Fieldwork to Support Habitat Restoration Work at Bleyswycks Bank, Thelnetham

NVC survey and 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). Bleyswycks Bank, Thelnetham is situated on the southern bank of the River Little Ouse and is contiguous with units of the Blo'Norton and Thelnetham Fens SSSI at Parker's Piece and the newly-named Oak Tree Fen. The recently restored Webb's Fen lies to the east.

2. LOHP has requested that a National Vegetation Classification survey is carried out following a period of site restoration treatments, and that the two permanent monitoring plots established in 2009 at the start of the Vegetation Monitoring Programme are re-surveyed. The objective of this second survey is to assess the changes that have occurred in the structure and composition of the restored vegetation since 2009.

3. Three terrestrial vegetation communities were identified from the peat-scraped centre of Bleyswycks Bank. The main area of rushy vegetation is assigned to the MG10b *Holco-Juncetum effusi* Page 1980*, Juncus inflexus* sub-community, though it should be noted that the community also supports a number of fenland species. On its southern margin, grading out of the scraped area, is the OV28a *Agrostio-Ranunculetum repentis* Oberdorfer et al. 1967*, Polygonum hydropiper-Rorippa sylvestris* sub-community, with patches of the S18 *Caricetum otrubae* Mirza 1978.

4. The more deeply-dug excavation in this area is still a small waterbody and the remaining area of open water continues to support the two stonewort species recorded by Nick Stewart in 2010. Small swamp stands are also present: S12a *Typhetum latifoliae* swamp, *Typha latifolia* sub-community; S10a *Equisetetum fluviatile* swamp, *Equisetum fluviatile* sub-community; and S8a *Scirpetum lacustris* swamp, *Scirpus lacustris* ssp. *lacustris* sub-community. The margin of the pond also supports Marsh Dock, a Locally Scarce plant in Suffolk; with the exception of the stoneworts, which are of local interest in the context of the headwater fens, no other notable plant species were recorded.

5. The permanent monitoring plots were re-located and re-surveyed on 17th July 2017. Both plots sample the 'Ordinary Wet Grassland' in the peat-scraped area that has developed into the Hard Rush sub-community of the MG10 Yorkshire Fog-Soft Rush rush-pasture. Wet and dry facies were recognised, particularly in Plot B-02, and the presence of several types of fenland species were noted.

6. The advancement of sward characters in the monitoring plots since 2009 suggests that the type and intensity of management has been maintained in a near-ideal regime, in that the rush-pasture retains short-sward gaps and tall species – including Common Reed – have not been allowed to develop. It is proposed that, in coming years, an additional management target should be to ensure that colonization continues to occur, by preventing further coalescence of the rush-sedge tussocks. In time, it is anticipated that fen-meadow species will then colonize where substrate characters are suitable.

7. The Fieldwork Report makes three recommendations, that:

   a) The Vegetation Monitoring Programme is maintained at Bleyswycks Bank as an aid to management decision-making;

b) The means of achieving target conditions for each sward should be reviewed, to prevent dominance by rushes and the prevalence of trampling and lodging, and also to enhance natural processes of colonization by fen species.

c) Monitoring surveys should be repeated regularly, and the results incorporated into the management decision-making process.

CONTENTS

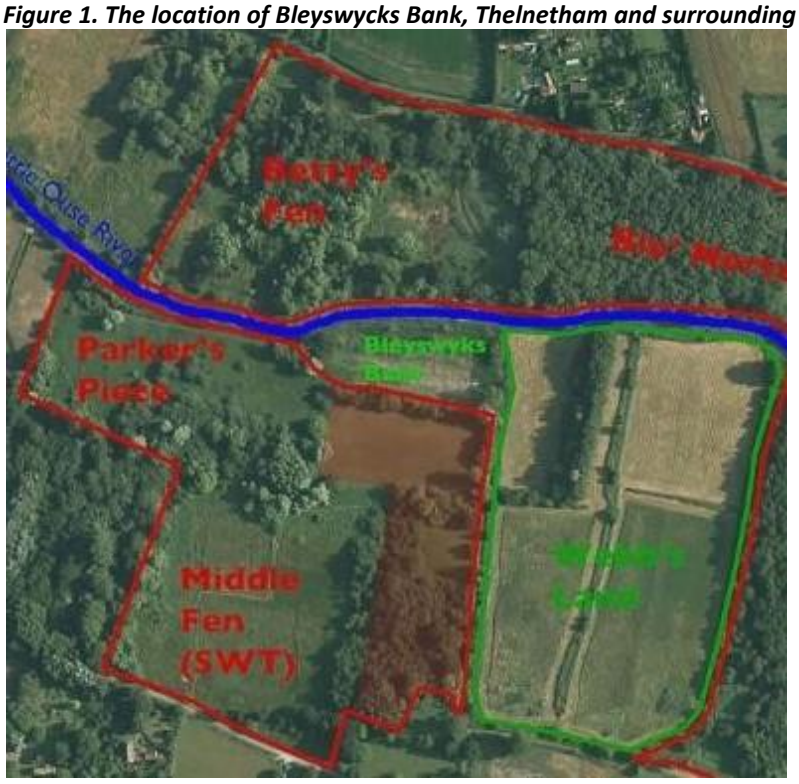
1. INTRODUCTION

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 a more extensive habitat, for which East Anglia had one of the most important concentrations in Western Europe.

Bleyswycks Bank, Thelnetham is a 0.9 ha site purchased by LOHP in autumn 2007 and named after its former owner. As shown in Figure 1, The Bank is situated on the southern bank of the River Little Ouse and is contiguous with units of the Blo'Norton and Thelnetham Fens SSSI at Parker's Piece and the newly-named Oak Tree Fen. The recently restored Webb's Fen lies to the east. In 2008, Bleyswycks Bank was cleared of a tree nursery and the central part of the site was cleared of stumps and degraded peat to a depth of c.20 cm and allowed to re-colonise (LOHP 2012).

Figure 1. The location of Bleyswycks Bank, Thelnetham and surrounding land



1.2 Survey requirements and objectives

Since the initial restoration of Bleyswycks Bank was carried out in 2008, a programme of restoration grazing has been carried out, guided by assessment of two permanent plots established at the start of the Fen Restoration Vegetation Monitoring Programme (OHES 2009, 2010), which provided a mechanism for assessing the effectiveness of management in meeting site restoration targets. From

2011, funding for the ongoing restoration work on Bleyswycks Bank has come from Natural England through a Higher Level Stewardship Scheme agreement[1].

The LOHP has requested that two vegetation surveys are carried out, a full NVC survey of the main habitats, and re-survey of the two permanent monitoring plots.

The first requirement is for a National Vegetation Classification (NVC) survey (Rodwell 1992-2000), with the objective of establishing the character of grassland and fen 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 re-survey the two monitoring plots established in 2009. This is a continuation of the Vegetation Monitoring Programme established on other LOHP sites and follows the Monitoring Plan field methodology (OHES 2010) with the objective of assessing the changes that may have occur in the structure and composition of the swards since 2009.

1.3 Survey reporting

Jonny Stone has been commissioned by LOHP to undertake these vegetation surveys on Bleyswycks Bank, Thelnetham. 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 re-survey of the established monitoring plots are given in the 2017 Fieldwork Report in section 6.

[1] HLS Agreement No. AG00357439 Date commenced: 01 October 2011

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 (e.g. Rodwell et al. 2007). The classification 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 'finer-grained' swards were sampled using 2 x 2m plots, and the 'coarser' rush-dominated vegetation by 4 x 4m plots, following Rodwell (2006). The general character of each plot was recorded by taking photographs of the vegetation 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.

All vascular plants are named following Stace (2010); the bryophyte flora follows Hill et al. (2008) and stoneworts John et al. (2002). Species recorded in NVC sample plots are listed in Appendix 2.

Field data was tabulated in Microsoft Excel, then grouped by floristic similarity to show the common and typical characters; each type was then compared with the published NVC accounts (Rodwell 1992-2000). This comparison was refined using the European phytosociological framework recently adopted by the International Association for Vegetation Science (Mucina et al. 2016). Field data is presented in Appendix 3.

2.2 Vegetation monitoring survey methodology

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

The methodology was applied at Bleyswycks Bank to re-locate and re-survey the permanent vegetation plots, with the following objectives:

1. To re-locate the permanent monitoring plots in specified habitat types and general locations, using the protocols developed in the Monitoring Plan.

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

3. To interpret the fieldwork results, and provide guidance on attaining the target conditions.

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 ground surface 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.

This second fieldwork report followed the prescriptions of the Monitoring Plan (OHES 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 4 and 5.

2.3 Limitations to the surveys

Both surveys were carried out in July 2017 at an optimal time of year for both grassland and fenland vegetation. No access issues were encountered. There were no limitations affecting the location of the NVC sample plots.

The locations of all permanent markers for the monitoring plots had been slightly adjusted by the installation of stock fencing and removal of tree stumps following the original installation of marker posts, but the locations of both permanent plots were re-located using the original geo-references without any issues.

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.

3. VEGETATION SURVEY RESULTS

3.1 Character of the survey area

The area including Bleyswycks Bank is shown on Hodskinson's Map of Suffolk in 1783 (Dymond 2003) as lying at the eastern end of Thelnetham Fen, though the precise geographical relation to the Blo'Norton-Thelnetham Lake Basin is not known (Tallentire 1969; West 2009). By 1885, the modern field layout is clearly shown on the Ordnance Survey Six-inch England and Wales series, 1842-1952[2], Suffolk XXIV.NW. The western boundary with Parker's Piece is marked by a substantial drain.

In the decades prior to purchase, the land has had a mixed management history, including arable cultivation, pig rearing, periods of fallow and most recently tree planting or abandonment. None of these practises benefited the nature conservation interest of the land which was once a part of the Thelnetham and Blo' Norton fens complex.

The topography, soils and hydrology of both Parker's Piece and Bleyswycks Bank were investigated during the development of a restoration proposal, which focused on scraping a layer of degraded peat from the surface (ELP 2008). Initial recovery by the vegetation, shown in Photo 1 below, produced a sward dominated by Creeping Buttercup and Rough Meadow-grass (OHES 2009). Subsequent management has permitted the development of rush-pasture over most of the scraped area, with scattered swamp, reed-fen and fen-meadow species, notably in the lower parts.

Photo 1. ***Bleyswyck Bank: vegetation recovery following peat scraping (November 2010)***

[2] 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 3rd January 2018)]

At the time of survey, the ground surface of the scraped peats was found to be slightly damp to saturated, following several months of normal rainfall levels[3]. The underlying peats varied from firm to soft.

3.2 NVC survey results

The walkabout survey identified six distinct vegetation types, as follows:

Stand A Inundation sward. This sward retains the low, creeping character of the vegetation recorded in the initial assessment of the recovering fen vegetation, with the addition of Creeping Bent, Soft Rush and False Fox-sedge. The Stand is located along the shallow southern margin of the peat-scraped area and in a separate lobe at the eastern end where a lawn dominated by the creeping White Clover has established. The rush and sedge are mostly present as isolated tussocks, but the sedge has coalesced into patches at the eastern end of the Stand shown in Figure 3.

Stand B Ordinary Wet Meadow. This stand has developed in the deeper bowl of the scraped area. Here mixed Hard, Soft and Jointed Rush tussocks are typically dominant, patches and individual tussocks over-growing a similar short-sward to that found in Stand A. Although the floristics are otherwise typical of rush-pasture, several fenland species are present.

Stand C Ordinary Damp Meadow. This stand occupies the river bank and unscraped areas of the survey area along the north and east sides. Here, the sward is very grassy, and Yorkshire Fog is frequently co-dominant with Creeping Bent; Perennial Ryegrass and Rough Meadow-grass occur through the sward. Although Soft Rush is often present, much of the taller vegetation found in the sward is composed of docks and Common Nettle. A mown form of the stand forms the grassy path between the stock-fence and the riparian strip, occupied by Stand D.

Stand D Tall Ruderal Reedbed. This unmanaged stand of Common Nettle and Common Reed forms a thin strip along the southern bank of the River Little Ouse.

Stand E Tall Ruderals. Nettle- and Creeping Thistle-dominated vegetation occurs in two separate stands. The western stand is largely overstood by oak trees; also partly shaded, the eastern stand is partly obscured by cut plant litter.

Pond vegetation. A small hollow has been excavated in the centre of Bleyswycks Bank. Initially colonised by rushes (as in Photo 1) the swamp vegetation has developed into patches of Reedmace, Water Horsetail and Common Club-rush. Open water is largely covered by stonewort growth.

As shown in ***Figure 2. Location of NVC sample plots***, 23 plots were selected from representative locations within Stands A-D. Sample plots are colour coded to each stand. 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.

The simple species-composition of Stand E did not require sampling, and it was not possible to separately sample the small patches of simple swamp and aquatic vegetation in the pond. The character of the vegetation in these stands is briefly described below.

[3] 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).

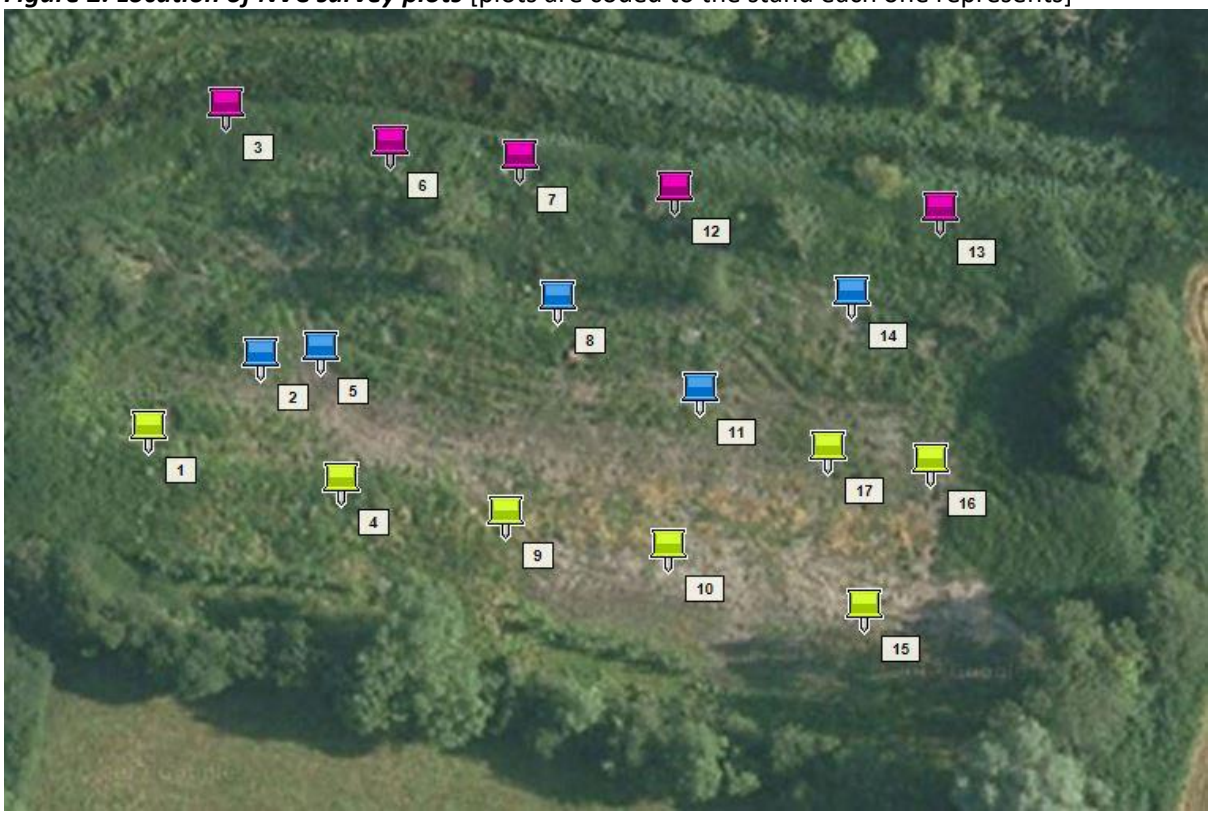
Including the small mono-specific stands of swamp plants recorded from the pond, ten NVC communities were identified in the survey, and are listed in Table 3. The terrestrial communities are shown in ***Figure 3. Location of NVC plant communities***. It should be noted that the pond, in particular, and also vegetation in Stands A and D, were allocated to more than one NVC type, as is the convention (Rodwell 2006).

Table 3. NVC communities recorded from The Lows, Blo'Norton

Stand	NVC code	Community title	Area (ha)
A	OV28a S18	*Agrostio-Ranunculetum repentis* Oberdorfer et al. 1967, *Polygonum hydropiper-Rorippa sylvestris* sub-community With patches of: *Caricetum otrubae* Mirza 1978	0.16
B	MG10b	*Holco-Juncetum effusi* Page 1980, *Juncus inflexus* sub-community	0.23
C	MG10a	*Holco-Juncetum effusi* Page 1980, *Typical* sub-community	0.33
D	OV24b S26b	*Urtica dioica-Galium aparine* community, *Arrhenatherum elatius-Rubus fruticosus* sub-community Grading into: *Phragmites australis-Urtica dioica* tall-herb fen, *Arrhenatherum elatius* sub-community	0.05
E	OV25a	*Urtica dioica-Cirsium arvense* community, *Holcus lanatus-Poa annua* sub-community (partly overstood with trees)	0.10
POND	S12a S10a S8a	*Typhetum latifoliae* swamp, *Typha latifolia* sub-community *Equisetetum fluviatile* swamp, *Equisetum fluviatile* sub-community *Scirpetum lacustris* swamp, *Scirpus lacustris* ssp. *lacustris* sub-community	0.01

Full floristic and physiognomic data tables for the sampled vegetation stands are given in Appendix 3.

Figure 2. Location of NVC survey plots [plots are coded to the stand each one represents]



Riparian plots

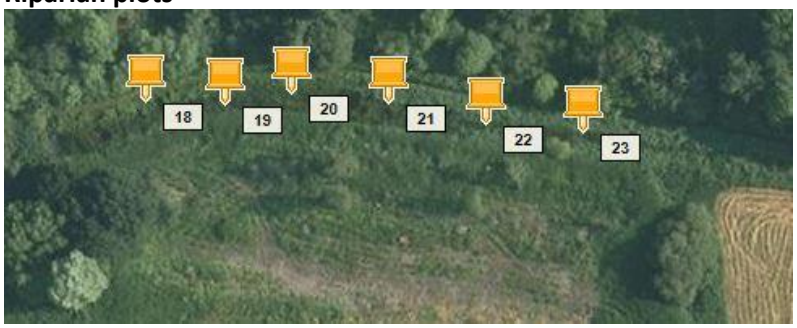
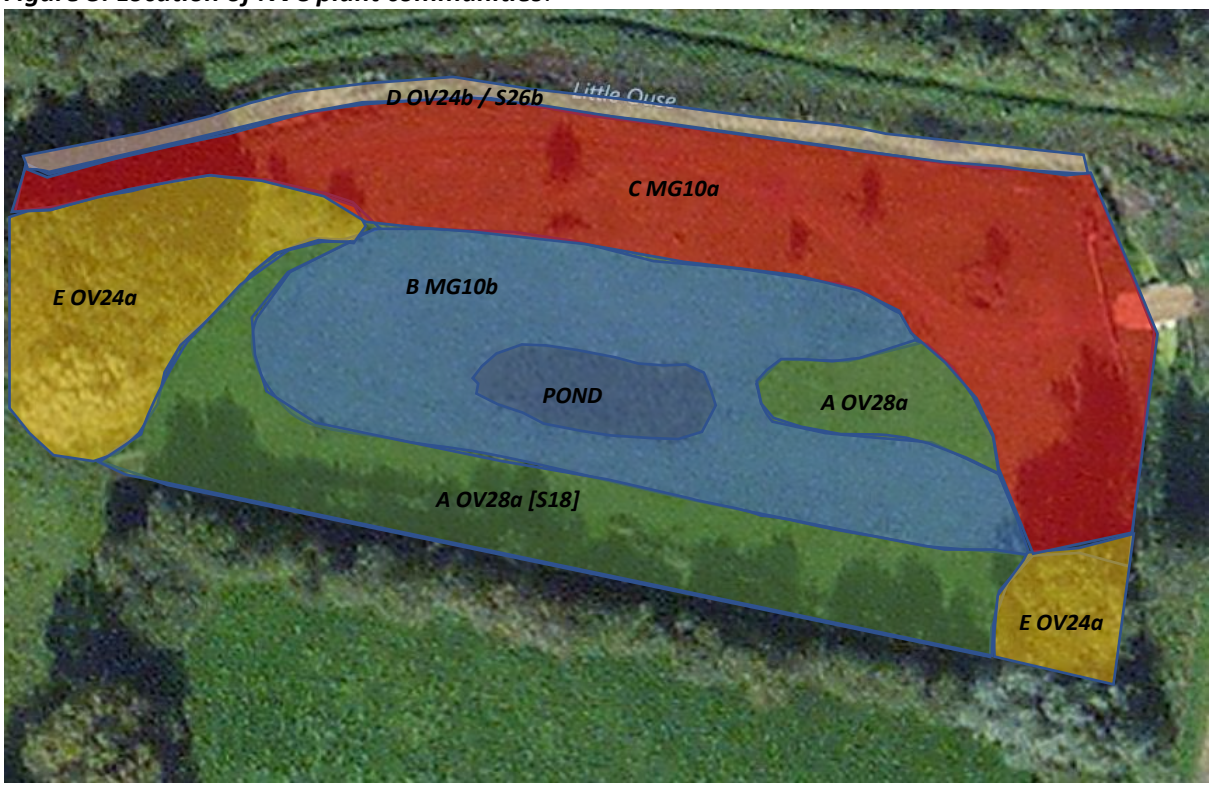


Figure 3. Location of NVC plant communities.



3.2.1 Synopsis of fenland communities (Stands A-D)

Stand A (Photo 2)***.*** The inundation sward is a simple matrix of creeping species with variable cover of Soft Rush and False Fox-sedge. In extensive patches, sward height is c. 5 cm high, but may be a short as 1 cm where White Clover has proliferated. Where the sedge is thinly spread, and the creeping lawn most extensive, the sward is best placed within **OV28a *Agrostio-Ranunculetum repentis* Oberdorfer et al. 1967, *Polygonum hydropiper-Rorippa sylvestris* sub-community**. This is a vegetation-type associated with hollows in damp pastures, where grazing plays a part in checking any seral change (Rodwell 2000, pp. 425-426). The spread of False Fox-sedge is favoured by flushed, heavy soils (Jermy et al. 2007) and this species occurs throughout. Where the large tussocks coalesce, these patches can be regarded as **S18 *Caricetum otrubae* Mirza 1978 swamp**.

Photo 2. Stand A Inundation sward – representative oblique view [13th July 2017]

Stand B (Photo 3)***.*** This rush-pasture occurs in an often sharply-defined stand adjacent to Stand A or abutting Stand C where a change in peat-excavation depth is still clearly evident. The presence of Soft Rush, which prefers neutral to acidic soil moisture, intermixed with Hard Rush (neutral to alkaline) is indicative of impeded drainage following the intrusion of river floodwater into the peat basin, supplemented by rainwater. The associate species are commonly found in a range of disturbed and fen habitats, but few are preferential for types of fen-meadow; of these, the more frequently occurring here are Jointed Rush and Purple Loosestrife. The sward is thus best located within the **MG10b *Holco-Juncetum effusi* Page 1980, *Juncus inflexus* sub-community**. Sward heights of the sample plots are c.40-45 cm, with an average species-richness of 16.0 species; these are quite average values for the set of rush-pasture samples used in constructing the National Vegetation Classification.

Stand C (Photo 4) is somewhat similar in composition to Stand B, though the contribution of rushes and fenland species is much lower and the sward typically contains a marked ruderal element. This is also a rush-pasture, but one with a simpler species-composition associated with damp, rather than wet soil conditions. It is placed within **MG10a *Holco-Juncetum effusi* Page 1980, Typical sub-community**, though it is also close to the *Lolio-Plantagion* community (MG7) found to the south. The sward height is typically c.15 cm tall, with an average species-richness of 11.6 species.

Stand D (Photo 5). The riparian strip, by contrast is unmanaged and much taller. Common Nettle is often abundant, with patches of Common Reed. False oat-grass typically accompanies nettle stands to form the **OV24b *Urtica dioica-Galium aparine* community, *Arrhenatherum elatius-Rubus fruticosus* sub-community**. Here, the sward height varies between 70-105 cm, and is often lodged where Hedge Bindweed is present. Where reed and nettle are closely associated, these patches are best placed in the **S26b *Phragmites australis-Urtica dioica* tall-herb fen, *Arrhenatherum elatius* sub-community**. Where reed is dominant, heights in excess of 200 cm were noted.

Photo 3. Stand B Ordinary Wet Meadow – representative oblique view [17th July 2017]

Photo 4. Stand C Ordinary Damp Meadow – representative oblique view [13th July 2017]

Stand E (Photo 6) occurs in two patches and is composed almost entirely of mixtures of the tall ruderals Common Nettle and Creeping Thistle, which are assigned to the **OV25a *Urtica dioica-Cirsium arvense* community, *Holcus lanatus-Poa annua* sub-community**.

Pond (Photo 7). The small pond in the centre of the site supports swathes of two stoneworts (Bristly and Common Stonewort). These are both species of shallow, naturally eutrophic waters rich in calcium

compounds (Urbaniak & Gąbka 2014), and are associated with occasional strands of Canadian Waterweed. Several swamp helophytes have established in the pond, giving small stands of **S12a *Typhetum latifoliae* swamp, *Typha latifolia* sub-community**, **S10a *Equisetetum fluviatile* swamp, *Equisetum fluviatile* sub-community** and **S8a *Scirpetum lacustris* swamp, *Scirpus lacustris* ssp. *lacustris* sub-community**.

The Marsh Dock *Rumex palustris* (Photo 8) was found growing amongst Water Horsetail on the southern margin of the pond. This species is uncommon in Suffolk (Sanford & Fisk 2010) and is a colonist of bare, saturated mud.

Photo 5. Stand D Tall Ruderal Reedbed – representative oblique view [17th July 2017]

Photo 6. Stand E Tall Ruderals – representative oblique view [13th July 2017]

Photo 7. Pond Swamp – representative oblique view [17th July 2017]

Photo 8. Marsh Dock growing on the southern margin of the Bleyswycks Bank Pond [17th July 2017]

A summary of the floristic characters of Stands A-D 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 fenland communities

	A	B	C	D
Agrostis stolonifera	V	V	V	V
Cirsium arvense	IV		V	IV
Juncus effusus	V	V	V	
Poa trivialis	V	V	V	
Lolium perenne	II		V	
Phragmites australis		III		III
Rumex sanguineus	II			
Carex otrubae	V	V		
Ranunculus repens	V	V		
Trifolium repens	IV	III		
Juncus articulatus	III	V		
Juncus bufonius	II	II		
Carex hirta	II	II		
Juncus inflexus		V		
Lythrum salicaria		III		
Carex riparia		II		
Vicia cracca		II		
Leptobrum pyriforme		II		
Chenopodium album		II		
Carex remota		II		
Phleum pratense		III	II	
Plantago major		III	II	
Rumex conglomeratus		II	III	
Persicaria maculosa		II	II	
Rumex crispus			II	
Rumex obtusifolius			II	
Holcus lanatus			V	II
Urtica dioica			II	V
Glechoma hederacea				V
Calystegia sepium				IV
Cirsium palustre				IV
Arrhenatherum elatius				III
Stachys palustris				II

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.

The key potential habitat would be Lowland Fen, which is assumed to constitute the primary target conservation feature for Bleyswycks Bank. The closest stand to represent this habitat following site restoration is Stand B, the Ordinary Wet Grassland MG10b *Holco-Juncetum effusi* Page 1980, *Juncus inflexus* sub-community. Unlike other examples amongst the valley fens managed by LOHP, the floristics do not indicate that the stand is significantly influenced by groundwater and cannot therefore

be regarded as a groundwater-dependent wetland (*sensu* Krause et al. 2007; Brooks et al. 2014). Notwithstanding, a number of associate fenland species growing within the dominant suite of rush-pasture species may indicate that flooding river water may support floodplain fen in time.

As shown in Table 6, Stands A and B are accorded a 'Low Local' Level of Ecological Value, indicating that they 'enrich the species richness within the immediate environs of the site'.

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

	Ecological feature
Low Local	Stand B. Ordinary Wet Grassland MG10b *Holco-Juncetum effusi* Page 1980, *Juncus inflexus* sub-community Stand A. Inundation Grassland S28a *Agrostio-Ranunculetum repentis* Oberdorfer et al. 1967, *Polygonum hydropiper-Rorippa sylvestris* sub-community, with patches of: S18 *Caricetum otrubae* Mirza 1978 Pond Stonewort vegetation, with S12a *Typhetum latifoliae* swamp, *Typha latifolia* sub-community; S10a *Equisetetum fluviatile* swamp, *Equisetum fluviatile* sub-community; and S8a *Scirpetum lacustris* swamp, *Scirpus lacustris* ssp. *lacustris* sub-community
Negligible	Stand C Ordinary Damp Meadow MG10a *Holco-Juncetum effusi* Page 1980, *Typical* sub-community Stand D Tall Ruderal Reed-bed OV24b *Urtica dioica-Galium aparine* community, *Arrhenatherum elatius-Rubus fruticosus* sub-community, grading into: S26b *Phragmites australis-Urtica dioica* tall-herb fen, *Arrhenatherum elatius* sub-community Stand E Tall Ruderals OV25a *Urtica dioica-Cirsium arvense* community, *Holcus lanatus-Poa annua* sub-community (partly overstood with trees)

4.2 Notable plant species

One notable plant species was recorded during the survey – Marsh Dock Rumex palustris – which is classified as Locally Scarce (Suffolk Biological Records Centre 2005). In Suffolk, the species has been recorded from 27 tetrads, "mainly in the Lark valley and the lower reaches of the Waveney" (Sanford & Fisk 2010) as a colonist of "open mud in areas subject to winter flooding that dry out in the summer".

	Marsh Dock
Status[1]	Not Scarce
GB Red List[2]	Threat Status: Least Concern
England Red List[3]	Threat Status: Least Concern

[1] Stewart et al. (1994); [2] Cheffings et al. (2005); [3] Stroh et al. (2014)

The presence of two stonewort species in the pond is of local interest – they are a feature of calcareous pools amongst the headwater fens. Both species were refound having been recorded from this location by Stewart (2010).

5. MANAGEMENT CONSIDERATIONS

5.1 As part of the landscape unit

Bleyswycks Bank, Thelnetham is a small site extending the area of floodplain fen under conservation management between Parker's Piece and Webb's Fen, and between the modern river and the upland margin. The Bank is now surrounded by land under this style of management, and lies at the margin of two SSSI units, to the west and south[4].

Bleyswycks Bank also extends the area of peat scraping undertaken on Parker's Piece in 2008, enlarging the area with potential to re-establish fen-meadow vegetation, and thus the area of the Lowland Fen priority habitat (Section 41 (S41) of The Natural Environment and Rural Communities (NERC) Act 2006).

5.2 At the site-scale

The peat-scraping conducted at Bleyswycks Bank has created three notable habitats:

Stand A occupying a transition from the original land surface to the excavation floor (over c.20 cm depth). This vegetation has developed in response to a combination of winter flooding and stock grazing, and also appears to be influenced by slope flushing.

Stand B is a form of rush-pasture with some potential to develop towards floodplain fen-meadow.

Pond habitat, which supports stonewort species and swamp colonists, as well as providing the marginal substrate for colonization by Marsh Dock.

The adjoining area of Ordinary Damp Grassland (Stand C), which occupies the top of the river bank and unscraped land to the east of the site, provides further vegetation diversity as well as firmer, drier ground for stock.

[4] http://magic.defra.gov.uk/MagicMap.aspx

6. VEGETATION MONITORING PROGRAMME – FIELDWORK REPORT

Fieldwork to re-establish the permanent plots and carry-out the vegetation re-survey was undertaken on 17th July 2017.

6.1 Locating the Monitoring Plots

The two monitoring plots were re-established in Stand B Ordinary Wet Grassland 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 location of the permanent marker posts is given in Figure 4 and are visible as fence posts topped by white paint, either on the stock fencing or on one corner of the dipwell enclosure. 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

Plot B-01 and Plot B-02 Ordinary Wet Grassland

Table 7. Details of permanent monitoring plot locations

VEGETATION TYPE	PLOT CODE	MARKER POSTS	Marker Post Location	EASTING	NORTHING	Plot location
Ordinary Wet Grassland	**B-01**	B-01-N	The marker post is on the fenceline.	601544	278979	The NW corner of the plot is 30m south of B-01-N
		B-01-S	The marker post is on the northwest corner of the dipwell enclosure.	601534	278944	
Ordinary Wet Grassland	**B-02**	B-02-N	The marker post is on the fenceline.	601569	278982	The NW corner of the plot is 30m south of B-02-N
		B-02-S	The marker post is on the fenceline	601570	278928	

6.2 Monitoring Plot Report – B-01 Ordinary Wet Grassland 2017

Plot code	B-01 Ordinary Wet Grassland
Treatment type	**Summary of preceding Monitoring Plot Report**
Ordinary Wet Grassland	In 2009, the exposed black, granular peat was very evident, and the plot showed thin re-vegetation following restoration by scraping the peat surface. Rough Meadow-grass and Creeping Buttercup were ubiquitous, and the plot was described as a weedy form of rush-pasture; fenland species were restricted to occasional shoots of Common Reed and a single plant of Water Figwort.

Vegetation structure

• In 2017, the ground surface was slightly damp to moist, with no surface saturation or surface water.
• Plant litter was occasional and consisted of a thin often lodged thatch amongst rush tussocks; the bryoflora was thinly scattered: the colonist of bare ground, Golden Thread-moss, was still present but ground-dwelling perennials had established as scattered shoots.
• The sward structure was dominated by rush species with occasional short-sward lawns, similar to those in Stand A. Fenland species were present – notably Jointed Rush and False Fox-sedge.
• The photographic record is an accurate representation of the plot's sward structure.

Floristics

• This is a sward with abundant rushes that currently coalesce infrequently, permitting the establishment and persistence of many other species. The grassy matrix of the sward is provided by three ubiquitous species: Creeping Buttercup, Rough Meadow-grass and Creeping Bent, accompanied by Hairy Sedge, White Clover and Greater Plantain.
• Two reed-fen species are thinly scattered: Common Reed and Purple Loosestrife. The swamp species False Fox-sedge and Greater Pond-sedge have established as tufts. Fen meadow species are currently represented by frequent Jointed Rush and rare Tufted Vetch.
• The species of disturbed ground present in 2009 are no longer present, but several indicators of disturbed, fertile ground have replaced them, including Clustered and Broad-leaved Docks.

Summary of records and events

• Not available at the time of reporting.
• Field evidence suggests that the sward has developed considerably since 2009, with colonisation and management creating almost total ground cover. Negative indicators are almost absent – with the exception of scattered docks and no woody plants have successfully colonized.
• Evidence for grazing is present as low levels of trampling and dunging within the plot, and there is no sign of poaching or of lodging.

Relation to past and target conditions

• This survey continues the Vegetation Monitoring Programme; the baseline survey undertaken in 2009 provides a summary description of the monitoring plot as a weedy form of rush pasture, with no real sign of fenland colonists.
• Vegetation characters suggest that the plot can be regarded as coalescing form of rush-pasture with very few negative indicators. The presence of a suite of fenland species is very encouraging at this stage in vegetation development, though the sward is unequivocally a rush-pasture. The potential for further development towards fen-meadow may be partly hydrologically-driven and partly a consequence of preventing overly-thick rush tussock coalescence.

Plot code B-01	Photographic Record 2017

Monitoring Plot Field Form – Vegetation structural characters

Monitoring Plot	**B-01 Ordinary Wet Grassland**
Recorder	**Jonny Stone**
Survey Date	**17th July 2017**

Character of the ground surface

● The ground surface was soft and firm beneath, covered by black, earthy peat with no structure. The soil wetness was slightly damp to moist.
● The ground surface was planar within a shallow bowl with no discernable slope; distinct hoof-prints were evident though not frequent, with very occasional poaching and occasional stock dunging.

Soil wetness

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

	ATTRIBUTE	SAMPLE from each plot quarter 1	2	3	4	AVERAGE
Layer height	Standing water (cm)	0	0	0	0	0 cm
	Plant litter (cm)	+	1	1	1	0.8 cm
	Woody seedlings (cm)	0	0	0	0	0 cm
	Large sedges / rushes (cm)	60	50	80	60	62.5 cm
	Reed-like grasses (cm)	30	45	25	0	25 cm
	Woody saplings (cm)	0	0	0	0	0 cm
Cover value	Standing water (%)	0	0	0	0	0 %
	Trampling (%)	+	0	5	5	2.5 %
	Dunging (%)	+	+	+	+	0 %
	Bare ground (%)	1	1	1	0	0.8 %
	Plant litter (%)	1	+	+	+	0.3 %
	Bryophytes (%)	+	0	+	+	0 %
	Woody seedlings (%)	0	0	0	0	0 %
	Large sedges / rushes (%)	60	60	80	30	57.5 %
	Reed-like grasses (%)	+	+	+	0	0 %
	Woody saplings (%)	0	0	0	0	0 %

Monitoring Plot Field Form – Floristic sub-sampling – all survey years

Monitoring Plot	**B-01 Ordinary Wet Grassland**
Recorder	**Jonny Stone**
Survey Date	**17th July 2017**

This data is collated from the 20 1x1 m sub-samples given in Appendix 4.
[The groups into which recorded species are allocated are indicative and context-specific. They are intended to provide a general indication over time of changes in the floristic composition of the monitoring plot in relation to the specified target condition.]

Species	**2009**	**2017**
	[ex20]	[ex 20]
Reed Fen Species		
Phragmites australis	1	7
Lythrum salicaria		5
Scrophularia aquatica	1	
Swamp species		
Carex otrubae	1	9
Carex riparia		4
Fen Meadow Species		
Juncus articulatus		19
Vicia cracca		1
Rush-pasture		
Ranunculus repens	20	20
Poa trivialis	18	20
Agrostis stolonifera		20
Juncus effusus	2	18
Juncus inflexus	2	16
Carex hirta		14
Trifolium repens		13
Plantago major	7	11
Brachythecium rutabulum		5
Holcus lanatus	2	3
Taraxacum agg.		3
Oxyrrhynchium hians		2
Disturbed ground species		
Leptobrum pyriforme		6
Rumex conglomeratus		6
Juncus bufonius		5
Rumex obtusifolius		3
Glechoma hederacea		1
Veronica serpyllifolia		1
Cirsium arvense	5	
Linaria vulgaris	5	
Bryum sp.	4	
Conium maculatum	2	
Epilobium hirsutum	1	
Veronica beccabunga	1	
Galium aparine	1	
Senecio vulgaris	1	
Erysimum cheiranthoides	1	

Floristic character	2009	2017
Reed Fen Species	2	2
Swamp Species	1	2
Fen-meadow Species	0	2
Rush-pasture Species	6	12
Disturbed Ground Species	9	6
Total species	18	24

6.3 Monitoring Plot Report – B-02 Ordinary Wet Grassland 2017

Plot code	B-02 Ordinary Wet Grassland
Treatment type	**Summary of preceding Monitoring Plot Report**
Ordinary Wet Grassland	In 2007, the earthy peat ground surface was described as 'slightly damp' and the amount of bare ground was variable, with a relatively high proportion of plant litter present. As with B-01, Creeping Buttercup and Rough Meadow-grass formed much of the re-vegetation following peat scraping, with Creeping Thistle and Ground-ivy. A sole plant of Water Figwort represented fenland species.

Vegetation structure

• The ground surface varied from slightly damp and firm in the north to wet or saturated and soft in the southern half. Plant litter was very evident amongst thick rush tussocks but almost absent in short-sward lawns.
• The tussocks structure was more strongly established in the wetter, southern half of the plot, with short-sward lawns more a feature of the drier, northern half.

Floristics

• Soft Rush and Creeping Bent were the only species frequent throughout the plot.
• In the drier half, the short-sward lawns were composed of Creeping Bent, Creeping Buttercup, Rough Meadow-grass and White Clover. Hard Rush was the most frequent rush species, though Jointed and Soft Rush were both frequent associates. Greater Plantain and Hairy Sedge were also scattered through this sward.
• In the wetter half of the plot, Soft Rush and Creeping Bent were the most frequently occurring species, typically with Silverweed and Water Mint. Greater Pond-sedge and Reedmace were also present.
•Disturbed ground species persist in the plot, with Redshank and Golden Thread-moss occasional in the wetter part and Thyme-leaved Speedwell, Corn Mint and Broad-leaved Dock occasional in the drier areas. Single specimens of Crack Willow and Grey Willow were recorded from the wetter half.

Summary of records and events

• Not available at the time of reporting.
• Field evidence suggests that the plot has been frequently visited by stock. The wetter area, in particular, is quite heavily poached and trampled, though there is little dunging.

Relation to past and target conditions

• This survey continues the Vegetation Monitoring Programme; the baseline survey undertaken in 2009 provides a summary description of the monitoring plot as a weedy form of rush pasture, with no real sign of fenland colonists.
• In 2017, the plot has been colonized by 23 additional species, with the loss of the Disturbed Ground species that were recorded in 2009. The general appearance is of a rush-dominated rush-pasture with, in the wetter part of the plot, a suite of fenland species. Of these, Jointed Rush and Water Mint are particularly frequent.
• Development of the plot towards floodplain fen-meadow would appear to be contingent upon favourable hydrological influence and upon preventing the coalescence of rush tussocks to the point that potential colonization is prevented.

Plot code B-02	Photographic Record 2017

Monitoring Plot Field Form – Vegetation structural characters

Monitoring Plot	**B-02 Ordinary Wet Grassland**
Recorder	**Jonny Stone**
Survey Date	**17th July 2017**

Character of the ground surface

- The ground surface was moist and soft, with earthy peat showing at the surface.
- Multiple, deep hoof-print and considerable poaching were evident in the southern (wetter) half of the plot; distinct prints were widely evident in the northern half of the plot, with little poaching.
- The plot is located on a level plane descending slightly along the southern edge.

Soil wetness

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

	ATTRIBUTE	SAMPLE from each plot quarter 1	2	3	4	AVERAGE
Layer height	Standing water (cm)	0	0	0	0	0 cm
	Plant litter (cm)	4	0	0	4	2 cm
	Woody seedlings (cm)	0	0	0	0	0 cm
	Large sedges / rushes (cm)	110	40	40	80	67.5 cm
	Reed-like grasses (cm)	60	0	0	30	22.5 cm
	Woody saplings (cm)	0	0	0	0	0 cm
Cover value	Standing water (%)	0	0	0	0	0 %
	Trampling (%)	20	5	5	15	11.3%
	Dunging (%)	2	0	0	1	0.8 %
	Bare ground (%)	10	2	1	5	4.5 %
	Plant litter (%)	30	1	1	20	13 %
	Bryophytes (%)	0	+	+	0	0 %
	Woody seedlings (%)	0	0	0	0	0 %
	Large sedges / rushes (%)	70	60	50	80	65 %
	Reed-like grasses (%)	+	0	0	+	0 %
	Woody saplings (%)	0	0	0	0	0 %

Monitoring Plot Field Form – Floristic sub-sampling – all survey years

Monitoring Plot	**B-02 Ordinary Wet Grassland**
Recorder	**Jonny Stone**
Survey Date	**17th July 2017**

This data is collated from the 20 1x1 m sub-samples given in Appendix 5.
[The groups into which recorded species are allocated are indicative and context-specific. They are intended to provide a general indication over time of changes in the floristic composition of the monitoring plot in relation to the specified target condition.]

Species	**2009**	**2017**
	[ex 20]	[ex 20]
Aquatic species		
Elodea canadensis		2
Swamp Species		
Veronica catenata		4
Carex otrubae	2	4
Carex riparia		3
Typha latifolia		3
Reed-fen species		
Mentha aquatica		8
Lythrum salicaria		5
Phalaris arundinacea		4
Phragmites australis		4
Salix fragilis sapling		1
Salix cinerea sapling		1
Scrophularia aquatica	1	
Fen-meadow Species		
Juncus articulatus		10
Carex remota		1
Rush-pasture Species		
Agrostis stolonifera	2	19
Juncus effusus	3	16
Poa trivialis	20	16
Ranunculus repens	17	13
Trifolium repens		10
Juncus inflexus	2	9
Potentilla anserina		7
Plantago major	4	6
Rumex sanguineus		4
Carex hirta		5
Phleum pratense		3
Taraxacum agg.		1
Holcus lanatus	2	
Disturbed Ground Species		
Veronica serpyllifolia		7
Persicaria maculosa		4
Leptobrum pyriforme		5
Rumex obtusifolius		3
Mentha arvensis		3

Juncus bufonius		2
Cirsium arvense	8	
Glechoma hederacea	7	
Bryum sp.	3	
Barbarea vulgaris	2	
Conium maculatum	2	
Senecio vulgaris	1	
Sonchus arvensis	1	
Stellaria media	1	

Floristic character	**2009**	**2017**
Aquatic species		1
Swamp Species	1	4
Reed-fen Species	1	6
Fen-meadow Species	0	1
Rush-pasture Species	7	13
Disturbed Ground Species	8	6
Total Species	17	31

6.4 Interpretation of the Monitoring Plot surveys

The two monitoring plots were established in situations intended to represent units of vegetation that have many of the distinguishing features of the habitat-type in which they are located, but are also likely to be sensitive to changes in management and hydrological influence.

In sections 6.2-6.3 each plot is described in terms of the vegetation-type mapped by the accompanying NVC survey (see Figure 3). Since 2009, both plots have developed from a very weedy form of rush-pasture, with some affinity to the OV28 *Agrostio-Ranunculetum* community (Stand A in 2017), to a rush-dominated form of rush-pasture. In both plots, the vegetation assemblages (but Plot B-02 in particular) present dry and wet internal variation:

Dry facies: Hard Rush, White Clover, Hairy Sedge, Greater Plantain and False Fox-sedge.

Wet facies: Common Reed, Purple Loosestrife, Water Mint, Lesser Pond-sedge and Silverweed.

The drier parts of each plot are clearly most closely matched to the MG10b *Holco-Juncetum effusi* Page 1980, *Juncus inflexus* sub-community (Stand B in 2017), and are most likely to develop towards the *Briza media-Trifolium* spp. sub-community of the *Juncus subnodulosus-Cirsium palustre* fen-meadow (M22b).

The wetter parts of each plot, particularly in B-02, are quite dissimilar to rush pasture vegetation and – in terms of grazed fen-meadow – are most likely to develop towards the *Iris pseudacorus* sub-community of the *Juncus subnodulosus-Cirsium palustre* fen-meadow (M22d).

This variability in species composition is typical of quite small variations in the relative ground surface height of floodplain fens, and is present in the adjacent parts of Parker's Piece.

The development of the vegetation over the period 2009-2017 will have been greatly influenced by three factors:

Potential for species colonization. As evinced at neighbouring sites, ruderal, rush-pasture and some swamp and reed-fen species tend to be relatively more mobile than fen-meadow species, though many of the latter may generate a small seed-rain, or require specific vectors of circumstances for the dispersal of vegetative fragments. It is therefore to be expected that suites of non-target species are most likely to establish at post-restoration receptor sites.

Substrate character. At Bleyswycks Bank, the primary receptor sites are the shallow peat excavation occupied by Stand B, and the deeper water-filled pond. The dry and wet rush-pasture facies described above indicate that there is some internal variation within the shallow excavation affecting species distribution, and the key substrate characters are likely to be (a) the retention of high soil moisture levels through the early part of the growing season; and (b) the hydro-chemical signature of the waters affecting the substrate topsoil. The first factor is likely to affect whether rush-pasture, fen-meadow or swamp species are likely to colonize successfully. The second factor is likely to affect species composition and rate of seasonal growth. The rate of growth may determine the vigour of rush and sedge tussocks and thus the shade regime that is established, which will, in turn, affect seedling establishment and the survival of shorter plants in the sward.

Management type and intensity. The facility with which management can moderate vegetation development and further species colonisation is greatly influenced by substrate character, in particular, by how wet the site is. If the site is too wet to stock early in the growing season, then

rush-dominance may be difficult to prevent if it is favoured by substrate conditions. Similarly, late-season topping as a default position is likely to allow thick litter to develop, which can severely affect species composition. The ideal management type and intensity is likely to vary annually, but should manipulate management type, timing and intensity to prevent a shading canopy developing, without significantly poaching the ground or allowing plant litter to build up. This will typically be achieved by overwhelming plant growth rates early in the season[5] with a relatively high stocking rate, followed by periodically subduing regrowth at a lower stocking rate into the autumn, with supplementary topping if required[6].

The advancement of sward characters in the monitoring plots since 2009 suggests that management type and intensity has been maintained in a near-ideal regime, in that the rush-pasture in Stand B retains short-sward gaps and tall species – including Common Reed – have not been allowed to develop. In coming years, an additional management target should be to ensure that colonization continues to occur, by preventing further coalescence of the rush-sedge tussocks. In time, it is anticipated that fen-meadow species will then colonize where substrate characters are suitable.

[5] In conditions where the ground is sufficiently dry.
[6] Typically to subdue vigorous patches.

6.5 Recommendations of the Vegetation Monitoring Programme

It is recommended that:

1. The ***Vegetation Monitoring Programme is maintained*** at Bleyswycks Bank, Thelnetham by those responsible for ensuring appropriate management of the recovering vegetation. This second Fieldwork Report successfully repeated the permanent plot surveys using the 'full' survey method (photographs, physiognomy and floristics). The Monitoring Plan (OHES 2010) proposes several means to integrate vegetation monitoring as a management decision-making tool.

2. ***The means of achieving target conditions for each sward should be reviewed***, based on the comments made in the previous section. Although it is evident that considerable progress has been made in diverting the overall structural and floristic characters towards a 'fen meadow' target there are two over-arching issues that could be addressed.

   a) The first is the degree of control over stocking intensity and regime that would be needed to prevent continued dominance by rushes and the prevalence of trampling and lodging. Both impacts are likely to affect successful colonization.

   b) The second issue is the paucity of evidence for successful colonization by fen species. If greater control can be exerted over achieving early-, mid- and late-season targets for sward height and rush cover, then natural ecological processes are likely to be successful. It may also be appropriate to enhance natural processes by strewing green hay from carefully selected local sites.

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	Stand	NVC Code
1	601529	278941	A	S28a
2	601542	278950	B	MG10b
3	601537	278979	C	MG10a
4	601552	278936	A	S28a
5	601549	278951	B	MG10b
6	601556	278975	C	MG10a
7	601571	278974	C	MG10a
8	601576	278958	B	MG10b
9	601571	278933	A	S28a
10	601590	278930	A	S18
11	601593	278948	B	MG10b
12	601589	278971	C	MG10a
13	601620	278970	C	MG10a
14	601610	278960	B	MG10b
15	601613	278924	A	S28a
16	601620	278941	A	S28a
17	601608	278942	A	S28a
18	601519	278983	D	OV24b
19	601537	278983	D	OV24b
20	601552	278986	D	OV24b
21	601574	278985	D	S26b
22	601596	278981	D	S26b
23	601618	278982	D	S26b

Appendix 2. SPECIES RECORDED IN NVC AND MONITORING PLOTS

The following species were recorded within the survey sample plots.
The 'Preferential Habitat' column is an informal indication of the main valley-floor habitats typically occupied by relevant species: Aquatic (largely inundated species); Swamp (frequently inundated unmanaged fen, dominated by grazing-sensitive species); Reed-fen (infrequently or unmanaged fen, dominated by grazing-sensitive species); Fen-meadow (frequently managed fen, dominated by grazing-tolerant species); Wet-grassland (frequently managed grassland supporting largely dryland species tolerant of periodic waterlogging); Disturbed Ground (dryland and periodically inundated species of disturbed and often nutrient-rich fen margins, usually too dry to support fenland species). Unlabelled species are preferential in two or more habitats. See Section 3.2.2.

Species name	Common Name	Preferential Habitat
Agrostis canina	Velvet Bent	Fen-meadow
Agrostis stolonifera	Creeping Bent	Rush-pasture
Alisma plantago-aquatica	Water-plantain	Aquatic
Angelica sylvestris	Wild Angelica	Reed-fen
Anthriscus sylvestris	Cow Parsley	Disturbed Ground
Arrhenatherum elatius	False Oat-grass	Disturbed Ground
Calystegia sepium	Hedge Bindweed	Reed-fen
Carex hirta	Hairy Sedge	Rush-pasture
Carex otrubae	False Fox-sedge	Swamp
Carex remota	Remote Sedge	Fen-meadow
Carex riparia	Greater Pond-sedge	Swamp
Cerastium fontanum	Common Mouse-ear	-
Chara hispida	Bristly Stonewort	Aquatic
Chara vulgaris	Common Stonewort	Aquatic
Chenopodium album	Fat-hen	Disturbed
Cirsium arvense	Creeping Thistle	Disturbed Ground
Cirsium palustre	Marsh Thistle	Fen-meadow
Crepis capillaris	Smooth Hawk's-beard	-
Cynosurus cristatus	Crested Dog's-tail	Rush-pasture
Dactylis glomerata	Cock's-foot	-
Deschampsia cespitosa	Tufted Hair-grass	Rush-pasture
Dicranella staphylina	Field Forklet-moss	Disturbed Ground
Elodea canadensis	Canadian Waterweed	Aquatic
Elytrigia repens	Common Couch	Disturbed Ground
Equisetum fluviatile	Water Horsetail	Swamp
Galium aparine	Cleavers	-
Geranium dissectum	Cut-leaved Crane's-bill	Disturbed Ground
Glechoma hederacea	Ground-ivy	Disturbed ground
Holcus lanatus	Yorkshire Fog	Rush-pasture
Hottonia palustris	Water Violet	Aquatic
Juncus articulatus	Jointed Rush	Fen-meadow
Juncus bufonius agg.	Toad Rush	Disturbed Ground
Juncus effusus	Soft Rush	Rush-pasture

Juncus inflexus	Hard Rush	Rush-pasture
Lolium perenne	Perennial Ryegrass	Rush-pasture
Lythrum salicaria	Purple Loosestrife	Reed-fen
Mentha aquatica	Water Mint	Reed-fen
Mentha arvensis	Corn Mint	Disturbed Ground
Myosotis scorpioides	Water Forget-me-not	Swamp
Persicaria maculosa	Redshank	Disturbed Ground
Phalaris arundinacea	Reed Canary-grass	Reed-fen
Phleum pratense	Timothy	Rush-pasture
Phragmites australis	Common Reed	Reed-fen
Helminthotheca echioides	Bristly Ox-tongue	Disturbed Ground
Plantago major	Greater Plantain	Rush-pasture
Poa pratensis s.l.	Smooth Meadow-grass	-
Poa trivialis	Rough Meadow-grass	Rush-pasture
Potentilla anserina	Silverweed	Rush-pasture
Quercus robur seedling	Pedunculate Oak	Rush-pasture
Ranunculus repens	Creeping Buttercup	Rush-pasture
Rorippa sylvestris	Creeping Yellowcress	Disturbed Ground
Rumex conglomeratus	Clustered Dock	Disturbed Ground
Rumex crispus	Curled Dock	-
Rumex obtusifolius	Broad-leaved Dock	Disturbed Ground
Rumux palustris	Marsh Dock	Disturbed Ground
Rumex sanguineus	Wood Dock	Rush-pasture
Salix cinerea sapling	Grey Willow	Reed-fen
Salix fragilis sapling	Crack Willow	Reed-fen
X Schedolium loliaceum	Hybrid Fescue	Rush-pasture
Schoenoplectus lacustris	Common Club-rush	Swamp
Stachys palustris	Marsh Woundwort	Reed-fen
Taraxacum agg.	Dandelion	Rush-pasture
Trifolium dubium	Lesser Trefoil	Rush-pasture
Trifolium repens	White Clover	Rush-pasture
Typha latifolia	Bulrush	Swamp
Urtica dioica	Common Nettle	Disturbed Ground
Veronica anagallis-aquatica	Blue Water-speedwell	Swamp
Veronica serpyllifolia	Thyme-leaved Speedwell	Disturbed Ground
Vicia cracca	Tufted Vetch	Fen-meadow
Bryophytes		
Brachythecium rutabulum	Rough-stalked Feather-grass	-
Leptobrum pyriforme	Golden Thread-moss	Disturbed Ground
Oxyrrhynchium hians	Swarz's Feather-moss	Rush-pasture

Appendix 3. NVC COMMUNITY TABLES

Stand A: Inundation sward
OV28a *Agrostio-Ranunculetum repentis* Oberdorfer et al. 1967, *Polygonum hydropiper-Rorippa sylvestris* sub-community, with patches of
S18 *Caricetum otrubae* Mirza 1978

Plot	1	4	9	10	15			16	17
Agrostis stolonifera	9	8	8	5	9	V	(5-9)	5	5
Poa trivialis	6	6	4	5	7	V	(4-7)	7	4
Ranunculus repens	10	10	9	3	9	V	(3-10)	8	8
Carex otrubae	1	4	6	8	2	V	(1-8)	1	1
Juncus effusus	4	1	5	1	4	V	(1-5)		
Cirsium arvense	3	2		1	3	IV	(1-3)		2
Juncus articulatus	2			5	4	III	(2-5)	4	2
Trifolium repens	1	4			1	III	(1-4)	10	10
Juncus bufonius		2	2			II	(2)		
Carex hirta		1			3	II	(1-3)	4	2
Rumex sanguineus			2	1		II	(1-2)		
Lolium perenne		1	1			II	(1)		
Holcus lanatus				2		I	(2)		1
Leptobrum pyriforme	2					I	(2)	1	
Glechoma hederacea				1		I	(1)		
Rumex conglomeratus				1		I	(1)		
Vicia cracca	1					I	(1)		
Crepis capillaris				1		I	(1)		
Plantago major								1	1
Juncus inflexus								2	
Cynosurus cristatus									2
Quercus robur seedling									1
Dicranella staphylina								1	
Sward height (cm)	6	5	11	30	6			4	4
% Total veg. cover	100	100	99	98	100			100	100
% Plant litter	2	0	1	0	0			0	0
% Bryophyte cover	1	0	0	0	0			0	0
% Lichen cover	0	0	0	0	0			0	0
% Bare ground	1	0	1	2	0			0	0
No. of species	10	10	8	12	8	Av.	9.6	11	12

Stand B: Ordinary Wet Meadow
MG10b *Holco-Juncetum effusi* Page 1980, *Juncus inflexus* sub-community

Plot	2	5	8	11	14		
Agrostis stolonifera	8	8	9	8	8	V	(8-9)
Juncus effusus	7	5	6	5	7	V	(5-7)
Juncus inflexus	4	4	5	4	7	V	(4-7)
Poa trivialis	3	6	4	5	5	V	(3-6)
Ranunculus repens	3	4	3	3	3	V	(3-4)
Juncus articulatus	8	9	4	5	2	V	(2-9)
Carex otrubae	1	1	1	7	1	V	(1-7)
Trifolium repens	2	3	3			III	(2-3)
Plantago major	3	2	3			III	(2-3)
Phragmites australis	3	1		4		III	(1-4)
Lythrum salicaria	2	1			2	III	(1-2)
Phleum pratense	1		1		2	III	(1-2)
Juncus bufonius	2			4		II	(2-4)
Carex hirta	1			3		II	(1-3)
Rumex conglomeratus	2		1			II	(1-2)
Leptobrum pyriforme	1			2		II	(1-2)
Persicaria maculosa			1	2		II	(1-2)
Vicia cracca	1				2	II	(1-2)
Carex riparia	1	1				II	(1)
Carex remota		1	1			II	(1)
Chenopodium album	1	1				II	(1)
	19	14	13	12	10		
Holcus lanatus					3	I	(3)
Poa pratensis	2					I	(2)
Cirsium arvense	1					I	(1)
Stachys palustris					1	I	(1)
Taraxacum agg.	1					I	(1)
Agrostis canina	1					I	(1)
Trifolium dubium	1					I	(1)
Anthriscus sylvestris	1					I	(1)
Rorippa sylvestris	1					I	(1)
Brachythecium rutabulum		1				I	(1)
Oxyrrhynchium hians			1			I	(1)
Mentha aquatica			1			I	(1)
Sward height (cm)	40	45	40	50	45		
% Total veg. cover	100	99	100	99	99		
% Plant litter	1	1	0	0	1		
% Bryophyte cover	0	1	0	1	0		
% Lichen cover	0	0	0	0	0		
% Bare ground	0	1	0	1	1		
No. of species	26	15	15	12	12	Av.	16.0

Stand C: Ordinary Damp Meadow
MG10a *Holco-Juncetum effusi* Page 1980, *Typical* sub-community

Plot	3	6	7	12	13		
Agrostis stolonifera	9	8	9	8	9	V	(8-9)
Holcus lanatus	7	7	5	6	7	V	(5-7)
Poa trivialis	3	5	5	3	2	V	(2-5)
Cirsium arvense	2	4	4	2	1	V	(1-4)
Lolium perenne	2	1	4	2	4	V	(1-4)
Juncus effusus	1	1	1	1	1	V	(1)
Rumex conglomeratus		1	1		1	III	(1)
Urtica dioica		2		3		II	(2-3)
Phleum pratense	2		2			II	(2)
Rumex crispus				2	2	II	(2)
Rumex obtusifolius	1			3		II	(1-3)
Plantago major	2				1	II	(1-2)
Persicaria maculosa	1				1	II	(1)
Dactylis glomerata		4				I	(4)
Carex hirta					2	I	(2)
Arrhenatherum elatius		2				I	(2)
Picris echioides				2		I	(2)
Phalaris arundinacea			2			I	(2)
Ranunculus repens					1	I	(1)
Glechoma hederacea	1					I	(1)
Stachys palustris					1	I	(1)
Taraxacum agg.					1	I	(1)
Quercus robur seedling		1				I	(1)
Geranium dissectum				1		I	(1)
X Schedolium loliaceum	1					I	(1)
Cerastium fontanum	1					I	(1)
Sward height (cm)	15	13	16	15	10		
% Total veg. cover	100	95	100	95	95		
% Plant litter	2	5	2	20	2		
% Bryophyte cover	0	0	0	0	0		
% Lichen cover	0	0	0	0	0		
% Bare ground	0	5	0	2	5		
No. of species	13	11	9	11	14	Av.	11.6

Stand D: Tall Ruderal Reedbed
OV24b *Urtica dioica-Galium aparine* community, *Arrhenatherum elatius-Rubus fruticosus* sub-community, grading into:
S26b *Phragmites australis-Urtica dioica* tall-herb fen, *Arrhenatherum elatius* sub-community

Plot	18	19	20	21	22	23		
Urtica dioica	7	6	10	10	7	10	V	(6-10)
Agrostis stolonifera	3	3	4	3	3	2	V	(2-4)
Glechoma hederacea	3		4	3	2	2	V	(2-4)
Calystegia sepium	8	2			4	2	IV	(2-8)
Cirsium arvense		2	2		7	4	IV	(2-7)
Cirsium palustre			1	1	1	1	IV	(1)
Phragmites australis				10	4	4	III	(4-10)
Arrhenatherum elatius	1	8	2				III	(1-8)
Stachys palustris	4	3					II	(3-4)
Holcus lanatus		2	2				II	(2)
Ranunculus repens			4				I	(4)
Carex riparia		4					I	(4)
Galium aparine	4						I	(4)
Poa trivialis						1	I	(1)
Rumex conglomeratus		1					I	(1)
Vicia cracca					1		I	(1)
Elytrigia repens	1						I	(1)
Deschampsia cespitosa					1		I	(1)
Angelica sylvestris				1			I	(1)
Sward height (cm)	70	90	105	180	110	120		
% Total veg. cover	90	85	100	100	85	100		
% Plant litter	10	15	5	30	15	15		
% Bryophyte cover	0	0	0	0	0	0		
% Lichen cover	0	0	0	0	0	0		
% Bare ground	10	10	15	15	10	15		
No. of species	8	9	8	6	9	8	Av.	8.2

Appendix 4. FIELD RECORD FOR B-01 ORDINARY WET 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
Ranunculus repens	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	20
Poa trivialis	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	20
Agrostis stolonifera	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	20
Juncus articulatus	P	P	P	P	P	P	P	P	P		P	P	P	P	P	P	P	P	P	P	19
Juncus effusus	P	P	P	P	P	P	P	P	P	P	P	P	P		P	P	P		P	P	18
Juncus inflexus		P	P	P	P	P	P	P	P	P	P		P	P	P	P	P		P		16
Carex hirta	P	P				P	P	P	P		P	P	P	P			P	P	P	P	14
Trifolium repens	P	P	P			P		P	P	P		P		P		P	P	P	P		13
Plantago major		P	P		P		P	P			P	P	P			P		P		P	11
Carex otrubae				P	P	P			P	P				P	P		P	P			9
Phragmites australis										P				P	P	P		P	P	P	7
Leptobrum pyriforme	P			P			P				P								P	P	6
Rumex conglomeratus	P	P							P				P			P	P				6
Brachythecium rutabulum		P							P			P	P				P				5
Lythrum salicaria										P					P			P	P	P	5
Juncus bufonius			P	P				P			P					P					5
Carex riparia			P			P	P							P							4
Holcus lanatus	P								P								P				3
Rumex obtusifolius			P					P												P	3
Taraxacum agg.	P							P									P				3
Oxyrrhynchium hians		P											P								2
Glechoma hederacea																	P				1
Vicia cracca															P						1
Veronica serpyllifolia		P																			1
No. of species	11	14	12	10	9	11	11	13	13	9	11	10	12	10	10	11	15	10	11	11	Av. 11.2

Appendix 5. FIELD RECORD FOR B-02 ORDINARY WET GRASSLAND MONITORING PLOT P = present in sub-plot

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	2017
Agrostis stolonifera	P	P	P	P	P	P	P	P	P	P	P	P	P		P	P	P	P	P	P	19
Juncus effusus	P		P		P		P	P		P	P	P	P	P	P	P	P	P	P	P	16
Poa trivialis	P	P	P		P	P	P	P	P	P			P	P		P	P	P			16
Ranunculus repens	P	P	P	P	P	P	P	P	P	P								P	P	P	13
Juncus articulatus	P	P	P	P		P		P	P	P							P	P			10
Trifolium repens	P	P	P	P	P	P	P	P	P	P											10
Juncus inflexus	P		P	P	P	P	P	P	P	P											9
Potentilla anserina							P				P		P	P		P			P	P	7
Mentha aquatica											P	P		P	P		P	P	P	P	8
Veronica serpyllifolia			P	P	P	P		P	P			P									7
Plantago major		P		P	P	P		P		P											6
Phalaris arundinacea												P	P	P		P					4
Rumex sanguineus														P	P			P	P		4
Lythrum salicaria									P					P	P		P	P			5
Persicaria maculosa	P	P			P							P									4
Carex hirta		P	P				P	P	P												5
Leptobrum pyriforme				P	P					P	P				P						5
Phragmites australis																	P	P	P	P	4
Veronica catenata											P	P					P	P			4
Rumex obtusifolius	P	P					P														3
Carex otrubae		P	P			P	P														4
Phleum pratense				P	P			P													3
Mentha arvensis					P	P		P													3
Carex riparia														P	P	P					3
Typha latifolia													P			P	P				3
Elodea canadensis											P	P									2
Juncus bufonius			P	P																	2
Carex remota				P																	1
Taraxacum agg.						P															1
Salix fragilis sapling																				P	1
Salix cinerea sapling																			P		1
No. of species	9	10	11	11	12	11	10	12	10	9	6	8	6	8	7	7	9	10	8	7	