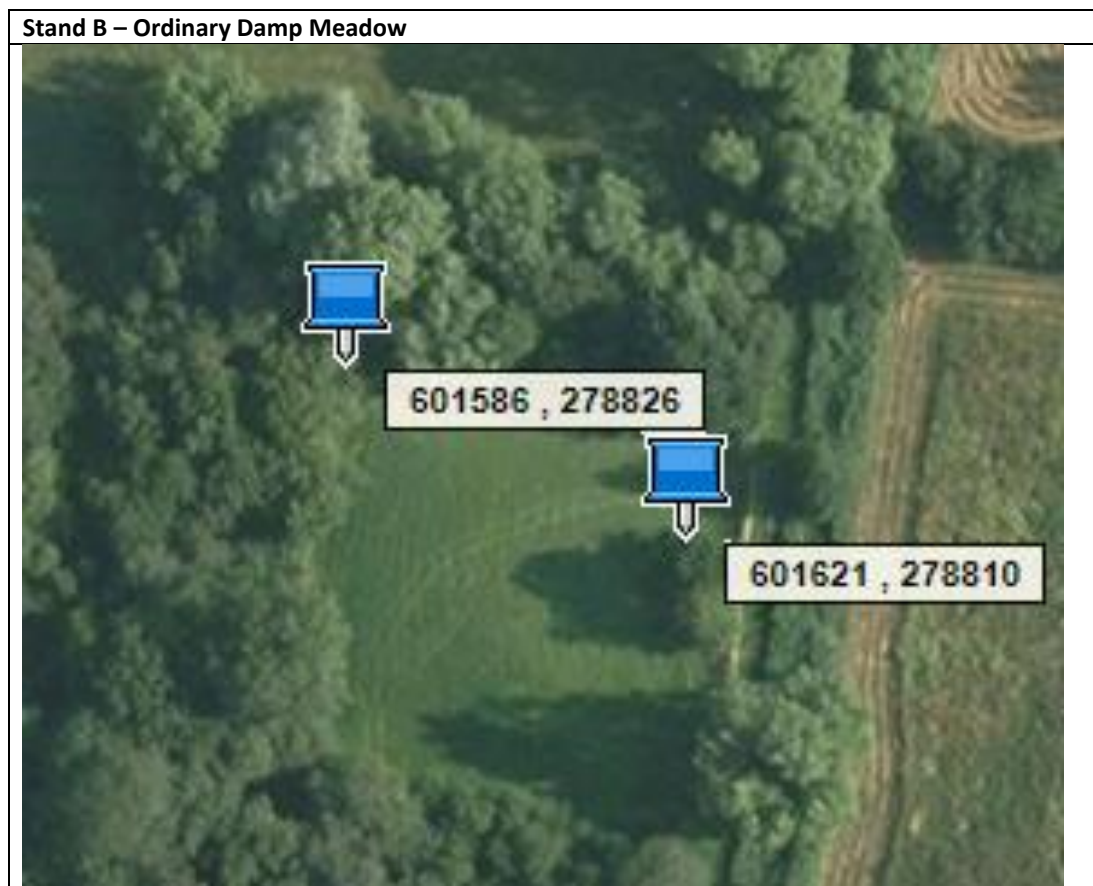


Table 7. Details of permanent monitoring plot locations

VEGETATION TYPE	PLOT CODE	MARKER POSTS	Marker Post Location	EASTING	NORTHING	Plot location
Alluvial Meadow	E01	E01-01	This post is free-standing along the southern margin of Stand A, close to the ditch junction between the woodlot and Middle Fen	601566	278854	The southwest corner of the plot is 25 metres north of E01-01
		E01-02	This post is almost due north of marker post E01-01, close to the northern margin of Stand A.	601586	278810	
Ordinary Damp Meadow	E02	E02-01	This post is free-standing on the margin of Stand B close to mature hazel stools.	601586	278826	The northwest corner of the plot is 5 metres east of E02-01
		E02-02	This post is free-standing beneath the canopy of an oak near the boundary with the track.	601621	278810	

6.2 Monitoring Plot Report – E01 Alluvial Meadow 2017

Plot code	E01 Alluvial Grassland
Treatment type	Summary of preceding Monitoring Plot Report
Alluvial Meadow	This is the initial Monitoring Plot Report

Vegetation structure

- In 2017, the ground surface was predominantly moist, with no surface saturation or surface water.
- Thick plant litter was scattered and limited to strewn hay cuttings, and no bryophyte cover or few seedlings were present.
- The sward structure was very grassy, comprising thick tufts and small tussocks; Rough Meadow-grass was particularly abundant between tussocks. Prolific flowering from Yorkshire Fog and a thin supra-canopy of Meadow Foxtail flowering stems. Abundant Reed Canary-grass shoots from rhizome extension. Woody seedlings are rare and saplings absent.

Floristics

- This is a grass-dominated sward, with Creeping Bent, Yorkshire Fog and Rough Meadow-grass abundant throughout. Perennial Ryegrass and Reed Canary grass are abundant on the south and north side of the plot, respectively.
- The terrestrial form of Amphibious Bistort occurs throughout the stand, with scattered Wild Angelica and very few other herbs. These species indicate periodic topsoil saturation rather than long periods of waterlogging during the growing season. Wild Angelica is a relatively weak 'fen indicator', but with Amphibious Bistort and Reed Canary-grass, indicates the potential to transition to a form of fen meadow.
- There are no negative indicators.

Summary of records and events

- Not available at the time of reporting.
- Field evidence suggests that the sward had not been recently disturbed; no evidence of wheel-ruts, hoof-prints or dunging. Occasional lagomorph grazing around the field edge, and thinly scattered mole hills.

Relation to past and target conditions

- This survey initiates the Vegetation Monitoring Programme and provides a baseline for assessing subsequent meadow vegetation development.
- Vegetation characters suggest that the plot can be regarded as a grass-dominated Alluvial Meadow, with Amphibious Bistort, Reed Canary-grass and Wild Angelica indicating periodic topsoil saturation. Thick growth of Rough Meadow-grass may be a significant factor in reducing the potential for colonisation by wet grassland and fen meadow species.

Plot code E01

Photographic Record 2017



Monitoring Plot Field Form – Vegetation structural characters

Monitoring Plot	E01 Alluvial Meadow
Recorder	Jonny Stone
Survey Date	11th June 2017

Character of the ground surface

- The ground surface was fairly firm and composed of typically moist to slightly damp black, earthy structureless peat.
- The ground surface was planar with a tilth; a very slight slope south to north grades from a slightly raised area towards a gentle hollow. No hoof-prints or wheel tracks evident.

Soil wetness

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

ATTRIBUTE		SAMPLE from each plot quarter				AVERAGE
		1	2	3	4	
Layer height	Standing water (cm)	0	0	0	0	0 cm
	Plant litter (cm)	1	2	4	3	2.5 cm
	Woody seedlings (cm)	0	6	0	0	1.5 cm
	Large sedges / rushes (cm)	0	0	0	0	0 cm
	Reed-like grasses (cm)	8	0	10	8	6.5 cm
	Woody saplings (cm)	0	0	0	0	0 cm
Cover value	Standing water (%)	0	0	0	0	0 %
	Trampling (%)	0	0	0	0	0 %
	Dunging (%)	0	0	0	0	0 %
	Bare ground (%)	5	10	5	5	6.3 %
	Plant litter (%)	1	1	10	10	5.5 %
	Bryophytes (%)	0	0	0	0	0 %
	Woody seedlings (%)	0	1	0	0	0.3 %
	Large sedges / rushes (%)	0	0	0	0	0 %
	Reed-like grasses (%)	5	0	15	25	11.3 %
	Woody saplings (%)	0	0	0	0	0 %

6.3 Monitoring Plot Report – E02 Ordinary Damp Meadow 2017

Plot code	E02 – Ordinary Damp Meadow
Treatment type	Summary of preceding Monitoring Plot Report
Ordinary Damp Meadow	This is the initial Monitoring Plot Report

Vegetation structure

- The ground surface was dry, quite firm and composed of black, earthy structureless peat.
- Thick plant litter, although present, was thinly scattered and accounted for c.10 per cent plot cover. Very little bare ground was evident when viewed from above the sward canopy, and what there was (c.5-10 per cent) occurs between the thick tufts and small tussocks.
- The dominant grasses and Hairy Sedge present an even cover with little structural variation; herbs are rare. Woody seedlings are rare and saplings absent.

Floristics

- The dense, grassy cover is dominated by Yorkshire Fog, over scattered Rough Meadow-grass and Creeping Bent. In this part of the field, single shoots of Hairy Sedge are frequent. Tufts of Timothy are scattered throughout.
- Herbs are rare in the plot and its surroundings, the most frequent being the occasional Marsh Thistle. Bryophytes are absent.
- Woody plants are rare and there are no other negative indicators.

Summary of records and events

- In autumn 2016, a sinuous strip was rotovated and vegetation cut from SWT Theltham Middle Fen strewn.
- Field evidence suggests that the sward had not been recently disturbed; no evidence of wheel-ruts, hoof-prints or dunging. Occasional lagomorph grazing around the field edge, and thinly scattered mole hills.

Relation to past and target conditions

- This survey initiates the Vegetation Monitoring Programme and provides a baseline for assessing subsequent meadow vegetation development.
- Vegetation characters suggest that the plot can be regarded as a grass-dominated Ordinary Damp Meadow With no species indicating more than occasional topsoil saturation, borne out by occasional tussocks of Soft Rush elsewhere in the stand. Thick growth of Rough Meadow-grass may be a significant factor in reducing the potential for colonisation by wet grassland species.

Plot code E02

Photographic Record 2017



Monitoring Plot Field Form – Vegetation structural characters

Monitoring Plot	E02 Ordinary Damp Meadow
Recorder	Jonny Stone
Survey Date	11th June 2017

Character of the ground surface

- The ground surface was dry, quite firm and composed of black, earthy structureless peat; a faint tilth gives very little structure to the otherwise smooth surface.
- The plot is located in a slightly lower part of a very gentle slope rising to the southeast.

Soil wetness

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

ATTRIBUTE		SAMPLE from each plot quarter				AVERAGE
		1	2	3	4	
Layer height	Standing water (cm)	0	0	0	0	0 cm
	Plant litter (cm)	2	2	3	2	2.3 cm
	Woody seedlings (cm)	8	0	0	0	2 cm
	Large sedges / rushes (cm)	0	0	0	0	0 cm
	Reed-like grasses (cm)	0	0	0	0	0 cm
	Woody saplings (cm)	0	0	0	0	0 cm
Cover value	Standing water (%)	0	0	0	0	0 %
	Trampling (%)	0	0	0	0	0 %
	Dunging (%)	0	0	0	0	0 %
	Bare ground (%)	5	10	5	5	6.3 %
	Plant litter (%)	10	15	10	10	11.3 %
	Bryophytes (%)	0	0	0	0	0 %
	Woody seedlings (%)	1	0	0	0	0.3 %
	Large sedges / rushes (%)	0	0	0	0	0 %
	Reed-like grasses (%)	0	0	0	0	0 %
Woody saplings (%)	0	0	0	0	0 %	

6.4 Interpretation of the Monitoring Plot surveys

The two monitoring plots were established in each grassland stand in locations intended to represent both the typical characters of each sward and also an area that would be sensitive to some combination of management and hydrological influence. The general lack of negative indicators in both swards is reflected in the floristic composition of the plots.

The current sward characters of both plots are summarised below. As is evident from their floristic composition, these are grass-dominated grassland plots which would be described as 'poor semi-improved grasslands' in the JNCC Phase 1 Habitat Survey classification.

The abundance of Rough Meadow-grass, in particular, is indicative of the fertile conditions of drained fen peats, and consistent with the small suite of species – notably in Stand A - that are associated with periodic saturation of the topsoil.

Plot E01 Alluvial Meadow

This plot is located on a floristically typical area of Stand A, away from a stand of Reed Canary Grass and obvious topographical lows and highs; floristics indicate the plot grades from fresh to moist soils. As in the rest of the stand, this is a grass-dominated sward, with Creeping Bent, Yorkshire Fog and Rough Meadow-grass abundant. The terrestrial form of Amphibious Bistort occurs throughout the stand, with scattered Wild Angelica and very few other herbs. These species indicate periodic topsoil saturation rather than long periods of waterlogging during the growing season.

Vegetation characters suggest that the plot can be regarded as a grass-dominated Alluvial Meadow, with Amphibious Bistort, Reed Canary-grass and Wild Angelica indicating periodic topsoil saturation. Thick growth of Rough Meadow-grass may be a significant factor in reducing the potential for colonisation by wet grassland and fen meadow species.

Field evidence suggests that the sward had not been recently disturbed; no evidence of wheel-ruts, hoof-prints or dunging. Occasional lagomorph grazing around the field edge, and thinly scattered mole hills.

Plot E02 Ordinary Damp Meadow

This plot is situated in what appears to be a slightly lower part of this small field (Stand B). It receives more sunlight than the overshadowed area to the south. As in the rest of the sward, this is a grass-dominated grassland, with Yorkshire Fog particularly abundant. Hairy Sedge occurs throughout; there are very few herbs.

Vegetation characters suggest that the plot can be regarded as a grass-dominated Ordinary Damp Meadow with no species indicating more than occasional topsoil saturation, borne out by occasional tussocks of Soft Rush elsewhere in the stand. Thick growth of Rough Meadow-grass may be a significant factor in reducing the potential for colonisation by wet grassland species.

Field evidence suggests that the sward had not been recently disturbed; no evidence of wheel-ruts, hoof-prints or dunging. Occasional lagomorph grazing around the field edge, and thinly scattered mole hills.

6.5 Recommendations of the Vegetation Monitoring Programme

It is recommended that:

1. ***The Vegetation Monitoring Programme is adopted*** at Oak Tree Fens by those responsible for ensuring appropriate management of the grasslands. This first Fieldwork Report provides details of the successful installation of the permanent plot markers, and the completion of a baseline survey of each plot using the 'full' survey method (photographs, physiognomy and floristics). The Monitoring Plan (ELP 2010) proposes several means to integrate vegetation monitoring as a management decision-making tool.
2. ***Target conditions for each sward should be devised***, based on the initial descriptions of grassland types and character given in the Fieldwork Report - supplemented by the NVC survey. Target conditions should reflect the restoration approaches to be employed, and management capacity. As indicated in the report, the presence of a small group of 'fen transition' species in Stand A (absent in Stand B) suggests that a form of fen meadow can be targeted through appropriate management, particularly if this approach is supplemented by lowering the ground level by shallow excavations, at least in a proportion of Stand A. In Stand B (as in Stand A) lower levels of topsoil fertility may be sought, particularly if this approach increases the levels of skylight reaching the soil surface, in order to enhance species colonization. In both stands, enhancing plant species-richness may require supplementary seeding from similar local grasslands, as was initiated in summer 2016.
3. ***Monitoring surveys should be repeated regularly***, and the results incorporated into management decision-making. As recommended in the Monitoring Plan, the 'rapid survey' technique (plot photographs) is a useful annual device to assess gross changes in the sward. This should ideally be supplemented by a rapid walkover survey to identify the presence of colonising plant species, particularly when these can be interpreted as indicators of positive (or negative) change. The 'full survey' should provide a summative statement of the floristic and physiognomic changes that have occurred over a period of several years, and should be integrated into a periodic review of restoration progress.

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Appendix 1. NVC SAMPLE PLOT NATIONAL GRID REFERENCES

Plot	Easting	Northing	NVC code
A1	601534	278877	MG15a
A2	601549	278903	MG15a
A3	601596	278894	MG15a
A4	601580	278878	MG15a
A5	601603	278867	MG15a
A6	601554	278866	MG15a
B1	601591	278820	MG7b
B2	601593	278794	MG7b
B3	601617	278788	MG7b
B4	601606	278806	MG7b
B5	601618	278814	MG7b
C1	601571	278812	W6d
C2	601600	278764	W6d
C3	601590	278724	W5a
C4	601560	278718	W5a
C5	601564	278772	W5a

Appendix 2. SPECIES RECORDED IN NVC SAMPLE PLOTS

<i>Agrostis stolonifera</i>	Creeping Bent
<i>Alliaria petiolata</i>	Garlic Mustard
<i>Alnus glutinosa</i>	Alder
<i>Alopecurus pratensis</i>	Meadow Foxtail
<i>Angelica sylvestris</i>	Wild Angelica
<i>Arrhenatherum elatius</i>	False Oat-grass
<i>Betula pubescens</i>	Downy Birch
<i>Carex acutiformis</i>	Lesser Pond-sedge
<i>Carex elata</i>	Tufted-sedge
<i>Carex hirta</i>	Hairy Sedge
<i>Carex remota</i>	Remote Sedge
<i>Carex riparia</i>	Greater Pond-sedge
<i>Cerastium fontanum</i>	Common Mouse-ear
<i>Cirsium palustre</i>	Marsh Thistle
<i>Corylus avellana</i>	Hazel
<i>Crataegus monogyna</i>	Hawthorn
<i>Deschampsia cespitosa</i>	Tufted Hair-grass
<i>Elytrigia repens</i>	Common Couch
<i>Eupatorium cannabinum</i>	Hemp Agrimony
<i>Fraxinus excelsior</i>	Ash
<i>Geranium robertianum</i>	Herb Robert
<i>Glechoma hederacea</i>	Ground Ivy
<i>Hedera helix</i>	Ivy
<i>Holcus lanatus</i>	Yorkshire Fog
<i>Hypericum tetrapterum</i>	Square-stemmed St John's-wort
<i>Iris pseudacorus</i>	Flag Iris
<i>Juncus effusus</i>	Soft Rush
<i>Lolium perenne</i>	Perennial Ryegrass
<i>Lonicera periclymenum</i>	Honeysuckle
<i>Lythrum salicaria</i>	Purple Loosestrife
<i>Mentha aquatica</i>	Water Mint
<i>Persicaria amphibia emersa</i>	Amphibious Bistort (land form)
<i>Phalaris arundinacea</i>	Reed Canary-grass
<i>Phleum pratense</i>	Timothy
<i>Phragmites australis</i>	Common Reed
<i>Plantago lanceolata</i>	Ribwort Plantain
<i>Poa trivialis</i>	Rough Meadow-grass
<i>Prunus spinosa</i>	Blackthorn
<i>Quercus robur</i>	Pedunculate Oak
<i>Ranunculus repens</i>	Creeping Buttercup
<i>Rhamnus cathartica</i>	Buckthorn
<i>Ribes nigrum</i>	Black Currant
<i>Ribes rubrum</i>	Red Currant
<i>Rosa canina</i> agg	Common Dog-rose
<i>Rubus fruticosus</i> agg	Bramble
<i>Salix cinerea</i>	Grey Willow
<i>Sambucus nigra</i>	Elder
<i>Silene dioica</i>	Red Campion
<i>Solanum dulcamara</i>	Bittersweet

<i>Sonchus arvensis</i>	Perennial Sow-thistle
<i>Stellaria media</i>	Common Chickweed
<i>Taraxacum officinale</i> agg	Dandelion
<i>Trifolium repens</i>	White Clover
<i>Urtica dioica</i>	Common Nettle
<i>Valeriana dioica</i>	Marsh Valerian
Bryophytes	
<i>Amblystegium serpens</i>	Creeping Feather-moss
<i>Brachythecium rutabulum</i>	Rough-stalked Feather-moss
<i>Fissidens taxifolius</i>	Great Pocket-moss
<i>Kindbergia praelonga</i>	Common Feather-moss
<i>Lophocolea bidentata</i> sl	Bifid Crestwort
<i>Mnium hornum</i>	Swan's-neck Thyme-moss
<i>Oxyrrhynchium hians</i>	Swartz's Feather-moss
<i>Pellia endiviifolia</i>	Endive Pellia
<i>Plagiomnium undulatum</i>	Hart's-tongue Thyme-moss

Appendix 3. NVC GRASSLAND COMMUNITIES

MG15a *Alopecurus pratensis*–*Poa trivialis*–*Cardamine pratensis* grassland, *Agrostis stolonifera* sub-community

Plot	A1	A2	A3	A4	A5	A6		
<i>Poa trivialis</i>	9	8	9	9	8	8	V	(8-9)
<i>Holcus lanatus</i>	7	8	8	5	7	7	V	(5-8)
<i>Agrostis stolonifera</i>	5	5	4	7	8	7	V	(4-8)
<i>Phleum pratense</i>	5	4	2	6	3	2	V	(2-6)
<i>Lolium perenne</i>	4	2	4	3	2	6	V	(2-6)
<i>Alopecurus pratensis</i>	5	4	4	1	2	3	V	(1-5)
<i>Persicaria amphibia emersa</i>	2	3	3	2	1	4	V	(1-4)
<i>Ranunculus repens</i>		2	1	1			III	(1-2)
<i>Taraxacum officinale</i> agg				2	1	2	III	(1-2)
<i>Cerastium fontanum</i>			1	1	1		III	(1)
<i>Arrhenatherum elatius</i>	1			1			II	(1)
<i>Ranunculus acris</i>		1			1		II	(1)
<i>Deschampsia cespitosa</i>		5					I	(5)
<i>Phalaris arundinacea</i>						4	I	(4)
<i>Trifolium repens</i>						2	I	(2)
<i>Elytrigia repens</i>			1				I	(1)
<i>Carex hirta</i>	1						I	(1)
<i>Quercus robur</i> seedling	1						I	(1)
<i>Cardamine pratensis</i>		1					I	(1)
<i>Sonchus arvensis</i>					1		I	(1)
<i>Angelica sylvestris</i>						1	I	(1)
<i>Trifolium pratense</i>						1	I	(1)
Sward height (cm)	30	35	40	40	40	50		
Sward cover (%)	95	100	100	100	95	100		
Bryophyte cover (%)	0	0	0	0	0	0		
Plant litter cover (%)	1	1	1	1	1	5		
Bare ground (%)	10	10	5	10	10	5		
No. of species	10	11	10	11	11	12	Av.	10.8

MG7b *Lolio-Plantaginion* Sissingh 1969 p.p., *Lolium perenne* – *Poa trivialis* leys

Plot	B1	B2	B3	B4	B5		
<i>Poa trivialis</i>	8	8	6	8	7	V	(6-8)
<i>Holcus lanatus</i>	6	7	7	6	8	V	(6-8)
<i>Phleum pratense</i>	5	2	4	4	2	V	(2-5)
<i>Agrostis stolonifera</i>	4	3	4	3	1	V	(1-4)
<i>Lolium perenne</i>	1	3		1	2	IV	(1-3)
<i>Carex hirta</i>	4		2		2	III	(2-4)
<i>Alopecurus pratensis</i>	3	4	1			III	(1-4)
<i>Cerastium fontanum</i>		1		1	1	III	(1)
<i>Trifolium repens</i>	1				1	II	(1)
<i>Juncus effusus</i>			1	1		II	(1)
<i>Cirsium palustre</i>			1	1		II	(1)
<i>Ranunculus repens</i>		1				I	(1)
<i>Plantago lanceolata</i>				1		I	(1)
<i>Quercus robur</i> seedling	1					I	(1)
Sward height (cm)	40	35	38	40	37		
Sward cover (%)	95	100	90	95	95		
Bryophyte cover (%)	0	0	0	0	0		
Plant litter cover (%)	15	10	5	5	5		
Bare ground (%)	5	5	10	5	5		
No. of species	9	8	8	9	8	Av.	8.4

Appendix 4. NVC WOODLAND COMMUNITIES

W5a *Alnus glutinosa* – *Carex paniculata* woodland, *Phragmites australis* sub-community

	3	4	5		
Canopy trees					
<i>Alnus glutinosa</i>	5	7	6	3	(5-7)
<i>Fraxinus excelsior</i>	5	4	6	3	(4-6)
<i>Betula pubescens</i>	1		1	2	(1)
<i>Quercus robur</i>	4			1	(4)
Sub-canopy and shrubs					
<i>Salix cinerea</i>	4	5	6	3	(4-6)
<i>Rubus fruticosus</i> agg	1	1	3	3	(1-3)
<i>Ribes nigrum</i>		2	4	2	(2-4)
<i>Crataegus monogyna</i>	1		4	2	(1-4)
<i>Salix cinerea</i> sapling	1	1		2	(1)
<i>Ribes rubrum</i>	1		1	2	(1)
<i>Rosa canina</i> agg	1		1	2	(1)
<i>Rhamnus cathartica</i>			1	1	(1)
Field layer					
<i>Carex riparia</i>	7	8	8	3	(7-8)
<i>Iris pseudacorus</i>	5	5	4	3	(4-5)
<i>Eupatorium cannabinum</i>	2	4	3	3	(2-4)
<i>Urtica dioica</i>	5	2	4	3	(2-4)
<i>Carex acutiformis</i>	2	2	4	3	(2-4)
<i>Carex elata</i>	1	5	2	3	(1-5)
<i>Cirsium palustre</i>	2	1	2	3	(1-2)
<i>Phragmites australis</i>		4	2	2	(2-4)
<i>Solanum dulcamara</i>		2	1	2	(1-2)
<i>Lythrum salicaria</i>		2		1	(2)
Ground layer					
<i>Mentha aquatica</i>	4	2	1	3	(1-4)
<i>Ranunculus repens</i>	1	1	1	3	(1)
<i>Poa trivialis</i>	2		3	2	(2-3)
<i>Hypericum tetrapterum</i>		1	1	2	(1)
<i>Lonicera periclymenum</i>			2	1	(2)
<i>Valeriana dioica</i>		2		1	(2)
<i>Geranium robertianum</i>			1	1	(1)
<i>Hedera helix</i>	1			1	(1)
<i>Carex remota</i>	1			1	(1)
Bryophytes					
<i>Brachythecium rutabulum</i>	4	2	4	3	(2-4)
<i>Eurhynchium praelongum</i>	2	1	2	3	(1-2)
<i>Mnium hornum</i>	1		2	2	(1-2)
<i>Plagiomnium undulatum</i>	1	1		2	(1)
<i>Pellia endiviifolia</i>		3		1	(3)
<i>Lophocolea bidentata</i> sl		2		1	(2)
<i>Amblystegium serpens</i>	1			1	(1)
No. of species	27	25	28	Av.	26.7

W6 *Alnus glutinosa* – *Urtica dioica* woodland, *Sambucus nigra* sub-community

	1	2		
Canopy trees				
<i>Quercus robur</i>	4	5	2	(4-5)
<i>Alnus glutinosa</i>		4	1	(4)
<i>Fraxinus excelsior</i>		4	1	(4)
<i>Betula pubescens</i>	4		1	(4)
Sub-canopy and shrubs				
<i>Salix cinerea</i>	7	6	2	(6-7)
<i>Corylus avellana</i>	6	4	2	(4-6)
<i>Rubus fruticosus</i> agg	2	2	2	(2)
<i>Sambucus nigra</i>	2	2	2	(2)
<i>Rosa canina</i> agg	1	2	2	(1-2)
<i>Crataegus monogyna</i>	4		1	(4)
<i>Prunus spinosa</i>		1	1	(1)
<i>Ribes rubrum</i>	1		1	(1)
Field layer				
<i>Urtica dioica</i>	6	7	2	(6-7)
<i>Carex riparia</i>	2		1	(2)
<i>Cirsium palustre</i>		1	1	(1)
<i>Solanum dulcamara</i>		1	1	(1)
<i>Juncus effusus</i>	1		1	(1)
Ground layer				
<i>Poa trivialis</i>	3	4	2	(3-4)
<i>Geranium robertianum</i>	4	3	2	(3-4)
<i>Glechoma hederacea</i>	3	2	2	(2-3)
<i>Hedera helix</i>	1	2	2	(1-2)
<i>Silene dioica</i>	2	2	2	(2)
<i>Alliaria petiolata</i>	2	2	2	(2)
<i>Ranunculus repens</i>	1		1	(1)
<i>Hypericum tetrapterum</i>		1	1	(1)
<i>Lonicera periclymenum</i>		1	1	(1)
<i>Carex remota</i>		1	1	(1)
<i>Stellaria media</i>	1		1	(1)
Bryophytes				
<i>Kindbergia praelonga</i>	4	4	2	(4)
<i>Brachythecium rutabulum</i>		4	1	(4)
<i>Oxyrhynchium hians</i>	2		1	(2)
<i>Fissidens taxifolius</i>	2		1	(2)
<i>Amblystegium serpens</i>		1	1	(1)
No. of species	23	24	Av.	23.5

Appendix 5. FIELD RECORD FOR E01 ALLUVIAL GRASSLAND MONITORING PLOT P = present in sub-plot

Sub-plots	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	2017	
<i>Agrostis stolonifera</i>	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	20
<i>Panicum amphibia</i>	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	20
<i>Holcus lanatus</i>	P	P	P	P	P	P	P	P	P	P	P	P		P	P	P	P	P	P	P	P	19
<i>Poa trivialis</i>	P	P	P	P	P	P	P	P	P	P	P			P	P	P	P	P	P	P	P	19
<i>Lolium perenne</i>	P	P	P	P	P	P	P	P	P		P			P				P	P	P		14
<i>Phalaris arundinacea</i>	P	P									P	P	P	P	P	P	P	P	P	P	P	12
<i>Angelica sylvestris</i>		P				P															P	3
<i>Alopecurus pratensis</i>			P									P										2
<i>Phleum pratense</i>							P				P											2
<i>Trifolium repens</i>				P																		1
<i>Taraxacum</i> sp.					P																	1
<i>Quercus robur</i> seedling										P												1
No. of species	6	7	6	6	6	6	6	5	5	5	7	5	5	5	5	5	6	6	6	6	6	Av. 5.7

Appendix 6. FIELD RECORD FOR E02 ORDINARY DAMP GRASSLAND MONITORING PLOT P = present in sub-plot

Sub-plots	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	2017
<i>Holcus lanatus</i>	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	20
<i>Carex hirta</i>	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	20
<i>Poa trivialis</i>	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P		P	P	P	19
<i>Agrostis stolonifera</i>		P	P		P		P	P	P	P	P	P		P	P		P	P	P	P	15
<i>Phleum pratense</i>				P	P	P		P	P			P	P	P			P	P			11
<i>Cirsium palustre</i>						P				P											2
<i>Trifolium repens</i>															P						1
<i>Cerastium fontanum</i>																			P		1
<i>Quercus robur</i> seedling		P																			1
No. of species	3	5	4	4	5	5	4	5	5	5	4	5	4	5	5	5	3	5	5	4	Av. 4.5