

1. INTRODUCTION

Suffolk Wildlife Trust commissioned the re-survey of monitoring plots first established by Bellamy in 1959 (Bellamy 1967, Bellamy and Rose 1961) and re-recorded in 1991 by M. Harding and W. Fojt. The plots are shown on the attached map.

2. METHODS

Methods were the same as in Fojt and Harding (1995). The plots are all 10m x 10m. Within each plot, 50 x 50cm quadrats were located using random numbers, and in each quadrat all vascular plants and bryophytes were recorded and % cover estimated by eye. The following numbers of quadrats were recorded in each plot:

Plot 1: 25 quadrats
Plot 2: 20 quadrats
Plot 3: 20 quadrats
Plot 3a: 10 quadrats

This is the same as Bellamy's original methods except that he recorded cover using the Braun-Blanquet scale and derived percentage cover as the mid-point of each cover-class. Plots were re-sampled in June 1999. Nomenclature is according to Stace (1991) for vascular plants, Smith (1978, 1990) for bryophytes and Moore (1986) for charaphytes.

All of the *Chara* recorded in the plots in 1999 appeared to be *Chara vulgaris* var. *longibracteata*. However, Bellamy and Rose (1961) and Fojt and Harding (1995) did not determine species or variety. *Chara vulgaris* var. *contraria* was also recorded during this survey from elsewhere in the Fen, and may also occur in the plots. Records from 1959 and 1991 may therefore be either *Chara*, or both.

3. RESULTS

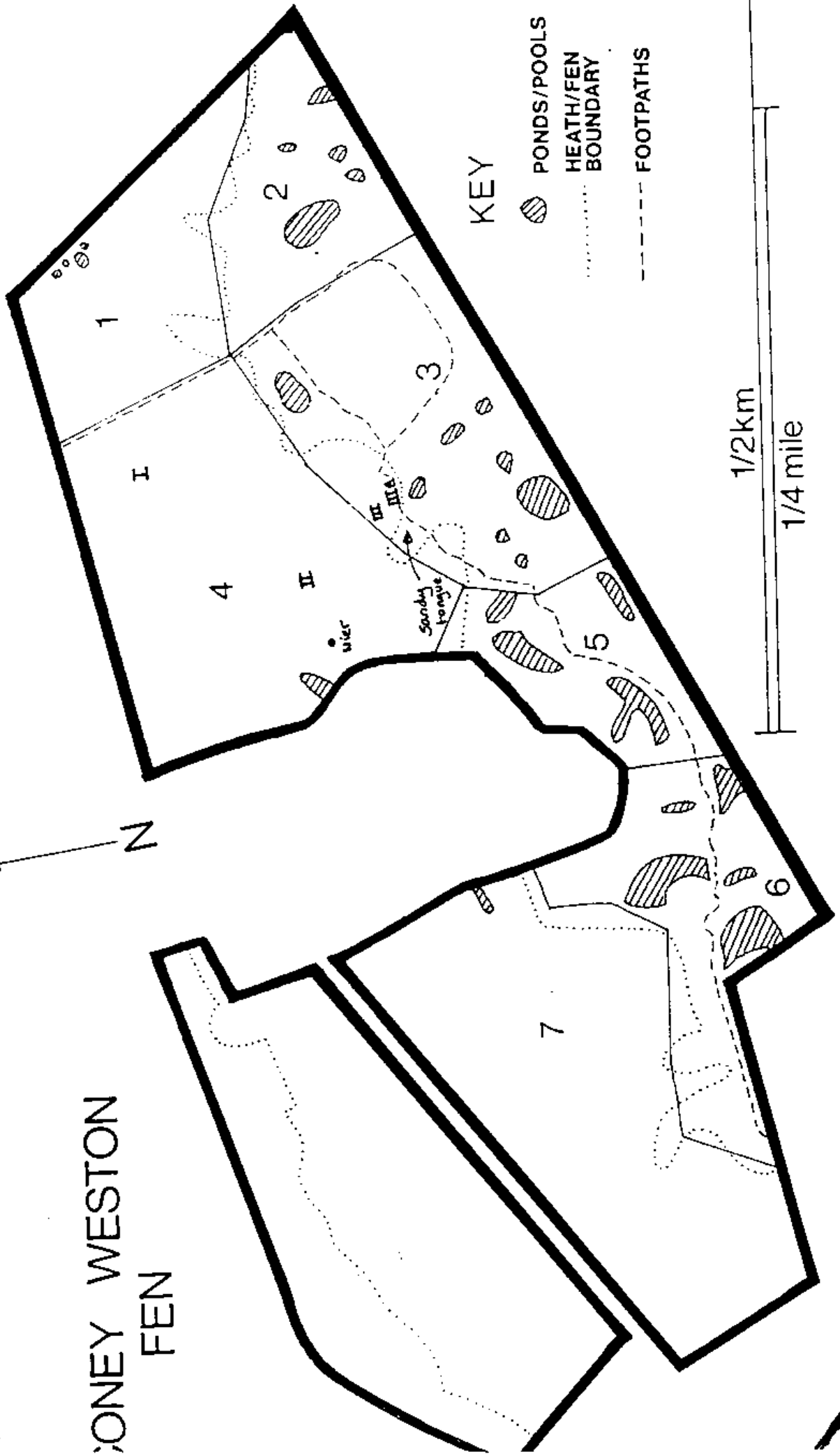
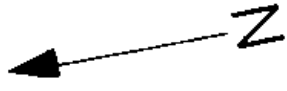
Results for 1999 are presented in the following tables. Mean cover and frequency were derived for each plot. Note that the accuracy of estimates of % cover by eye may be highly variable between recorders, and variable between growth forms (e.g. compare sedges, rushes, bryophytes and dicots) with same recorder. Such estimates must therefore be treated with caution. Frequency estimates are more reliable. Equivalent NVC communities described below are approximate as the NVC system would use much larger quadrat sizes (2 x 2m or 4 x 4m), making frequency comparisons very difficult (Rodwell 1991, 1995).

3.1 Plot 1

This area near to the river has not been managed within memory. A large willow and an alder cover about a quarter of the plot. The vegetation is tall and rank, and comparatively species poor with only 6 species per sample on average. *Phragmites* and *Cladium* are constant, the latter sometimes very dense, although the canopy is usually open enough for a few smaller species to persist. Some areas are very swampy with standing water

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and in places, *Berula erecta* and the floating *Lemna minor*. Flooding from the adjacent stream may increase the nutrients to the fen, as suggested by the frequent *Epilobium hirsutum*. A sewage works outfalls to this watercourse upstream of the Fen; a re-assessment of the discharge consents would be advisable as it is highly likely to be affecting the SAC. Other areas in this plot are raised and drier, without aquatic species. The dense vegetation and extensive litter, combined with deep standing water, conspire to keep bryophytes very reduced, with only *Eurynchium speciosum* making an appearance. Where there is standing water, it clings to litter or growing stems. A few tall-herbs are frequent with the sedge and reed, but only *Juncus subnodulosus* is a regular component of the understorey. The community is an example of S25 (c), the *Cladium mariscus* sub-community of the *Phragmites australis*-*Eupatorium cannabinum* tall herb fen.

Plot 2

This stand occupies a gentle slope between the sandy margin and the river. It is in the area of the main sedge beds. Since the last monitoring period, management has been introduced with about 2 cuts on a three-four year rotation. The last cut was in 1998. *Cladium* and *Juncus subnodulosus* are the main dominants, with reed almost always present but at much reduced cover. Tussocks of *Molinia* are frequent, and there are also *Schoenus* tussocks. There is a much greater range of small herbs compared with Plot 1, with average height less than half. Scrub is absent. Bryophytes are particularly extensive with *Calliergon* and *Campylium stellatum* dominating the ground layer, with a scattering of other uncommon rich-fen species. The water table is mostly below the surface, but only just so; depressions contained shallow water. The influence of management is obvious with this stand supporting nearly twice the number of species per sample as Plot 1.

Placing this stand in the NVC is not easy. The flora has elements of *Eupatorium cannabinum* sub-community of M24 *Molinia caerulea*-*Cirsium dissectum* fen-meadow and the *Cladium mariscus* sub-community of the S25 *Phragmites australis*-*Eupatorium cannabinum* swamp. The stand was of the latter community when last surveyed (Fojt and Harding 1995), while clearly the mowing of the stand has promoted a more open fen meadow character. Then, with the presence of species such as *Schoenus nigricans* and *Aneura pinguis*, there are affinities to M13 *Schoenus nigricans*-*Juncus subnodulosus*. This community is normally associated with laterally flowing calcareous groundwater, a condition that persists here.

Plot 3

This plot is between the sandy margin and Plot 2. Hydrologically, it may be a little above the slope of chalky seepage water that irrigates Plot 2. It probably also receives a comparatively high proportion of base-poor water from the sandy slopes close behind. The vegetation is strongly dominated by *Cladium*, with much *Juncus subnodulosus*, but other herbs are only occasionally prominent. The stand is particularly swampy, with water above ground in most quadrats and sometimes quite deep. This promotes species such as *Berula erecta* and *Lemna minor*, and there are patches of *Chara*. This deeper water restricts bryophytes in both frequency and abundance, and the dense *Cladium* canopy exacerbates this. Mosses indicative of drier conditions, especially, *Eurhynchium* spp., are usually found growing epiphytically on litter floating over the water. The

vegetation receives some management with light grazing, although this is too light to reduce the dominance of the sedge. Species richness is therefore quite low.

In NVC terms, the stand appears to be S25 (c), the *Cladium* sub-community of the *Phragmites australis-Eupatorium cannabinum* tall herb fen.

Plot 3a

This stand is adjacent to the sandy margin. It therefore receives strong flushing from sand-filtered rain water. This has normally been assumed to be acid, but has never been measured.

The flora of Plot 3a has species indicative of base-poor water (*Sphagnum subnitens*, *Aulacomnium palustre*, and *Agrostis canina*), but most are indicative of base-rich conditions. The acid indicators are mostly on the more elevated parts: tussocks, overgrown scrub stumps or peat hummocks. The chalky flora is associated with the lower and wetter areas, where rooting into the calcareous peat or irrigation by chalk water is more pronounced. In most areas, the chalky flora colonises the base of the tussocks or the hollows between them. This is a typical arrangement in better developed "mixed" mires.

The vegetation is the richest of all of the stands, with an average of 15 species per quadrat. It receives more or less annual management, usually a combination of cutting and light grazing. Plot 2, the next most intensively managed with cutting every 3 years, is much less rich. Plot 3a also has a greater range of fen plants, including the uncommon moss *Campylium elodes*.

In NVC terms, the stand appears to be transitional between M22 *Juncus subnodulosus-Cirsium palustre* fen meadow and S25(c) the *Cladium* sub-community of the *Phragmites australis-Eupatorium cannabinum* tall herb fen. This position reflects the gradual change of the community since the re-introduction of management (see below).

Table 1 : Plot 1, Market Weston Fen 1999

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	X	F	
<i>Phragmites australis</i>	40	20	2	10	10	40	20	30	50	60	30	10	3	5	20	10	40	30	20	40	40	1						
<i>Clethra mariscus</i>	50	40	80	50	50	90	50	50	5	5	30	35	50	5	40	40	70	20	20	30	10	80	70	2				
<i>Valeriana officinalis</i>	10	2	2	4	2	2	5	4	4	1	10			3	3	10	10	5	5	5				10	10	3	64	
<i>Eupatorium cannabinum</i>		40	5	4	10	10	10	20	20	40	30			5		2				10				5	10	8	56	
<i>Epilobium hirsutum</i>	5	10	2	2			1	10		5			10		20	5	5		5		10			2		4	56	
<i>Juncus subnodulosus</i>	5	3	1	1	2		1		10										5			2	10			1	36	
<i>Solanum dulcamara</i>	3					10			10										5								28	
<i>Salix cinerea</i>											95			95				95		50	95			95		25	28	
<i>Eurynchium speciosum</i>	2	2			4			1		95	2															0.5	20	
<i>Lemna minor</i>	10		5								5										5					1	16	
<i>Filipendula ulmaria</i>							10		30		5									5						2	16	
<i>Vicia cracca</i>	1										1				1												0.1	12
<i>Alnus glutinosa</i>						100											100									80	11	12
<i>Berula erecta</i>	60										10																3	36
<i>Lycopodium europaeus</i>	2																			2							0.2	8
<i>Lotus pedunculatus</i>			1												2												0.1	8
<i>Carex paniculata</i>									1		1																0.1	8
<i>Gailium palustre</i>																							2				0.2	8
<i>Eurynchium praelongum</i>																								5			0.4	8
<i>Mentha aquatica</i>	10																										0.3	4
<i>Carex panicea</i>				1																							0.1	4
<i>Angelica sylvestris</i>								1																			0.1	4
<i>Cardamine pratensis</i>									1																		0.1	4
<i>Carex elata</i>																20											0.8	4
Depth of water (cm)	15	5	8	5	0	0	0	0	0	7	0	7	2	0	2	5	0	0	0	0	4	0	0	0	0	0	2.4	
Bare ground/water (%)	50	10	0	10	0	0	0	0	80	40	40	40	20	70	30	40	20	0	0	30	30	0	0	0	80	80	27	
Litter layer (%)	50	90	100	90	100	100	100	100	20	60	50	60	80	30	70	60	80	100	100	70	70	100	100	20	20	73		
Vegetation height (m)	1.5	1.0	1.0	1.2	1.0	1.2	0.9	1.3	1.0	1.2	1.1	1.0	1.2	0.7	1.0	1.2	1.4	1.2	1.1	1.5	1.5	1.0	1.2	1.0	1.2	1.1		
Number of species	9	8	7	7	6	5	6	7	8	5	7	7	4	5	6	5	5	3	6	7	5	3	3	7	7	6		

Species found within the plot but not within quadrats: *Campylopus stellatus*, *Lotus pedunculatus*, *Lythrum salicaria*, and *Epilobium palustre*.

Table 2 : Plot 2 Market Weston Fen 1999

	1	2	3	4	6	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	X	F
<i>Juncus subnodulosus</i>	20	20	10	5	20	1	15	25	30	3	25	20	10	10	25	40	10	10	20	15	17	100
<i>Cladium mariscus</i>	5	10	10	10	20	30	20	10	30	10	1	10	15	10	5	3	10	5	1	20	12	100
<i>Phragmites australis</i>	15	4	10	2	10	5	3	1	1	5	3	10	10	5	2	3	20	15	10	8	7	100
<i>Campylopus stielatum</i>	10	10	15	2	20	20	20	2			5	40	10		30	40	1	20	10	40	15	86
<i>Calliergon cuspidatum</i>	70	15	30	10	30	5	20	1			20	20	20		35	50		30	20	30	20	80
<i>Eupatorium cannabinum</i>	5	3	25	10	2	10	2	2	2	1	1	5	10			1	1	1		5	4	80
<i>Mentha aquatica</i>	10	1	3	1	2	3	1	1	1		4	1	1			1	3	5	1	20	3	80
<i>Cirsium palustre</i>	3	2		5	10	2	10	1	2	1	5	2	2		2	2		2		10	3	80
<i>Molinia caerulea</i>	40	10			15	20	25	20	20		5				20	10		10	20	5	10	60
<i>Angelica sylvestris</i>	2				2	2	2	1	1	1		2			1	2				10	1.3	56
<i>Galium uliginosum</i>			2		2	1	1			1	1				1	1				1	0.5	45
<i>Schoenus nigricans</i>	5		10		40	1					5				1			1		20	4	40
<i>Ctenidium molituscum</i>	2	2			10	2				2	2											
<i>Carex panicea</i>					20		30				4							5		5	3	26
<i>Valeriana dioica</i>		2																				
<i>Rubus fruticosus</i>												10				20		5		10	2	20
<i>Pseudoscleropodium purum</i>		1			2				1										1		0.6	16
<i>Chiloscyphus pallescens</i>		1			1																0.2	15
<i>Potentilla erecta</i>							1							1							0.1	10
<i>Plagiominium elatum</i>	1																				0.1	10
<i>Epilobium spp.</i>					1																0.1	5
<i>Centaurea nigra</i>							1														0.1	5
<i>Holcus lanatus</i>											1										0.1	5
<i>Fissidens adianthoides</i>																				1	0.1	5
<i>Aneura pinguis</i>																1					0.1	5
Depth of water (cm)	2	0	2	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0.4
Bare ground/water (%)	20	30	40	20	20	20	10	10	5	5	30	30	10	0	20	5	0	20	40	30	18	
Litter layer (%)	10	30	30	60	40	60	60	90	95	95	40	20	70	100	30	10	100	40	40	40	5	62
Vegetation height (m)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.7	0.5	0.5	0.5	0.5	0.5	0.7	0.6	0.7	0.6	0.7	0.6	0.5
Number of species	11	14	10	8	15	13	14	10	9	7	14	11	8	3	11	13	7	12	8	15	11	

Species recorded within the plot but not in quadrats: *Succisa pratensis*, *Lophocolea bidentata*, *Rosa* spp., *Cratoneuron commutatum*, *Carex paniculata*, *Fraxinus* seedling, *Agrostis stolonifera*.

Table 3 : PLOT 3 Market Weston Fen 1999

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	X	F	
<i>Cladium mariscus</i>	100	2	80	25	100	100	60	80	40	30	70	80	80	70	20	100	70	100	3	40	63	100	
<i>Juncus subnodulosus</i>	10	15	10	25	3	1	5	5	20	10	5	5	5	10	10	5	10		40	20	11	95	
<i>Phragmites australis</i>	1	2	2	10	1	1	3	1	3	2	1	1	1	2	2	1	2	1	3	30	3	95	
<i>Mentha aquatica</i>		3	1	10			3		5	5	20	5	5	5	2	1	5		10	10	6	75	
<i>Berula erecta</i>	1	5	2	20			4	10	10						4		5		20	20	6	70	
<i>Eupatorium cannabinum</i>	5	5	1			5	15	5	5	5	5					10					3	55	
<i>Eurhynchium speciosum</i>		60					2	2		10	10	1					10				6	36	
<i>Lemma minor</i>			1	10					1				5						40	2	3	30	
<i>Calliergon cuspidatum</i>		10					1	5	1		10						5			2	2	30	
<i>Equisetum palustre</i>			1		1		1			1				2						1	0.4	30	
<i>Campylopus stellatum</i>		10					1	5		5											1	20	
<i>Cirsium palustre</i>										5	10	5									1	15	
<i>Betula pubescens</i>										5		10										0.8	10
<i>Lophocolea bidentata</i>		10					2														0.6	10	
<i>Epilobium parviflorum</i>	2		1																		0.2	10	
<i>Molinia caerulea</i>					1		1														0.1	10	
<i>Chara vulgaris</i>			40																		2	5	
<i>longibracteata</i>																							
<i>Angelica sylvestris</i>					5																0.3	5	
<i>Epilobium hirsutum</i>							5														0.3	5	
<i>Carex elata</i>								5													0.3	5	
<i>Thelypteris palustris</i>																					0.3	5	
<i>Gallium uliginosum</i>										3											0.2	5	
<i>Carex panicea</i>	1																				0.1	5	
<i>Rubus fruticosus</i>					1																0.1	5	
<i>Valeriana officinalis</i>										1											0.1	5	
<i>Lotus pedunculatus</i>											1										0.1	5	
<i>Carex disticha</i>														1							0.1	5	
<i>Juncus articulatus</i>														1							0.1	5	
Depth of water (cm)	6	3	8	10	0	5	5	8	8	0	0	5	10	6	10	0	2	5	10	7	5.4		
Bare ground/water (%)	40	10	30	40	0	0	15	30	70	15	20	30	10	50	30	5	40	0	20	30	24		
Litter layer (%)	90	90	20	40	100	100	85	70	40	85	80	70	90	50	70	95	80	100	60	70	74		
Vegetation height (m)	1.6	0.7	1.3	1.6	1.8	1.8	1.7	1.6	1.2	1.0	1.1	0.8	0.8	1.7	1.9	1.9	0.8	1.7	1.5	1.2	1.4		
Number of species	6	11	10	6	6	5	13	10	8	11	10	7	7	8	5	4	7	3	6	7	8		

Species recorded in the plot but not within quadrats: *Lychnis flos-cuculi*, *Carex paniculata*, *Quercus seedling*, *Pseudoscleropodium purum*

Table 4 : PLOT 3a Market Weston Fen 1999

	1	2	3	4	5	6	7	8	9	10	X	F
<i>Juncus subnodulosus</i>	40	40	30	10	15	10	10	80	30	40	31	100
<i>Calliergon cuspidatum</i>	1	80	40	20	25	20	20	10	5	5	23	100
<i>Phragmites australis</i>	3	3	5	2	2	5	2	2	10	20	5	100
<i>Cladium mariscus</i>		2	10	2	15	5	10		5	25	7	80
<i>Mentha aquatica</i>	5	2		5		2	3	1	2	10	3	80
<i>Equisetum palustre</i>	1		1	1	1	1	1			5	1	70
<i>Cirsium palustre</i>		1	5		20	2			5	15	6	60
<i>Carex disticha</i>	3		1		10	10			2	5	3	60
<i>Agrostis canina</i>		2	4	3	10		5		5		3	60
<i>Campyllum stellatum</i>			20		10	5	5		5		5	60
<i>Eurhynchium speciosum</i>		15	5		5	2				10	4	60
<i>Berula erecta</i>	1	1		2				1		5	1	60
<i>Galium uliginosum</i>		2			1	1	1			2	0.7	60
<i>Sphagnum subnitens</i>			35		20		80		90		23	40
<i>Carex paniculata</i>			5	50	5	5					7	40
<i>Lotus pedunculatus</i>		2			10	1	5				2	40
<i>Valeriana officinalis</i>		2		2			4		4		1	40
<i>Eupatorium cannabinum</i>		1				1	1		2		0.6	40
<i>Holcus lanatus</i>			5		10				2		2	30
<i>Valeriana dioica</i>			10		1	10					2	30
<i>Potentilla erecta</i>			1		5				2		0.8	30
<i>Lophocolea bidentata</i>		1	1			2					0.4	30
<i>Plagiomnium elatum</i>	1	1	1								0.3	30
<i>Carex panicea</i>				1	1			1			0.3	30
<i>Festuca rubra</i>				1	1			1			0.3	30
<i>Chara vulgaris longibracteata</i>	50					30					8	20
<i>Molinia caerulea</i>				5					10		2	20
<i>Carex elata</i>	1							10			1	20
<i>Agrostis stolonifera</i>	4					5					1	20
<i>Carex viridula brachyrhyncha</i>				2				1			0.3	20
<i>Epilobium palustre</i>			1			1					0.2	20
<i>Luzula campestris</i>					1		1				0.2	20
<i>Angelica sylvestris</i>				2							0.2	10
<i>Caltha palustris</i>	1										0.1	10
<i>Aulacomnium palustre</i>			1								0.1	10
<i>Betula seedling</i>						1					0.1	10
Depth of water (cm)	5	1	0	7	0	0	0	8	0	5	3	
Bare ground/water (%)	40	20	20	40	5	5	0	60	0	70	26	
Litter layer (%)	10	10	5	40	5	10	3	5	5	30	12	
Vegetation height (m)	0.5	0.6	0.25	0.6	0.2	0.6	0.4	0.6	0.5	0.8	0.5	
Number of species	12	15	18	15	20	20	14	7	16	11	15	

Species recorded within the plot but not in quadrats: *Lychnis flos-cuculi*, *Salix* seedling, *Quercus* seedling, *Campyllum elodes*, *Calypogeia fissa*, *Pseudoscleropodium purum*, *Succisa pratensis*, *Hydrocotyle vulgaris*, *Juncus effusus*, *Cardamine pratensis*.

4. Trends over Time

Detailed changes between 1959 and 1991 are described in Fojt and Harding (1995). The following mostly reflects changes since 1991. Data for the three time periods are summarised in Tables 5-8.

Plot 1.

Between 1959 and 1991 there occurred massive loss of species. In 1959, the vegetation was an open, wet mire with much *Cladium*, although no plant was overwhelmingly dominant, and few plants obtained a high cover at all. It was characterised by a very long list of infrequent species small in size, and usually of very high conservation value. Bryophytes in particular were very rich. By 1991, nearly all of the bryophytes and small herbs had disappeared under a dense sedge and reed canopy, to be replaced by a suite of tall herbs, climbers and sprawlers and a few mosses which grow over litter. All measures of conservation value declined substantially.

This trend has continued since 1991, with tall herbs such as *Epilobium hirsutum*, *Valeriana officinalis*, *Eupatorium cannabinum*, and *Filipendula ulmaria* all increasing. The tussock sedges *Carex elata* and *C. paniculata* have increased, as have the more robust sprawlers *Vicia cracca* and *Solanum dulcamara*. Conversely most of the smaller herbs have declined or become extinct from the plot, and the few true rich-fen bryophytes remaining in 1991 have also disappeared. Of particular significance is the appearance and great expansion of willow and alder scrub, which was on the margins of the plot in 1991 but now covers around 25%. The Plot appears to be moving towards fen scrub and eventually probably W6 *Alnus glutinosa*-*Carex paniculata* woodland. This trend will continue unless management is re-introduced.

Plot 2

In 1959, this was again an open sward, this time dominated by *Juncus subnodulosus* and *Schoenus nigricans*, with *Molinia*, *Cladium* and *Phragmites* frequent but of low cover. There was a wide range of small herb associates and bryophytes, although the plot was not as rich as Plot 1. By 1991, with the abandonment of management, the plot was heavily dominated by *Cladium*, *Phragmites* and *Molinia*, with the less vigorous *Schoenus* and *Juncus* declining in cover. Many of the small herbs and bryophytes declined or disappeared, and the Plot became impoverished.

By 1999, after the re-introduction of management as a 3-yearly mowing cycle, the Plot improved significantly. Cover of reed, *Cladium* and *Molinia* declined, *Schoenus* became more frequent, and a range of the smaller plants expanded. The bryophytes in particular have benefited, with *Campylium stellatum* and *Calliergon cuspidatum* greatly expanding and *Aneura pinguis*, *Cratoneuron commutatum*, *Ctenidium molluscum* and *Fissidens adianthoides* re-appearing. As is typical with the re-introduction of management, cutting and raking has allowed opportunists and scrub such as *Rosa spp* and *Fraxinus* to establish, but these are rare.

Overall, the plot has less of the characteristics of a tall herb fen and more of a fen meadow, and is moving generally back towards the floristics of the 1959 plot. Conservation value, overall species richness and number of species per quadrat have all greatly increased. However, very many of the rarest and most valuable plants, which

were very infrequent even in 1959, have not returned. Many of the plants of the wettest conditions are no longer present, although some hollows with very shallow water (1-2cm) were present in 1991. It may be that a three-year mowing cycle is too long to allow the less competitive species to gain a foothold in the community. Many of the plants that have not returned are present only in the annually mown areas on the Fen. In addition, longer mowing cycles favour taller, more vigorous plants that have a much higher rate of evapotranspiration, encouraging the fen surface to dry out.

Plot 3

In 1959, this was a short, very open community dominated by *Cladium* with *Juncus*, some *Schoenus* and a wide range of herbs at low cover. There was also a rich bryophyte layer, but diversity and rarity of species was perhaps less than the previous two plots. By 1991, the conservation value of the plot had severely declined. *Cladium*, *Juncus* and *Phragmites* had all expanded, while *Schoenus* disappeared. Many of the smaller herbs declined or were lost, and bryophytes in particular declined in cover and richness. As with other plots, the greatest losses were in the most valuable species for conservation. Newly established species reflected the absence of management and transition to tall herb fen; *Epilobium hirsutum*, *Valeriana officinalis*, *Rubus fruticosus* and *Betula pubescens*.

After 1991, some management was re-introduced, with light cattle grazing in late summer. Mowing has not been undertaken. Consequently, species resistant to light grazing, such as *Cladium*, *Rubus* and *Betula* have expanded, while *Phragmites* and *Juncus* have declined along with a number of tall-herbs. Bryophytes have recovered well. A number of species previously lost from the Plot have re-appeared, most notably *Chara* and *Molinia caerulea*, and many of the new species are fen species and include the uncommon *Thelypteris palustris*. Overall, the quality of the vegetation as measured by all parameters has substantially improved as a result of light management. The canopy of *Cladium*, however is too dominant and its litter too persistent to allow many of the more valuable plants recorded in 1959 to re-establish. The light grazing is insufficient to break down the dense *Cladium* canopy without help from mowing. By the time stock arrive, the sward is tough and unpalatable. Although not as rich as Plot 2 in terms of species per quadrat, Plot 3 has more Principal Fen Species and has shown a greater degree of recovery.

Plot 3a

Of all of the plots, this one has seen some of the most remarkable changes. In 1959, it was dominated by a nearly continuous carpet of *Sphagnum subnitens* with an upper tier of vegetation of open *Molinia*, *Juncus subnodulosus*, *Cladium*, *Schoenus* and reed. There was a range of small herbs, some of them such as *Blysmus compressus*, quite rare. Unlike all three other plots, bryophytes were not rich and other than *Sphagnum*, were not extensive. Also in contrast with the other plots, the flora was mixed acid and calcareous. The acidophilus species are surface rooting, and are probably associated with the base-poor rain water derived from the sand, whereas the plants more typical of base-rich conditions are associated with the calcareous peat and groundwater beneath (Fojt and Harding, 1995). Overall, the plot was least rich and had the lowest RWPFS of all.

Table 5: Comparison of Change Over Time for Plot 1

SPECIES	1959		1991		1999	
	Mean Cover ¹	Frequen ¹ cy ¹	Mean Cover ²	Frequen ² cy ²	Mean Cover	Frequen ³ cy ³
<i>Cladium mariscus</i>	28	96	37	76	33	80
<i>Juncus subnodulosus</i>	8	92	ND	ND	1	36
<i>Carex panicea</i>	2	50			0.1	4
<i>Campyllum stellatum stellatum</i>	7	46	0.1	4	+	
<i>Chara sp</i>	7	46				
<i>Phragmites australis</i>	0.46	46	41	96	24	96
<i>Valeriana dioica</i>	0.42	42				
<i>Calliergon cuspidatum</i>	6	35	6	8		
<i>Schoenus nigricans</i>	6	31				
<i>Mentha aquatica</i>	0.27	27	10	80	0.3	4
<i>Aneura pinguis</i>	0.23	23	0.4	12		
<i>Pedicularis palustris</i>	0.2	20				
<i>Ctenidium molluscum</i>	3	19				
<i>Succisa pratensis</i>	0.54	19				
<i>Cratoneuron filicinum</i>	2	15				
<i>Carex viridula brachyrhyncha</i>	0.85	15				
<i>Drepanocladus revolvens</i>	2	12				
<i>Bryum pseudotriquetrum</i>	0.46	12				
<i>Potentilla erecta</i>	0.11	12				
<i>Riccardia chamedryfolia</i>	0.11	12				
<i>Eupatorium cannabinum</i>	0.46	8	2	28	9	56
<i>Epilobium palustre</i>	0.08	8			+	
<i>Galium uliginosum</i>	0.07	8	3	52		
<i>Molinia caerulea</i>	0.07	8	0.6	8		
<i>Cardamine pratensis</i>	0.05	5			0.1	4
<i>Cirsium palustre</i>	0.4	4				
<i>Anagallis tenella</i>	0.04	4				
<i>Angelica sylvestris</i>	0.04	4	1	20	0.1	4
<i>Briza media</i>	0.04	4				
<i>Lotus pedunculatus</i>	0.04	4	0.1	4	0.1	8
<i>Pinguicula vulgaris</i>	0.04	4				
<i>Lophocolea bidentata</i>	0.04	4				
<i>Rhytidiadelphus squarrosus</i>	0.04	4				
<i>Splachnum ampullaceum</i>	+					
<i>Scorpidium scorpioides</i>	+					
<i>Riccardia multifida</i>	+					
<i>Rhytidiadelphus triquetrus</i>	+					
<i>Pseudoscleropodium purum</i>	+					
<i>Parnassia palustris</i>	+					
<i>Moerckia hibernica</i>	+					
<i>Lemna trisulca</i>	+					
<i>Fissidens adianthoides</i>	+					
<i>Equisetum palustre</i>	+					
<i>Equisetum arvense</i>	+					
<i>Epipactis palustris</i>	+					
<i>Drepanocladus fluitans</i>	+					
<i>Dicranella heteromalla</i>	+					
<i>Dactylorhiza traunsteineri</i>	+					
<i>Dactylorhiza praetermissa</i>	+					
<i>Cratoneuron commutatum</i>	+					

<i>falcatum</i>							
<i>Cratoneuron commutatum</i> <i>commutatum</i>	+						
<i>Carex flacca</i>	+						
<i>Carex elata</i>	+					0.8	4
<i>Calliergon giganteum</i>	+						
<i>Apium nodiflorum</i>	+						
<i>Lythrum salicaria</i>	+					+	
<i>Lemna minor</i>	+		0.1	4		1	16
<i>Lychnis flos-cuculi</i>	+		0.1	4			
<i>Agrostis stolonifera</i>	+		1	16			
<i>Berula erecta</i>			15	88		3	8
<i>Eurynchium speciosum</i>			6	36		0.5	20
<i>Valeriana officinalis</i>			2	24		3	64
<i>Epilobium hirsutum</i>			1	16		4	56
<i>Lycopus europaeus</i>			0.4	16		0.2	8
<i>Galium palustre</i>			1	12		0.2	8
<i>Vicia cracca</i>			0.1	4		0.1	12
<i>Solanum dulcamara</i>			0.1	4		2	28
<i>Filipendula ulmaria</i>			0.1	4		2	16
<i>Eurynchium praelongum</i>			0.1	4		0.4	8
<i>Urtica dioica</i>			0.4	8			
<i>Plagiomnium elatum</i>			0.2	8			
<i>Brachythecium rutabulum</i>			0.4	4			
<i>Scrophularia auriculata</i>			0.1	4			
<i>Salix cinerea</i>						25	28
<i>Ainus glutinosa</i>						11	12
<i>Carex paniculata</i>						0.1	8
Total number species recorded	59		30			27	
Mean species richness	6 ³		7 ²			6	
RWPFSS ⁴	15.18 ⁵		4.62 ⁵			4.13	
Total number PFS ⁴	44		19			18	
Fraction of PFS in flora	74%		63%			68%	
NVC Community	M13/ M24 ⁵		S25 ⁵			S25(c)	

¹ Data from Bellamy and Rose (1961). Note there must be some errors in Bellamy's original calculations as with 25 quadrats in Plot 1, frequencies must be in multiples of 4.

² Data derived from summary quadrat tables, unpublished SWT/EN, from the fieldwork for Fojt and Harding (1995).

³ Derived from original quadrat data in Bellamy (1967).

⁴ PFS = Principle Fen Species. RWPFSS = Rarity Weighted Principle Fen Species Score (Wheeler 1988)

⁵ Data given in Fojt and Harding (1995).

Table 6: Comparison of Change Over Time for Plot 2

SPECIES	1959		1991		1999	
	Mean Cover ¹	Frequency ¹	Mean Cover ²	Frequency ²	Mean Cover	Frequency
<i>Juncus subnodulosus</i>	39	100	18	100	17	100
<i>Phragmites australis</i>	1	75	24	90	7	100
<i>Carex panicea</i>	4	65	+		3	25
<i>Cladium mariscus</i>	3	65	41	100	12	100
<i>Mentha aquatica</i>	0.6	60	0.1	5	3	80
<i>Calliergon cuspidatum</i>	10	55	1	20	20	80
<i>Valeriana dioica</i>	1	55	1	5	2	20
<i>Molinia caerulea</i>	9	45	13	60	10	60
<i>Potentilla erecta</i>	0.85	40	0.5	15	0.1	10
<i>Schoenus nigricans</i>	14	35	5	20	4	40
<i>Succisa pratensis</i>	0.8	35	0.7	15	+	
<i>Galium uliginosum</i>	0.25	25	0.7	25	0.5	45
<i>Pseudoscleropodium purum</i>	3	20	1	15	0.2	15
<i>Campylium stellatum stellatum</i>	0.6	20	0.1	10	15	85
<i>Eupatorium cannabinum</i>	0.2	20	3	40	4	80
<i>Bryum pseudotriquetrum</i>	0.2	20				
<i>Lophocolea bidentata</i>	0.2	20	0.6	10	+	
<i>Lotus pedunculatus</i>	0.15	20	+			
<i>Drepanocladus revolvens</i>	2	15				
<i>Pinguicula vulgaris</i>	0.6	15				
<i>Aneura pinguis</i>	0.15	15			0.1	5
<i>Fissidens adianthoides</i>	0.55	10			0.1	5
<i>Plagiomnium elatum</i>	0.55	10	0.2	5	0.1	5
<i>Berula erecta</i>	0.1	10				
<i>Carex pulicaris</i>	0.1	10				
<i>Rhizomnium pseudopunctatum</i>	0.1	10				
<i>Carex viridula brachyrhyncha</i>	0.5	5				
<i>Alnus glutinosa</i>	0.05	5				
<i>Cirsium dissectum</i>	0.05	5				
<i>Dactylorhiza praetermissa</i>	0.05	5				
<i>Epipactis palustris</i>	0.05	5				
<i>Equisetum palustre</i>	0.05	5				
<i>Gymnadenia conopsea</i>	0.05	5				
<i>Hydrocotyle vulgaris</i>	0.05	5				
<i>Lychnis flos-cuculi</i>	0.05	5				
<i>Chara sp</i>	0.05	5				
<i>Ctenidium molluscum</i>	0.05	5			1	30
<i>Agrostis stolonifera</i>	+				+	
<i>Anthoxanthum odoratum</i>	+					
<i>Apium nodiflorum</i>	+					
<i>Carex flacca</i>	+					
<i>Cirsium palustre</i>	+				3	80
<i>Galium palustre</i>	+					
<i>Lemna minor</i>	+					
<i>Parnassia palustris</i>	+					
<i>Rubus fruticosus</i>	+		1	20	0.6	15
<i>Campylium elodes</i>	+					
<i>Campylium stellatum protensum</i>	+					

Cratoneuron commutatum falcatum	+					+	
Cratoneuron filicinum	+						
Riccardia chamedryfolia	+						
Riccardia multifida			0.1	5			
Eurhynchium praelongum			2	15			
Angelica sylvestris			0.5	10	1.3	85	
Rhytidiadelphus squarrosus			0.1	5			
Plagiomnium undulatum			0.1	5			
Chiloscyphus pallescens					0.1	10	
Epilobium spp					0.1	10	
Centaurea nigra					0.1	5	
Holcus lanatus					0.1	5	
Rosa spp					+		
Carex paniculata					+		
Fraxinus excelsior					+		
Total number species recorded	51		24		32		
Mean species richness	9 ³		6		11		
RWPFSS ⁴	13.93 ⁵		4.42 ³		5.33		
Total number PFS ⁴	38 ⁵		15 ³		19		
Fraction of PFS in flora	73% ⁵		68% ³		59		
NVC Community	M13/M2 4		S25 ³		S25/M24		

¹ Data from Bellamy and Rose (1961). Note there must be some errors in Bellamy's original calculations as with 20 quadrats in Plot 2, frequencies must be in multiples of 5.

² Data derived from summary quadrat tables, unpublished SWT/EN, from the fieldwork for Fojt and Harding (1995).

³ Derived from original quadrat data in Bellamy (1967).

⁴ PFS = Principle Fen Species. RWPFSS = Rarity Weighted Principle Fen Species Score (Wheeler 1988)

⁵ Data given in Fojt and Harding (1995).

Table 7: Comparison of Change Over Time for Plot 3

SPECIES	1959		1991		1999	
	Mean Cover ¹	Frequen ¹	Mean Cover ²	Frequen ²	Mean Cover	Frequen ³
<i>Cladium mariscus</i>	28	85	34	95	63	100
<i>Juncus subnodulosus</i>	16	80	29	100	11	95
<i>Phragmites australis</i>	2	60	16	100	3	95
<i>Mentha aquatica</i>	0.55	55	5	60	5	75
<i>Chara</i>	4	45			2	5
<i>Carex panicea</i>	2	45			0.1	5
<i>Valeriana dioica</i>	0.9	45				
<i>Cratoneuron filicinum</i>	4	40				
<i>Schoenus nigricans</i>	4	35				
<i>Molinia caerulea</i>	1	30			0.1	10
<i>Lotus pedunculatus</i>	0.75	30	0.1	5	0.1	5
<i>Calliergon cuspidatum</i>	5	25	0.7	25	2	30
<i>Campyllum stellatum stellatum</i>	2	25	0.2	15	1	20
<i>Succisa pratensis</i>	0.22	25				
<i>Pseudoscleropodium purum</i>	6	20	1	10	+	
<i>Equisetum palustre</i>	0.2	20	0.9	40	0.4	30
<i>Galium uliginosum</i>	0.2	20	0.1	5	0.2	5
<i>Eupatorium cannabinum</i>	0.15	15	5	50	3	55
<i>Potentilla erecta</i>	0.15	15	4	5		
<i>Sphagnum subnitens</i>	6	10	1.5	5		
<i>Cirsium palustre</i>	0.55	10			1	15
<i>Agrostis stolonifera</i>	0.1	10				
<i>Berula erecta</i>	0.1	10	7	65	6	70
<i>Cardamine pratensis</i>	0.1	10				
<i>Carex viridula brachyrrhyncha</i>	0.1	10				
<i>Carex appropinquata</i>	0.5	5				
<i>Anthoxanthum odoratum</i>	0.05	5				
<i>Caltha palustris</i>	0.05	5	+			
<i>Carex diandra</i>	0.05	5				
<i>Gymnadenia conopsea</i>	0.05	5				
<i>Lychnis flos-cuculi</i>	0.05	5			+	
<i>Vicia cracca</i>	0.05	5	0.5	5		
<i>Drepanocladus revolvens</i>	0.05	5				
<i>Fissidens adianthoides</i>	0.05	5				
<i>Rhizomnium pseudopunctatum</i>	0.05	5				
<i>Plagiomnium undulatum</i>	0.05	5				
<i>Plagiomnium elatum</i>	0.05	5				
<i>Apium nodiflorum</i>	+					
<i>Carex paniculata</i>	+		9	25	+	
<i>Galium palustre</i>	+					
<i>Holcus lanatus</i>	+					
<i>Parnassia palustris</i>	+					
<i>Campyllum stellatum protensum</i>	+					
<i>Eurhynchium praelongum</i>	+		0.1	5		
<i>Lophocolea bidentata</i>	+		1	25	0.6	10
<i>Philonotis calcarea</i>	+					
<i>Brachythecium rutabulum</i>			0.7	15		
<i>Epilobium hirsutum</i>			9	50	0.3	5
<i>Lemna minor</i>			2.5	5	3	30

<i>Valeriana officinalis</i>			1	5		0.1	5
<i>Rubus fruticosus</i>			+			0.1	5
<i>Betula pubescens</i>			+			0.8	10
<i>Eurhynchium speciosum</i>						3	55
<i>Epilobium parviflorum</i>						0.2	10
<i>Angelica sylvestris</i>						0.3	5
<i>Carex elata</i>						0.3	5
<i>Thelypteris palustris</i>						0.3	5
<i>Carex disticha</i>						0.1	5
<i>Juncus articulatus</i>						0.1	5
<i>Quercus robur</i>						+	
Total number species recorded	46		25			31	
Mean species richness	8 ¹		7			8	
RWPFSS ⁴	11.84 ⁵		3.18 ³			5.36	
Total number PFS ⁴	33 ⁵		13 ³			22	
Fraction of PFS in flora	72% ⁵		59% ³			71%	
NVC Community	M13/M2 4		S25 ³			S25(c)	

¹ Data from Bellamy and Rose (1961).

² Data derived from summary quadrat tables, unpublished SWT/EN, from the fieldwork for Fojt and Harding (1995).

³ Derived from original quadrat data in Bellamy (1967).

⁴ PFS = Principle Fen Species. RWPFSS = Rarity Weighted Principle Fen Species Score (Wheeler 1988)

⁵ Data given in Fojt and Harding (1995).

Table 8: Comparison of Change Over Time for Plot 3a

SPECIES	1959		1991		1999	
	Mean Cover ¹	Frequen- cy ¹	Mean Cover ²	Frequen- cy ²	Mean Cover	Frequen- cy
<i>Sphagnum subnitens</i>	80	100	44	100	23	40
<i>Juncus subnodulosus</i>	14	100	4	50	31	100
<i>Potentilla erecta</i>	3	100	0.5	10	0.8	30
<i>Molinia caerulea</i>	5	80			2	20
<i>Succisa pratensis</i>	3	80	+		+	
<i>Cladium mariscus</i>	0.8	70	52	90	7	80
<i>Valeriana dioica</i>	1	50	4	50	2	30
<i>Phragmites australis</i>	0.5	50	8.7	80	5	100
<i>Lotus pedunculatus</i>	3	30	+		2	40
<i>Drosera rotundifolia</i>	0.3	30				
<i>Galium uliginosum</i>	0.3	30	+		0.7	50
<i>Gymnadenia conopsea</i>	0.3	30				
<i>Mentha aquatica</i>	0.3	30	1	30	3	80
<i>Pseudoscleropodium purum</i>	1	20			+	
<i>Carex panicea</i>	0.2	20			0.3	30
<i>Holcus lanatus</i>	0.2	20			2	30
<i>Schoenus nigricans</i>	0.2	20				
<i>Anthoxanthum odoratum</i>	0.1	10				
<i>Blysmus compressus</i>	0.1	10				
<i>Cirsium dissectum</i>	0.1	10				
<i>Epipactis palustris</i>	0.1	10				
<i>Eupatorium cannabinum</i>	0.1	10	0.4	20	0.5	40
<i>Campyllum stellatum stellatum</i>	0.1	10			5	50
<i>Carex pulicaris</i>	+					
<i>Aulacomnium palustre</i>	+		0.1	10	0.1	10
<i>Pohlia nutans</i>	+					
<i>Equisetum palustre</i>			2	40	1	70
<i>Berula erecta</i>			1	20	1	50
<i>Carex disticha</i>			0.2	10	3	60
<i>Epilobium palustre</i>			0.3	10	0.2	20
<i>Carex elata</i>			0.5	10	1	20
<i>Carex paniculata</i>			2	10	7	40
<i>Valeriana officinalis</i>			0.5	10	1	40
<i>Plagiomnium elatum</i>			+		0.3	30
<i>Lophocolea bidentata</i>			+		0.4	30
<i>Caltha palustris</i>			+		0.1	10
<i>Cirsium palustre</i>			+		5	60
<i>Angelica sylvestris</i>			+		0.2	20
<i>Betula pubescens</i>			+		0.1	10
<i>Lemna minor</i>			2	10		
<i>Brachythecium rutabulum</i>			0.5	10		
<i>Calliergon cuspidatum</i>					23	100
<i>Agrostis canina</i>					3	60
<i>Eurhynchium speciosum</i>					4	50
<i>Festuca rubra</i>					0.3	30
<i>Chara sp</i>					8	20
<i>Agrostis stolonifera</i>					1	20
<i>Carex viridula brachyrrhyncha</i>					0.3	20
<i>Luzula campestris</i>					0.2	20
<i>Lychnis flos-cuculi</i>					+	
<i>Salix seedling</i>					+	

By 1991, the plot had changed considerably, with *Cladium* expanding to dominate. Reed, *Mentha aquatica* and *Eupatorium cannabinum* also increased, reflecting the abandonment of management. Under the dense sedge canopy, many of the smaller species declined or disappeared, and the *Sphagnum* carpet had become fragmented. Overall, losses were less in this plot than others, perhaps because there was much less to lose in the first place. In addition, many fen species were recruited to the plot, mostly medium or tall herbs and bulky sedges. As the species recruited were mostly wetland plants, a relatively high RWPFSS was maintained.

Since 1991, management has been re-introduced, and uniquely, included mowing as well as grazing. This has greatly reduced the sedge and reed canopy, so that the plot is now dominated by *Juncus subnodulosus*, with some *Cladium* and reed. A number of the plants lost between 1959 and 1991 have returned, nearly all of the fen species recruited in that period have been retained, and many more species have colonised since 1991. Some, such as the scrub species, are undesirable and may have been allowed in by the disturbance associated with management. Some are uncommon species, such as *Carex viridula brachyrrhyncha*, *Chara*, and the bryophytes *Campylium elodes* and *Calypogeia fissa*. Overall, total number of species, number of principal fen species and the RWPFSS all exceed those for both 1991 and 1959. A diverse bryophyte layer has also developed, and in places this can be extensive with especially *Calliergon cuspidatum* forming large patches. Overall, the plot has lost much of the base-poor element of the flora, with *Sphagnum* declining once again, with a much higher proportion of species typically associated with base-rich conditions. It is assumed that the hydrological balance between the two water sources has not changed, and that the swing to base-rich flora is management induced. The surface rooting acidophilus species depended on a thin layer of base-poor water, perched delicately above the base-rich groundwater saturated peat. The action of cattle trampling and mowing presses the surface layer into the spongy, chalky layer beneath, and the base-poor conditions are lost. *Sphagnum* now only colonises raised hummocks, old scrub stools or sedge tussocks.

Looking at the increases in overall richness, it would be tempting to conclude that the sward is more valuable for conservation than it was in 1959. However, the unique acid/alkaline mixed flora has been partially lost. Nearly all of the species lost since 1959 are the rarest and most valuable ones. Some, such as *Blismus compressus* and *Drosera rotundifolia*, are not recorded elsewhere on the fen or are very rare in the County. All of the species recruited since 1959 are recorded elsewhere on the fen or are common fen species. Whether it is better or worse now than in 1959 is thus arguable. However, all of the loss had occurred by 1991. The substantial improvement in value since 1991 with the re-introduction of management cannot be doubted. In addition, many of the lost species may yet return.

5. Conclusions

The following conclusions may be drawn from the 1999 monitoring:

- By 1999, three out of four of the plots have shown substantial recovery from the massive declines in conservation value recorded by 1991. Diversity, in terms of species per quadrat, total species recorded and fen species recorded all increased. Quality, as recorded by RWPFSS, also increased. This has been directly attributed to the re-introduction of management.

- However, progress remains slow and in all plots, the rarest and most valuable species have not yet returned, although further loss of such species has mostly been halted. Species that established since 1991 are generally the more common species, although there are exceptions. Recovery is due to a combination of expansion of species much reduced since 1959, the re-appearance of species lost by 1991, and by recruitment of fen species entirely new to the plots.
- The only plot to show a continued decline was Plot 1. This has had no management since 1991. As well as a decline in all measures of diversity and quality, the plot is rapidly scrubbing up. Clearance is required to prevent imminent transition to woodland.
- Eutrophication from the stream, where a local sewage outfall may have raised nutrient levels, was identified as a potential problem for the margin of the SAC. In the recent past, when the stream has flooded, subsequent summers have seen algal scum develop on the shallow pools in the very rich areas in Compartment 7. For the long-term health of the cSAC, discharge consents from the sewage works should be reviewed.
- The Plot that has received the most intensive management (Plot 3a) has improved the most. This has been grazed annually and mown occasionally. All measures of diversity and quality now exceed even those for 1959. It was shown that such results could not be taken at face value. The increase in diversity was largely due to commoner species and the rarer species lost between 1959 and 1991 had not returned even in this plot. Improvements since 1991 are, however, remarkable.
- Plot 3, which is lightly grazed only, showed the next best recovery in terms of diversity and quality measures. However, recovery in Plot 2, which is mown every 3 or 4 years without any grazing, was almost as good, and of a different nature. *Cladium* was reduced to a greater extent and the sward in general is much shorter and more open, although recording took place early in the management cycle. Plot 3 seemed wetter, and had a higher proportion of wet fen species. Differences are not sufficient to indicate whether grazing alone is better than mowing alone in promoting recovery.
- The greatest improvements are likely to be seen in the years following reintroduction of management. Without intensification of management in Plots 1-3, rate of improvement may slow or stop as the abundance of dominant species stabilises.

6. Implications For Management

A combination of grazing and mowing is clearly the best method of promoting fen recovery. Where late and light summer grazing only is used, as in Plot 3, control of tall dominants such as *Cladium* is insufficient. With an average vegetation height of 1.4m and a combined rush/sedge/reed canopy cover of 74%, it is difficult to see many of the small herbs and bryophytes lost since 1959 ever finding a place in the community. Similarly, long mowing cycles of 3-4 years alone, as applied to Plot 2, also allow too great a build-up of dense canopy to allow such species to return. Elsewhere on the fen, these species only exist in the annually mown swards.

If greater recovery is sought, management will need to be increased. To achieve this, there are a number of options:

- Mow all of the plots (and presumably the surrounding Fen) on an annual basis. This may be unsustainable.
- Increase the grazing pressure. The numbers of cattle could be increased, and ideally they could be brought on earlier, before the sward becomes tall and unpalatable. Even then, there is some doubt whether Sussex cattle will tackle the very roughest sedge swards. Some mowing-off of old-standing sedge may be required in the early years to promote edible growth, preferably in the winter, which will further reduce the sedge. This grazing regime would mean some loss of flowering orchid spikes on the sandy tongues. However, this loss would be visual – orchids survive quite happily in summer grazed pastures. Note also that since 1959, losses of fen orchids in the Plots have been absolute, and they will not return without more intensive grazing. The benefits to the fen of increased grazing should therefore outweigh visual loss of some flower spikes on the tongues. If strong concerns remained, a system of late grazing one year in four could be tried, which would provide adequate seeding.
- If an increase in cattle numbers is not possible, earlier grazing inadvisable and mowing-off of ranker areas cannot be done, then additional grazing stock that can cope with the roughest herbage will be needed. Tarpan horses from Redgrave and Lopham might be considered to supplement the Sussex cattle. Caution must be applied, however, as these are heavy animals. While they would undoubtedly benefit Bellamy's plots, they could damage richer and more sensitive *Schoenus*-bryophyte areas elsewhere on the fen – such as along the causeway. Either much lighter ponies could be used, or Tarpans could be put on in low numbers, preferably after a much larger area of the fen is enclosed to avoid over-intensive grazing.

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Mike Harding
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