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Hinderclay Fen

Establishment of Monitoring Plots

2020

Mike Harding on behalf of the Little Ouse Headwaters Project

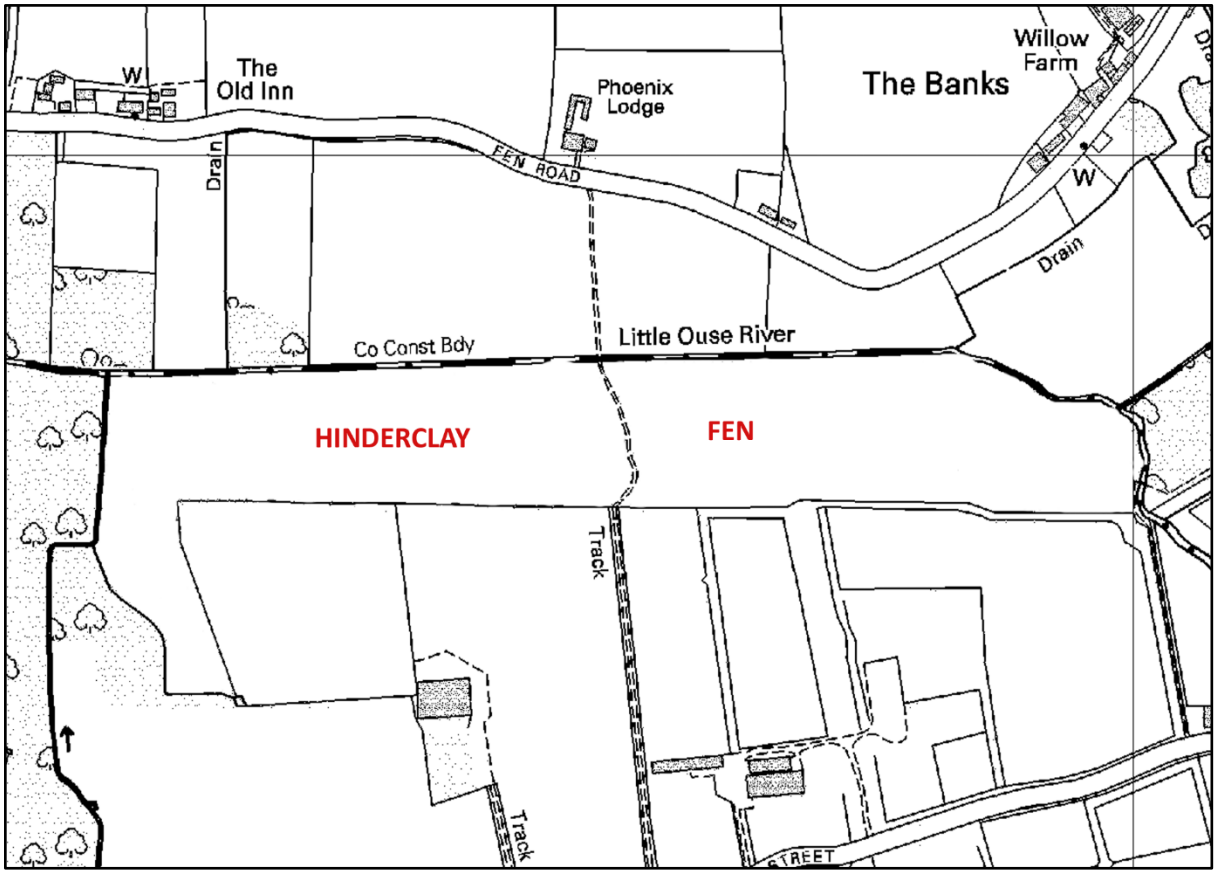
Little Ouse Headwaters Project
Conservation & Community

CONTENTS

1. AIMS

The Little Ouse Headwaters project manage Hinderclay Fen as a nature reserve. It is a County Wildlife Site, but not SSSI. The areas are shown on Figure 1.

Figure 1 : Location of Hinderclay Fen



Prior to this project there was no formal monitoring on the sites. The aim of this work is therefore:

- To install three monitoring plots on Hinderclay Fen, adopting the methodology laid out by OHES (2010).

2. METHODS

2.1 The Monitoring Methods

Three monitoring plots were installed on Hinderclay Fen in May 2020. The recommended monitoring methodology described in OHES was followed. OHES (2010) gives the four phases of monitoring common to all of the LOHP site monitoring projects, summarised in Table 1. All phases were undertaken for this project. OHES (2010) details the monitoring protocols. They were adhered to in all aspects, other than plot marking.

Table 1: The Four Phases of Monitoring (OHES 2010)

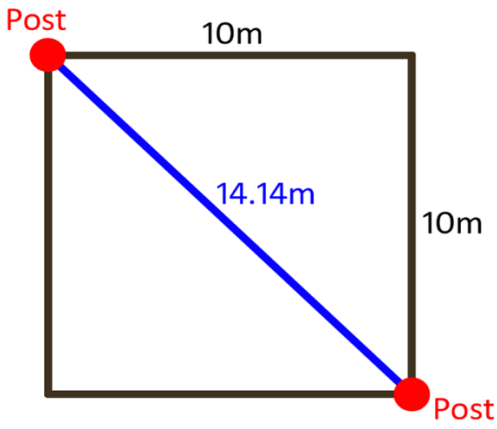
Survey intensity	Fieldwork Element		Function within the Survey
Rapid	1	Locating Monitoring Plots	To establish locations for the Monitoring Plots
	2	Photographic Record	To produce a record surveillance images showing the condition of the developing vegetation
Full	3	Vegetation structural characters	To 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.

2.2 Locating Monitoring Plots

The protocol suggests positioning marker posts at distance, and then stringing long tapes of 50m between them, and measuring off from this line. However, experience with re-locating and recording plots established on other sites suggested this line was difficult to keep straight, especially in any wind, and hence there was the likelihood of mis-registering the plots at successive recordings. There seemed to be no benefit to installing the marker posts remotely as each plot required two posts.

Hence on these sites, the two corner points on one diagonal were marked directly with a white-topped post, shown in Figure 2.

Figure 2: The Layout of a 10 x 10m Monitoring Plot



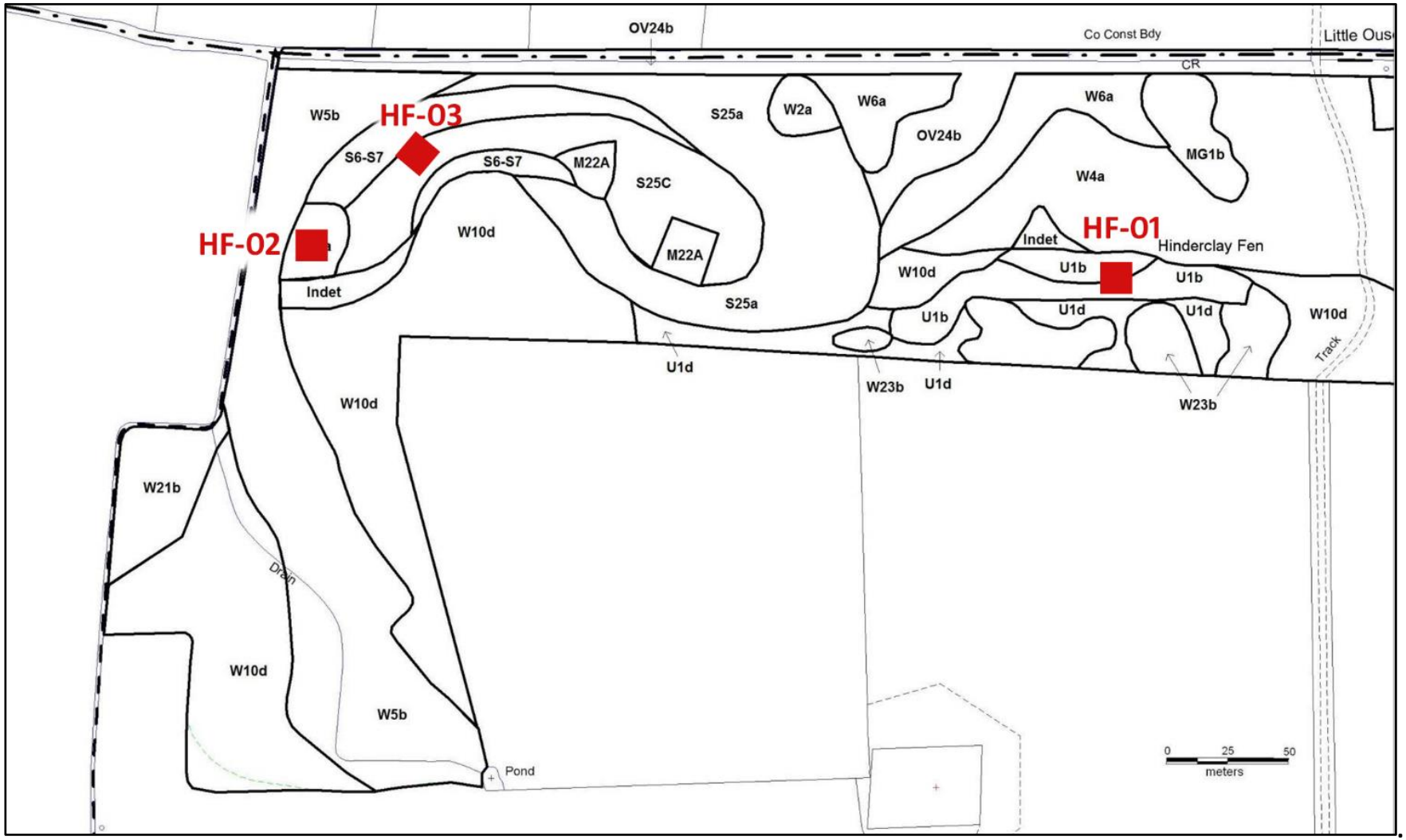
Marking the diagonal points of a 10m square makes re-establishing the original 10x10m square unequivocal, since the remaining 2 corners, if measured as 10m from both diagonal posts, can only be located at one point. The length of the diagonal is 14.14m. The posts were located in the south-east and north-west corners, except Plot HF-03 where the posts were the north and south corners. The plot layout is shown on Figure 2, the approximate location of the plots shown on Figure 3. The location of each post is recorded with a 10-digit GPS reading. All GPS readings in this report refer to OS Square TM.

The details of the monitoring plots and locations are given in Table 2.

Table 2: Monitoring Plot Locations at Hinderclay Fen. Vegetation type taken from NVC map in OHES (2012)

VEGETATION TYPE	PLOT CODE	MARKER POSTS	Marker Post Location	EASTING	NORTHING	Plot location
U1b *Festuca ovina-Agrostis capillaris-Rumex acetosella* grassland, Typical community. Parched acid grassland/Ling heather stands.	HF01	HF01-01	South-east corner of 10m plot	02473	78748	Plot between two areas of scrub trees, just north of footpath.
		HF01-02	North-west corner of 10m plot.	02462	78755	
M22a *Juncus subnodulosus-Cirsium palustre* fen meadow, Typical sub-community	HF02	HF02-01	South-east corner of 10m plot	02152	78746	Area of fen meadow on western edge, next to woodland.
		HF02-02	North-west corner of 10m plot.	02136	78750	
S25c *Phragmites australis-Eupatorium cannabinum fen, Cladium mariscus sub-community*	HF03	HF03-01	South corner of 10m plot	02177	78779	Plot in tall fen between margin and woodland edge. Note orientation (Figure 3).
		HF03-02	North corner of 10m plot.	02174	78794	

Figure 3: Location of Monitoring Plots at Hinderclay Fen. Base is the NVC Map from OHES (2012). See Table 2 for precise location details.



3. RESULTS

3.1 HF-01: U1b *Festuca ovina-Agrostis capillaris-Rumex acetosella* grassland, Typical sub-community.

3.1.1 Photographic Record

HF-01: U1b *Festuca ovina-Agrostis capillaris-Rumex acetosella* grassland, Typical community
View taken from TM 02468 78748, looking north.

HF-01: U1b *Festuca ovina-Agrostis capillaris-Rumex acetosella* grassland, Typical community
Quadrants

South West	South East
	

North West	North East
	

3.1.2 Vegetation Structural Characters

Monitoring Plot	HF01
Recorder	Mike Harding
Survey Date	23rd May 2020

Character of the ground surface

Relatively flat, some fall away to the north, towards the river. A sandy terrace with micro-topography created by anthills, rabbit activity and rabbit-grazed canopy of *Calluna*. The trampled footpath along southern edge was outside of the plot. There were patches of exposed, bare sandy coarse sand soils, and areas of leaf litter from nearby trees.

Soil Wetness

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

	Attribute	**Quadrant**				**Average**
		SW	**SE**	**NW**	**NE**	
Layer height	Standing water (cm)	0	0	0	0	0
	Plant litter (cm)	0.5	1	10	1	3.2
	Woody seedlings (cm)	0	0	0	0	0
	Large sedges / rushes (cm)	0	0	0	0	0
	Reed-like grasses (cm)	0	0	0	0	0
	Woody saplings (cm)	0	0	0	0	0
Cover value	Standing water (%)	0	0	0	0	0
	Trampling (%)	0	0	0	5	1.25
	Dunging (%)	<1	0	0	<1	<1
	Bare ground (%)	15	5	1	15	9
	Plant litter (%)	20	30	60	20	32.5
	Bryophytes (%)	25	20	20	60	31.25
	Woody seedlings (%)	0	0	0	0	0
	Large sedges / rushes (%)	0	0	0	0	0
	Reed-like grasses (%)	0	0	0	0	0
	Woody saplings (%)	0	0	0	0	0

3.1.3 Floristic Sampling

Monitoring Plot	HF01
Recorder	Mike Harding
Survey Date	23rd May 2020

	Sample Number, 1m²																				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**Frequency 2020**
Pseudoscleropodium purum	P	P	P	P	P	P	P	P	P	P	P	P		P	P	P		P	P	P	90
Agrostis capillaris	P	P	P	P	P	P	P	P		P	P	P	P	P		P	P	P		P	85
Rumex acetosella	P	P	P	P	P	P	P			P	P	P	P	P		P	P		P	P	80
Festuca ovina	P	P	P	P	P	P	P			P	P	P	P	P		P	P	P		P	80
Galium saxatile	P	P	P		P					P	P	P	P	P		P	P		P	P	65
Hypnum cupressiforme		P			P	P	P	P	P	P	P	P		P				P		P	60
Agrostis vinealis	P	P				P	P			P	P			P		P		P	P		50
Luzula campestris	P		P	P		P					P	P		P		P	P		P		50
Cladonia squamosa		P			P	P		P		P	P		P		P			P		P	50
Carex hirta	P		P	P	P	P							P			P	P		P		45
Calluna vulgaris		P			P	P	P	P	P						P			P		P	45
Cladonia furcata		P			P	P				P	P		P	P				P		P	45
Galium verum			P	P							P	P	P	P		P			P		40
Holcus lanatus				P		P				P	P	P		P			P			P	40
Ononis repens	P		P	P										P		P			P		30
Poa compressa	P			P						P		P	P	P							30
Aira praecox					P	P				P	P	P						P			30
Polytrichum juniperinum					P	P		P				P			P					P	30
Campanula rotundifolia	P			P										P		P	P				25
Anthoxanthum odoratum			P									P		P			P		P		25
Poa pratensis			P	P							P					P			P		25
Dicranum scoparium							P	P							P			P		P	25

Carex pilulifera		P								P								P		P	20
Glechoma hederacea			P	P												P			P		20
Festuca rubra				P									P		P				P		20
Molinia caerulea							P	P										P		P	20
Pilosella officinarum	P															P	P				15
Carex caryophyllea	P							P								P					15
Peltigera canina					P					P						P					15
Veronica arvensis											P					P	P				15
Cerastium fontanum												P					P				10
Stellaria graminea												P							P		10
																					Mean
Total Number Species	**13**	**11**	**12**	**14**	**13**	**14**	**9**	**9**	**3**	**14**	**15**	**15**	**10**	**15**	**6**	**17**	**12**	**12**	**13**	**14**	**12.05**

3.1.4 Commentary

Vegetation structure

There are two zones within the plot. In the northern c. third, the plot is dominated by mature but rabbit-grazed dense *Calluna* plants which form semi-continuous hummocks up to 30cm tall, dense and bushy. The remainder of the plot is short-grazed acid grassland less than 5cm tall and often less, rather open in structure. There are frequent patches of ground mosses, and patches of bare soil where rabbits have scraped, although there are no burrows in the plot. Also in the southern area are some rounded anthills to 20cm tall, providing further micro-topographical variation.

Floristics

The southern two-thirds of the plot comprises a typical acid grassland sward, with the principle species *Pseudoscleropodium purum, Agrostis capillaris, Rumex acetosella, Festuca ovina, Hypnum cupressiforme* and *Galium saxatile.* At lower frequency and more patchy in the sward are a range of heath sedges and grasses, some grasses such as *Holcus lanatus* indicating a coarseness suggesting elevated nutrients. These are relatively few, and overall the floristics are of a typical acid grassland in good condition. The ground has good cover from bryophytes and lichens, which can both occur as dense patches. Then there are some herbs of acid and near-neutral grassland, the latter including *Galium verum, Ononis repens, Campanula rotundifolia* and the uncommon sedge *Carex caryophyllea.* The sward is well established and compact, but there are frequent patches of bare ground. The number of annuals is then surprisingly low, the most frequent being *Aira praecox*.

The heather areas are dominated by coalescing bushes of *Calluna vulgaris* which when very dense markedly suppress species richness. The associated flora is a reduced suite of species of the acid grassland area, mostly occurring in gaps in the heather. The constants of the plots are usually present, along with *Hypnum,* a few *Cladonias* and a couple of species uncommon elsewhere in the plot such as *Molinia caerulea* and the moss *Dicranum scoparium.*

The grassland and heather stands were separated in the OHES (2012) NVC survey into separate stands, although both were assigned to U1b NVC type. The acid grassland is a reasonable fit to the community, although there is some affinity with the *Anthoxanthum odoratum-Lotus corniculatus* sub-community. The stands of *Calluna* are very close to H1 *Calluna vulgaris-Festuca ovina* heath, the *Hypnum cupressiforme* sub-community.

Summary of records and events

The plot has had occasional scrub rogueing but otherwise is maintained by rabbit grazing.

Relation to past and target conditions

The plot appears to be very similar to that described in the OHES (2012) NVC survey although different sampling densities and quadrats make comparisons difficult. If anything there seems to be slight improvement, with increased richness, and no recruitment of negative indicators. No targets for the community have been defined, but the plot is in good ecological condition. As long as rabbit grazing density is maintained, the Plot should be adequately maintained, although the regular rain of leaves from adjacent woodland provides unwelcome nutrient addition and seed source for scrub trees.

3.2 HF02 M22a *Juncus subnodulosus-Cirsium palustre* fen meadow, Typical sub-community, west side of Hinderclay Fen

3.2.1 Photographic Record

HF02 M22a *Juncus subnodulosus-Cirsium palustre* fen meadow, Typical sub-community. View taken from TM 02158 78746, looking north.

HF02 M22a *Juncus subnodulosus-Cirsium palustre* fen meadow, Typical sub-community Quadrants

South West	South East
	

North West	North East
	

3.2.2 Vegetation Structural Characteristics

Monitoring Plot	HF02: M22a Fen Meadow
Recorder	Mike Harding
Survey Date	24th May 2020

Character of the ground surface

Flat peat terrace slightly raised above the main fen area. Some micro-topography provided by tussocks and moss hummocks.

Soil Wetness

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

	Attribute	**Quadrant**				**Average**
		SW	**SE**	**NW**	**NE**	
Layer height	Standing water (cm)	0	0	0	0	0
	Plant litter (cm)	5	7	10	10	8
	Woody seedlings (cm)	0	0	0	0	0
	Large sedges / rushes (cm)	70	60	75	70	68.75
	Reed-like grasses (cm)	0	0	90	90	45
	Woody saplings (cm)	0	0	0	0	0
Cover value	Standing water (%)	0	0	0	0	0
	Trampling (%)	0	0	0	0	0
	Dunging (%)	0	0	0	0	0
	Bare ground (%)	5	10	5	5	6.25
	Plant litter (%)	90	85	90	90	88.75
	Bryophytes (%)	15	5	15	5	10
	Woody seedlings (%)	0	0	0	0	0
	Large sedges / rushes (%)	40	30	60	50	45
	Reed-like grasses (%)	0	0	2	2	1
	Woody saplings (%)	0	0	0	0	0

3.2.3 Floristic Sampling

Monitoring Plot	HF02
Recorder	Mike Harding
Survey Date	24th May 2020

	Sample Number																				Frequency 2020
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Valeriana officinalis	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	100
Juncus subnodulosus	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	100
Cirsium palustre	P	P	P	P	P	P	P	P	P		P		P	P	P	P	P	P	P	P	90
Calliergonella cuspidata	P	P	P	P	P	P	P	P	P		P		P	P		P	P	P	P	P	85
Galium uliginosum	P	P	P	P	P	P	P	P	P	P		P	P		P	P	P	P	P		85
Filipendula ulmaria	P	P		P	P	P		P		P	P		P		P	P	P	P		P	70
Mentha aquatica	P			P	P	P	P		P		P	P		P	P	P		P	P	P	70
Eupatorium cannabinum	P	P	P	P		P		P		P		P	P		P		P		P		60
Holcus lanatus	P		P	P	P	P			P		P	P		P			P			P	55
Kindbergia praelonga	P	P		P				P			P			P				P		P	40
Festuca rubra	P		P			P	P			P			P		P			P			40
Silene flos-cuculi								P			P	P	P		P	P	P		P		40
Phragmites australis					P	P		P		P	P				P				P		35
Hydrocotyle vulgaris					P	P		P			P		P		P					P	35
Oxyrrhynchium speciosum	P		P						P	P			P					P			30
Angelica sylvestris							P	P				P				P	P			P	30
Plagiomnium elatum	P			P			P					P			P						25
Scutellaria galericulata	P				P					P			P							P	25
Agrostis stolonifera			P			P				P						P	P				25
Calamagrostis canescens				P				P			P			P				P			25
Carex acutiformis							P			P	P				P			P			25
Bryum pseudotriquetrum							P					P		P			P			P	25

Aneura pinguis	P							P					P						P		20
Carex lepidocarpa					P	P									P				P		20
Galium palustre													P	P		P			P		20
Plagiomnium undulatum	P									P						P					15
Taraxacum officinale		P										P							P		15
Hypericum tetrapterum						P							P							P	15
Lotus pedunculatus								P		P									P		15
Cardamine pratensis											P		P						P		15
Carex disticha													P		P		P				15
Lythrum salicaria														P				P		P	15
Poa trivialis														P			P			P	15
																					Mean
Total Number Species	**16**	**9**	**10**	**12**	**12**	**15**	**11**	**15**	**8**	**13**	**14**	**11**	**17**	**12**	**15**	**12**	**14**	**13**	**15**	**15**	**12.95**

3.2.4 Commentary

Vegetation structure

The community is dominated by a consistent tier of *Juncus subnodulosus* with a patchy and relatively infrequent tier of overtopping *Phragmites,* but because of regular management the reed is only 20-30cm taller than the rush tier. The rush is relatively open and therefore allows a wide range of dicot herbs to provide some structural diversity. Closer to the ground, small herbs are very sparse but there is a patchy layer of bryophytes. Litter is extensive and can be quite deep, much of which is contributed by leaf fall from the woodland around the west and south sides.

Floristics

The tier of *Juncus subnodulosus* is relatively open and averages 45% cover, allowing a reasonable diversity of associated species. Most are relatively bulky – *Valeriana officinalis, Eupatorium cannabinum, Cirsium palustre* and *Phragmites australis,* with less commonly, *Angelica sylvestris, Carex acutiformis* and *Lythrum salicaria.* Smaller fen meadow herbs were also frequent with *Mentha aquatica, Hypericum tetrapterum* and *Scutellaria galericulata* being distinctive. There are some records for the uncommon *Carex lepidocarpa* in wetter areas near hollows. Although the ground layer of bryophytes is not extensive, it includes some uncommon species such as *Plagiomnium elatum*, *Aneura pinguis* and *Bryum pseudotriquetrum*. The sward is moderately species-rich, reaching nearly 13 species per quadrat.

The Plot is a good fit to M22 *Juncus subnodulosus-Cirsium palustre* fen meadow. Although it has a range of the species characteristic of some of the sub-communities it does clearly fit any of them and hence the general Typical sub-community remains the best fit.

Summary of records and events

The plot has been mown annually in summer with cuttings removed for at least the last 10 years.

Relation to past and target conditions

No particular targets were seen for this community, and there are no previous Plot records with which to assess general direction of travel. Comparing with the last NVC survey (OHES 2012) is difficult because of differences in quadrat size and number, but the stand now appears to have improved, with greater species-richness and a wider variety of species, and less negative indicator species. The plot is likely to be adversely affected by the woodland to the south causing shading, leaf fall and seed rain.

3.3 HF03 S25c *Phragmites australis-Eupatorium cannabinum fen, Cladium mariscus* sub-community, west side of Hinderclay Fen

3.3.1 Photographic Record

HF03 S25c *Phragmites australis-Eupatorium cannabinum fen, Cladium mariscus* sub-community, west side of Hinderclay Fen. View taken from TM 02177 78779, looking north.

BNF03: S25c *Cladium Fen*, West Side of Blo' Norton Fen. Quadrants

South West	South East
	

North West	North East
	

3.3.2 Vegetation Structural Characters

Monitoring Plot	BNF03
Recorder	Mike Harding
Survey Date	24th May 2020

Character of the ground surface

A flat peat surface with hollows up to 10cm deep formed by old peat diggings. Water above the surface across much of the plot, becoming deeper in the old hollows. There is a significant amount of bare ground and relatively little litter covering the ground surface. Some micro-topographic variation is also provided by the tussocks of *Carex elata*.

Soil Wetness

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

	Attribute	Quadrant				Average
		SW	SE	NW	NE	
Layer height	Standing water (cm)	5	10	5	3	5.75
	Plant litter (cm)	1	0	1	0	0.5
	Woody seedlings (cm)	0	0	0	0	0
	Large sedges / rushes (cm)	80	70	90	70	77.5
	Reed-like grasses (cm)	120	110	120	120	142.5
	Woody saplings (cm)	0	0	0	0	0
Cover value	Standing water (%)	20	40	60	30	37.5
	Trampling (%)	0	0	0	0	0
	Dunging (%)	0	0	0	0	0
	Bare ground (%)	40	60	65	50	53.75
	Plant litter (%)	20	10	10	30	17.5
	Bryophytes (%)	10	15	5	15	11.5
	Woody seedlings (%)	0	0	0	0	0
	Large sedges / rushes (%)	60	60	40	50	52.5
	Reed-like grasses (%)	30	40	50	40	40
	Woody saplings (%)	0	0	0	0	0

3.3.3 Floristic Sampling

Monitoring Plot	BNF03
Recorder	Mike Harding
Survey Date	24th May 2020

	Sample Number, 1m²																				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**Frequency 2020**
Phragmites australis	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	100
Carex elata	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	100
Oxyrrhynchium speciosum	P	P		P	P		P	P			P	P	P	P	P		P		P	P	70
Eupatorium cannabinum	P		P	P	P		P	P			P	P		P	P		P		P	P	65
Juncus subnodulosus		P	P				P		P		P	P	P	P	P		P	P		P	60
Carex acutiformis		P	P		P			P	P				P			P		P	P		45
Mentha aquatica			P					P	P		P	P		P	P		P	P			45
Calystegia sepium	P	P		P	P		P							P		P		P			40
Galium palustre	P						P			P	P	P	P				P		P		40
Lythrum salicaria		P				P	P				P		P		P		P	P			40
Epilobium parviflorum	P		P	P	P			P								P		P			35
Calliergonella cuspidata	P	P					P						P			P		P		P	35
Equisetum palustre		P	P					P			P					P			P	P	35
Scutelaria galericulata			P				P				P	P				P			P	P	35
Solanum dulcamara				P	P									P			P			P	25
Lycopus europaeus								P		P	P					P		P			25
Cirsium palustre								P	P					P	P					P	25
Agrostis stolonifera	P					P											P			P	20
Scrophularia auriculata					P			P				P						P			20
Carex riparia							P	P				P						P			20
Filipendula ulmaria														P	P			P		P	20
Calamagrostis canescens	P					P													P		15

Holcus lanatus		P													P			P		15
Bryum pseudotriquetrum												P							P		10
Valeriana officinalis															P				P		10
Angelica sylvestris																P				P	10
Urtica dioica						P															5
Galium aparine															P						5
Phalaris arundinacea																		P			5
																					Mean
Total Number Species	**10**	**10**	**9**	**7**	**9**	**6**	**11**	**12**	**6**	**4**	**11**	**11**	**8**	**10**	**11**	**11**	**10**	**14**	**12**	**13**	**9.75**

3.3.4 Commentary

Vegetation structure

The plot has an upper tier of reed at around 140cm, overtopping a more mixed associated fen flora of mostly small tussocks of *Carex elata* with broad-leaved herbs, 70-80cm tall. The habitat is still relatively open and there is a patchy cover of bryophytes on the ground. Following recent mowing, and being recorded in May, the sward is relatively short for reed fen and would be expected to develop into a taller and denser sward. Because of recent cutting and raking, there is relatively little litter and much bare ground. At the time of survey there was standing water across a high proportion of the plot, up to 10cm deep in the hollows.

Plot Floristics

The plot is dominated by *Phragmites australis* with *Carex elata* constant although not especially abundant. Also frequent are *Eupatorium cannabinum, Juncus subnodulosus, Mentha aquatica, Carex acutiformis* and *Lythrum salicaria* in the herb layer. Climbers and sprawlers are represented by *Calystegia sepium, Solanum dulcamara* and *Galium palustre,* while on the ground there is a reasonable cover of *Oxyrrhynchium speciosum* and less commonly *Calliergonella cuspidata*. Overall, this is a very typical base-rich reed fen seen frequently throughout the Waveney-Ouse Valley fens.

Perhaps unusual in this kind of habitat is the absence of *Cladium mariscus.* At other sites this would be expected to be the usual summer-mown saw-sedge bed, but the sedge may have been eliminated by the frequent inundation from eutrophic river water. Instead, the habitat has high frequency of the tussock sedge *Carex elata.* Despite the lack of *Cladium,* the stand was placed in the *Cladium* sub-community of S25 by OHES (2012), mostly by virtue of the *Carex elata* and the lack of species preferential to other sub-communities. This is a reasonable classification and still applies to this monitoring plot, but the fit to S25c is not ideal.

Because of the dominance by reed and *Carex elata* and the long rotation mowing the plot receives, it is not especially species rich recording mean number of species per quadrat of 9.75.

Summary of records and events

The plot was mown and cleared in summer 2019. It is on a longer rotation of 5-6 years.

Relation to past and target conditions

Although comparison with the 2012 NVC survey is difficult because of differences in sample size and density, the plot has maintained its overall character since the survey. Richness is higher in the monitoring plot despite a much smaller sample size, suggesting the plot is improving.

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