Na_name: EN Natural Area name

b) *"En_flood_na.xlw"*: Excel spreadsheet of the area (hectares) of *Land Cover Map* classes **6**, **7**, **8**, **18** and **19** conforming to the potential wet grassland criteria in each Natural Area. Two worksheets documented areas inside or outside Dargie sites.

Table 4 summarises the output from these data. Those 25m cells which were mapped as liable to flood by IH and/or below the 5m contour (FRCA) were allocated to five *LCM* classes, and tabulated as to whether they occurred within or without Dargie sites. Results were summarised by Natural Area, and the Natural Areas ranked from those possessing the greatest extent of "potential wet grassland" (*i.e.* the Fens) through to those with the least land meeting these criteria (Isles of Scilly).

Flood, altitude, land-cover and grazing marsh restoration

The most conspicuous trend emerging from examination of Table 4 is how closely the ranking by "potential wet grassland" area follows the selection of Natural Areas made both on the basis of a) greatest likelihood of success; and b) greatest relative gains in biodiversity (section 5.4.4). Indeed the top 16 Natural Areas in Table 4 were amongst the 23 listed in the original selection, and most of the other 7 are also highly ranked following this approach. Only the South Downs Natural Area seems to be an exception to this broad correspondence. Examination of Table 4 suggests a number of other Natural Areas which might make a contribution to the (re-)creation and rehabilitation of grazing marsh, many of which were also highly ranked in terms of biological attributes. These additional Areas include some where the available land for restoration is predominantly grassland (G), others mostly under arable cultivation (A) where re-creation might be appropriate, and others with mixed land-cover where both rehabilitation and re-creation might be attempted:

Breckland	Central Herefordshire	(A) East Anglian Chalk
East Anglian Plain	(A) Humber Estuary	(A) Lincs/Rutland Limestones
(G) Low Weald & Pevensey	South Coast Plain *etc*	Urban Mersey Basin
(G) Wessex Vales		

Using Table 4, the 23 Natural Areas in the preliminary selection (5.4.4.) may be similarly grouped into those where (re-)creation would be the priority, and those where rehabilitation or enhancement would be the main method. Examination of Figures 6 and 7 provides a graphic illustration of the two approaches, with tilled land accounting for almost 90% of the potential wet grassland area in the Fens, whilst over 80% of the suitable land in the Somerset Levels and Moors is grassland.

Figures 6 and 7 (and Table 4) demonstrate how the *Grazing Marsh GIS* can be used to target areas for re-creation, rehabilitation and enhancement of grazing marsh. On low-lying land liable to flooding, a restoration programme would focus on land within or adjacent to Dargie sites (particularly with high biological quality scores) and select:

- tilled land for grazing marsh re-creation;
- low quality grass land-cover for rehabilitation; and
- moderate quality grass land-cover for enhancement.

7.2.3 Likelihood of success vs. relative gain in biodiversity

In section 5.4.4, two contrasting approaches to targeting habitat restoration were outlined. The present project is inevitably directed towards the greatest likelihood of wildlife gain *i.e.* basing the selection of Natural Areas on extant blocks of high quality grazing marsh and intact surface drainage channels. However, it is clear from the response to the survey of existing and planned restoration schemes that many local EN offices saw three priorities in the effective conservation of grazing marsh through the Biodiversity Action Plan:

i. **Adequate protection for existing grazing marshes.** Even with advances in the techniques of habitat restoration, it remains difficult to create an adequate replica of the original habitat. On that basis, resources should be channelled firstly toward ensuring that there are no further losses of high quality habitat, before they are diverted toward attempts at restoration.

ii. **Effective meeting of BAP targets through effort where it was likely to deliver results.** Restoration (both creation and rehabilitation) is much more likely to be successful where there are viable populations of grazing marsh species, large blocks of habitat and a drainage channel network.

iii. **Target restoration effort to the most impoverished and degraded regions.** Areas of poor quality habitat, or where grazing marsh has been largely converted to arable land, now occupy large parts of lowland England. There is a clear argument for restoring grazing marsh in the wider countryside outside the special sites likely to benefit from approach II. Most of the English human population has easiest access to these "mediocre" areas, and targeting restoration there might not only produce the most tangible increase in the area of grazing marsh, but also produce habitat where more of the population might see and use it.

7.2.4 Procedures to allocate national targets for rehabilitation and re-creation

In the light of these two approaches to restoration (II and III), the areas of marsh required to meet the cHAP targets were allocated following a number of procedures, and the results presented in Table 5. The overall English national target used here actually corresponds to the cHAP targets for the entire UK *i.e.* 10,000ha of rehabilitation and 2,500ha of (re-)creation. The cHAP steering group has as yet not divided the UK targets between the four countries (England, Northern Ireland, Scotland and Wales), although a formula to arrive at these targets has been agreed:

- Rehabilitation targets will be in proportion to the area of extant marsh in each country.
- Re-creation targets will be in proportion to the area of arable land liable to flood.

When these national targets are decided upon, the provisional targets for England given in this report will clearly be adjusted downward. English National targets are likely to be of the order of 7,500ha for rehabilitation and *ca.* 2,200ha for re-creation (M. Drake, *pers.comm.*).

In addition, for the purposes of the report, this national allocation of effort was distributed between just those 23 Natural Areas listed in section 5.4.4, and used a number of differing procedures to arrive at possible allocations of restoration activity. As outlined, ten Natural Areas

where chosen which combined i) very high overall biological quality scores (section 5.4.1), ii) the largest extent of lowland wet grassland mapped by Dargie (1993, 1995), iii) a well-developed surface drainage network (Marshall *et al.*, 1978), and iv) a large area of low-lying land liable to flood (Table 4). In these Natural Areas, it was judged that restoration of grazing marsh was most likely to be successful, and they are hereafter referred to as the ten "***special***" Natural Areas. To these were added thirteen Natural Areas which combined a positive rank comparison value (section 5.4.3) with ii) iii) and iv) above. This group comprised both Areas of extensive, but poor quality, grazing marsh, and Areas where most of the grassland had been converted to ditched arable land. The 13 Natural Areas are subsequently referred to as the "***wider countryside***" Natural Areas. As a first step in allocating restoration effort, the area of extant marsh in each of these 23 Natural Areas was calculated (Table 5 Part 1). The 2500ha of land required to meet the cHAP target was then divided up in proportion to this extant area (*"Pro Rata"*). The same procedure was followed for the 10,000ha required for rehabilitation. On this basis 172 ha of grazing marsh creation might be allocated to the Broads and 159 ha of rehabilitation in the London Basin. Such a procedure clearly favoured attempts in the Somerset Levels and Moors (a ***special*** Natural Area), but targeted little effort in either of the Lincolnshire Natural Areas (***wider countryside***).

The second procedure assumed that any restoration programme would focus its entire effort on either the 10 ***special*** areas, or within the 13 ***wider countryside*** areas. For example, targets for creation and rehabilitation could be determined in proportion to the area of marsh only within the ten Natural Areas (Table 5 part 1a), when >40% of the effort might take place in the Somerset Levels and Moors. Where the needs of the ***wider countryside*** were stressed instead, the 2500ha of creation and 10000ha of rehabilitation were allocated in proportion to the marsh area in the 13 Areas (Table 5, Part 1b). Following this course, effort was rather more equally divided between Natural Areas, though 35% of the restoration would take place in two Natural Areas: the Lancashire Plain and Severn/Avon Vales. A fundamental weakness of this approach was that those Areas which had already lost most of their marsh (notably the two Lincolnshire Areas, Holderness, London Basin, Mosses and Meres and the Vale of Pickering) were allocated very little restoration effort.

Acknowledging this problem, the approach was developed further. The results of the survey of existing and planned restoration schemes in these 23 were tabulated, and further classified on the basis of whether the scheme was **a)** likely to take place *i.e.* already begun, or having firm plans with a medium-term completion date; or **b)** only potential *i.e.* the subject of internal discussions, but where there was no guarantee that the scheme could or would be realised (Table 5 Part 1 – creation and rehabilitation projects). The next step was to assess the difference between the allocated effort and the area of existing or planned schemes (Table 5 part 2), and assess whether in the 23 Natural Areas under the different approaches, there was a shortfall or surplus in the restoration effort. The differences were calculated separately for each of the possible scenarios. For example:

a. *Somerset Levels and Moors*: Assessed over all 23 Natural Areas, 644ha of creation was allocated, and only 12.5ha is likely to take place, leaving a shortfall of –631.5ha. Targeting the 10 ***special*** Areas only, 1150ha of creation was allocated, with a shortfall of –1137.5ha. Rehabilitation targets were calculated in the same way.

b. *The Fens*: Assessed over all 23 Natural Areas, 75ha of creation was allocated, but 160ha is likely to take place, producing a likely surplus of 85ha. If the potential creation figure

is added, the surplus comes to 457ha. The corresponding figures for targeting the 10 ***special*** Areas only are 137ha of creation , with a surplus of 23ha if only the "likely" schemes take place, but rising to 395 if all the potential schemes are realised.

Such figures represented first estimates of the scale of effort required. The major assumptions made (likely and potential effort, choice of approach, selection of the 23 Natural Areas) all had a profound impact on the totals calculated as targets. Other Natural Areas may potentially contribute significantly to the creation effort (*e.g.* 490ha planned for Breckland, Exmoor, Midland Plateau, Rockingham Forest and South Magnesian Limestone) and toward rehabilitation (*e.g.* 560ha in Urban Mersey, Wealden Greensand and Rockingham Forest Areas).

7.2.5 A practical approach to targeting restoration effort

Refinement of the figures discussed above and summarised in Table 5 required further data on schemes and some decision on the preferred balance between ***special*** or ***wider countryside*** areas. However, it was most important to use information on flood liability and land-cover to arrive at an allocation of effort where there was a) land to accommodate the schemes including both arable for re-creation and grassland for rehabilitation; b) suitable water-regimes; and c) nuclei of high quality grazing which might propagate re-creation and rehabilitation. Consequently, a further procedure was employed to arrive at a final recommended allocation of effort.

Re-creation targets were set for the 23 Natural Areas on the basis of the area of *Land Cover Map* Class **18** within each Natural Area that was subject to riverine flooding and/or below 5m AOD. Similarly rehabilitation targets were calculated on the basis of *Land Cover Map* Classes **6**, **7**, **8** and **19** (though the contribution of **19** "Ruderal Weed" was actually negligible). These totals were calculated as a proportion of 2,250ha for re-creation and 9,000ha for rehabilitation, since some of the effort to meet the cHAP targets would be expected to come from other Natural Areas. Following discussion with English Nature, a figure of 90% was adopted as the proportion of the effort to come from the 23 main Natural Areas. As discussed in section 7.2.4, these figures will need to be readjusted following the setting of national targets for England, Northern Ireland, Scotland and Wales. Other English Natural Areas which might be expected to contribute significantly to the eventual restoration effort include the Breckland, East Anglian Plain, Humber Estuary, Low Weald and Pevensey, South Coast Plain and Hampshire Lowlands, Urban Mersey Basin and Wessex Vales. These Natural Areas might supply up to 15% of the UK target for rehabilitation, and as much as 7% of the ditched arable land for re-creation, and it will be noted from Table 2 that 60ha of re-creation are envisaged in Breckland, and 152ha of rehabilitation in Urban Mersey.

7.3 Conclusions

Working targets, expressed as a percentage of the total UK targets are set out below for rehabilitation (***Rehab***) and re-creation (***Creat***) for each of the selected 23 Natural Areas:

	Creat	***Rehab***		***Creat***	***Rehab***
Cumbria Fells and Dales	0.2%	1.5%	Severn and Avon Vales	1.1%	3.8%
Greater Thames Estuary	2.2%	4.5%	Solway Basin	0.2%	2.7%
Holderness	2.8%	1.6%	Somerset Levels and Moors	0.9%	9.3%
Humberhead Levels	11.2%	4.9%	South Downs	0.04%	0.2%
Lancashire Plain	0.9%	4.0%	Suffolk Coast and Heaths	0.7%	2.0%
Lincolnshire Coast	4.2%	3.2%	Thames and Avon Vales	2.0%	5.6%
London Basin	1.9%	6.6%	The Broads	2.0%	5.0%
Mosses and Meres	0.6%	3.3%	The Fens	44.0%	11.3%
North Lincolnshire	2.9%	1.2%	Trent Valley and Rises	4.9%	6.3%
North Norfolk	0.8%	1.1%	Vale of Pickering	0.9%	0.9%
Romney Marshes	2.4%	3.1%	Vale of York and Mowbray	1.6%	2.5%
			West Anglian Plain	3.4%	5.7%

Although these allocated targets distribute the effort between the Natural Areas, it will be noted that certain Areas bear a much larger responsibility than others. The greater part of the re-creation activity would take place in the Humberhead Levels and especially the Fens, where at present 557ha of schemes are under way or (in most cases) simply envisaged. Such a figure represents *ca.* 22% of the UK national targets, leaving a shortfall of some 825ha on the calculated allocation. The Fens also figure prominently in the rehabilitation allocation, together with the Somerset Levels and Moors. These targets must be compared with those set under regional and county biodiversity action plans, to allow both these nationally-derived figures and those emanating from local projects to be critically reviewed. Where present (and planned) restoration activity is assessed, ESAs contribute 54% of the schemes, and should present incentives re-creation, rehabilitation and enhancement continue, this agri-environment scheme (amongst others) may play its expected significant part in meeting the BAP targets.

The research has established criteria for the identification and evaluation of projects which may be taken forward to meet the BAP targets. These criteria were primarily derived from six biological attributes that quantify the present conservation value of and likely restorability of grazing marsh both in terms of Dargie polygons and EN Natural Areas. A ranking of Natural Areas for grazing marsh restoration was derived which was then revised to take account of the area of extant marsh, the liability of the land to flood and the availability of ditched arable. The costed Habitat Action Plan for coastal and floodplain grazing marsh takes account of both the re-creation of grazing marsh on arable land, and the rehabilitation of degraded lowland wet grassland, but takes no account as yet of the enhancement of extant marsh. The UK Steering Group agrees that targets for enhancement should be fixed (M. Drake, *pers.comm.*), and these could be derived following the methods described in this report.

This report is accompanied by the *Grazing Marsh GIS* and an Annexe of schemes, both of which could be augmented with new data as they become available. The *GIS* files have been converted from *ArcView* into *MapInfo* format *i.e.* all ***.shp*** files converted to MapInfo export files (****.mif***), except for the flood data which are included as an *ArcInfo* grid. The specific GIS file including details of extant and proposed schemes is contained on a separate diskette to ensure confidentiality.

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Tables

Table 1 Natural Areas with data for 6 selected biological attributes, their rank, mean rank across attributes and final 'combined' rank

Legend:

No.	NA attribute name	Area weighted mean across Dargie polygons within Natural Area
1	web_impo	Sum of regional, national and international importance scores (*WeBS counts*)
2	web_rich	Number of wildfowl species - from *WeBS* counts
3	bww_dens	Density of pairs of breeding waders – from Breeding Waders of Wet Meadows counts
4	act_rare	Actual rare or scarce plant species
5	pwgtqual	Mean score (1-10) of all potential species plant
6	inv_rich	Number of invertebrate species

Table 1. Natural Areas with data for six selected biological attributes, their rank, mean rank across attributes and final 'combined rank'

Table 1 (Part 1) Natural Area biological attribute data

NA number	Natural Area	1	2	3	4	5	6
48	The Broads	11714.61	42.46	1.45	5.60	5.60	8.42
77	New Forest	4383.59	39.70	0.56	2.58	5.33	11.84
49	Suffolk Coast and Heaths	12980.03	37.13	0.45	1.52	5.07	11.70
37	The Fens	2825.80	35.93	1.62	2.49	5.05	18.75
16	Vale of York and Mowbray	See Note 2	43.00	2.09	0.43	5.21	6.22
74	South Downs	3995.21	27.44	0.44	3.15	5.22	9.00
47	North Norfolk	6295.50	46.82	0.34	0.74	5.15	4.46
70	Wealden Greensand	3429.60	29.10	0.89	3.40	5.30	5.81
67	Greater Thames Estuary	25703.01	41.40	1.50	2.17	4.65	16.48
71	Romney Marshes	4451.00	38.90	0.34	1.80	4.95	13.85
81	Dorset Heaths	3840.16	26.70	0.35	1.70	5.41	13.75
68	North Kent Plain	3037.69	35.50	0.33	1.51	5.09	9.40
85	Somerset Levels and Moors	4493.28	38.67	0.19	13.21	4.88	23.60
10	Cumbria Fells and Dales	4050.30	32.63	0.35	0.10	5.64	8.03
87	Exmoor and the Quantocks	567.00	40.79	0.11	2.83	5.43	23.11
75	South Coast Plain and Hampshire Lowlands	9382.35	30.09	0.36	0.83	5.00	5.91
5	Northumbria Coal Measures	552.00	47.00	0.37	0.74	5.12	2.25
22	Humberhead Levels	3816.55	32.42	1.18	0.86	4.97	2.50
73	Low Weald and Pevensey	1964.52	33.77	0.08	1.30	5.11	36.92
86	Mid Somerset Hills	377.86	34.99	0.25	10.16	4.85	22.79
11	West Cumbria Coastal Plain	4632.34	34.52	0.27	0.00	5.60	0.86
7	Tees Lowlands	3531.00	45.32	0.46	0.11	4.98	0.61
3	Solway Basin	3158.00	35.61	0.23	0.00	5.48	2.38
76	Isle of Wight	443.00	42.00	0.28	1.24	4.90	4.84
13	Lancashire Plain and Valleys	6732.71	38.71	0.20	0.25	5.05	0.38
62	Bristol, Avon Valleys and Ridges	0.30	37.00	0.19	3.99	4.88	12.46
46	Breckland	700.00	23.41	0.23	0.05	5.42	8.33
63	Thames and Avon Vales	9986.30	26.85	0.20	0.37	4.92	3.04
72	High Weald	0.31	43.20	0.63	0.30	4.91	2.66
9	Eden Valley			0.56	0.00	5.65	0.00
66	London Basin	8300.55	24.52	0.18	0.68	4.86	4.98
56	Severn and Avon Vales	3340.89	30.64	0.12	1.14	4.78	7.23
26	Urban Mersey Basin	5087.38	28.08	0.12	0.22	5.10	0.84
12	Forest of Bowland	943.65	30.76	0.79	0.00	5.20	0.00
64	Midvale Ridge		25.00	0.07	0.98	5.09	4.09
91	South Devon	1677.42	17.63		0.03	4.97	27.56
90	Devon Redlands	2515.85	37.37	0.14	0.68	4.75	3.47

NA number	Natural Area	1	2	3	4	5	6
50	East Anglian Plain	2411.61	28.25	0.26	0.59	4.82	1.34
78	Hampshire Downs	2387.00	19.00	0.27	0.02	4.92	6.72
33	Trent Valley and Rises	13975.72	29.41	0.18	0.13	4.81	1.04
89	Blackdowns	259.00	25.00	0.02	0.73	5.12	7.88
52	West Anglian Plain	12508.01	24.39	0.21	0.35	4.62	2.86
83	Wessex Vales	465.14	27.18	0.21	1.86	4.44	3.43
88	Vale of Taunton and Quantock Fringes	388.95	25.11	0.26	1.52	4.67	2.08
20	Holderness	1416.00	33.06	0.15	0.14	4.92	0.32
84	Mendip Hills	5.98	34.00	0.07	4.14	4.75	3.29
8	Yorkshire Dales	95.00	16.10	0.26	0.00	5.58	1.39
93	The Culm	643.73	36.47		0.00	4.93	0.51
27	Mosses and Meres	2168.53	21.82	0.16	0.40	4.99	0.06
43	Midlands Plateau	248.94	26.77	0.27	0.14	4.97	0.07
80	South Wessex Downs	3898.03	16.55	0.16	0.14	4.75	2.72
51	East Anglian Chalk	137.00	10.58	0.11	0.02	5.25	6.00
53	Bedfordshire Greensand Ridge	259.00	19.14	0.21	0.00	4.87	6.33
17	North York Moors and Hills				0.00	5.23	0.00
61	Dean Plateau and Wye Valley	25.19	21.31		1.25	5.02	0.00
23	South Magnesian Limestone	1060.45	16.69	0.02	0.17	4.94	2.51
15	Pennine Dales Fringe	137.00	13.00	0.63	0.00	5.02	0.20
58	Clun and North West Herefordshire Hills			0.23	0.00	4.97	0.00
95	Cornish Killas and Granites	499.00	25.55		0.00	4.89	1.17
65	Chilterns	41.00	19.49	0.15	0.00	5.01	2.13
79	Berkshire and Marlborough Downs	190.00	12.00	0.23	0.09	4.95	1.04
38	Lincolnshire and Rutland Limestone	260.00	26.37	0.03	0.00	4.95	2.09
21	Humber Estuary	1337.67	26.92	0.05	0.10	4.82	0.28
59	Central Herefordshire	654.00	18.59	0.13	0.00	4.87	1.65
44	Midland Clay Pastures	785.44	19.99	0.18	0.07	4.66	0.84
69	North Downs		19.00	0.23	0.11	4.77	0.16
55	Cotswolds	958.53	21.76	0.06	0.00	4.80	1.24
28	Potteries and Churnet Valley			0.02	0.00	5.12	0.00
1	North Northumberland Coastal Plain			0.18	0.00	4.90	0.00
40	Needwood and South Derbyshire Claylands	705.89	17.24	0.17	0.00	4.70	0.40
14	Southern Pennines	41.00	14.00		0.00	5.10	0.00
42	Shropshire Hills			0.35	0.00	4.41	0.00
18	Vale of Pickering	470.00	15.65	0.02	0.00	5.04	0.03
34	North Lincolnshire Coversands and Clay Vales	451.20	18.45	0.11	0.00	4.88	0.00
24	Coal Measures	932.00	18.52	0.03	0.00	4.39	1.39
29	South West Peak	0.09	6.00		0.00	5.13	0.00

NA number	Natural Area	1	2	3	4	5	6
31	Derbyshire Peak Fringe and Lower Derwent	232.00	16.70		0.54	4.50	0.27
36	Lincolnshire Coast and Marshes	0.13	25.81	0.05	0.03	4.76	0.43
25	Dark Peak	273.78	14.00		0.00	4.78	0.44
30	White Peak	0.22	14.00		0.00	4.85	0.68
32	Sherwood			0.09	0.19	4.59	0.00
45	Rockingham Forest			0.06	0.00	4.77	0.06
54	Yardley-Whittlewood Ridge			0.09	0.00	4.29	0.00

NOTE 1: Other Natural Areas scored 0 for all attributes

NOTE 2: Although there are 3 WeBS sites within 1km of Dargie polygons in the Vale of York and Mowbray, there are no count data within the period included in the files provided by EN.

Table 1 (Part 2) Natural Areas Ranked on Corresponding attribute data

NA number	Natural Area	1	2	3	4	5	6
48	The Broads	5	6	4	3	3	15
77	New Forest	15	10	10	9	10	11
49	Suffolk Coast and Heaths	3	15	13	15	27	12
37	The Fens	26	18	2	10	28	6
16	Vale of York and Mowbray		5	1	32	15	22
74	South Downs	17	35	14	7	14	14
47	North Norfolk	10	2	20	25	17	28
70	Wealden Greensand	22	32	6	6	11	25
67	Greater Thames Estuary	1	8	3	11	76	7
71	Romney Marshes	14	11	20	13	41	8
81	Dorset Heaths	19	40	17	14	9	9
68	North Kent Plain	25	20	22	17	25	13
85	Somerset Levels and Moors	13	13	41	1	53	3
10	Cumbria Fells and Dales	16	26	17	47	2	17
87	Exmoor and the Quantocks	44	9	56	8	7	4
75	South Coast Plain and Hampshire Lowlands	7	30	16	24	34	24
5	Northumbria Coal Measures	45	1	15	25	19	40
22	Humberhead Levels	20	27	5	23	37	38
73	Low Weald and Pevensey	31	24	61	18	22	1
86	Mid Somerset Hills	52	21	30	2	59	5
11	West Cumbria Coastal Plain	12	22	24	56	3	52
7	Tees Lowlands	21	3	12	45	36	56
3	Solway Basin	24	19	31	56	6	39
76	Isle of Wight	50	7	23	20	50	27
13	Lancashire Plain and Valleys	9	12	39	37	28	61
62	Bristol, Avon Valleys and Ridges	68	16	41	5	53	10
46	Breckland	41	49	31	51	8	16
63	Thames and Avon Vales	6	38	39	34	46	33
72	High Weald	67	4	8	36	49	36
9	Eden Valley			10	56	1	72
66	London Basin	8	47	43	28	58	26
56	Severn and Avon Vales	23	29	54	21	65	19
26	Urban Mersey Basin	11	34	54	38	23	53
12	Forest of Bowland	37	28	7	56	16	72
64	Midvale Ridge		45	62	22	25	29
91	South Devon	32	61		52	37	2
90	Devon Redlands	27	14	52	28	70	30
50	East Anglian Plain	28	33	27	30	61	47
78	Hampshire Downs	29	56	24	54	46	20
33	Trent Valley and Rises	2	31	43	44	63	50
89	Blackdowns	55	45	70	27	19	18

NA number	Natural Area	1	2	3	4	5	6
52	West Anglian Plain	4	48	36	35	77	34
83	Wessex Vales	48	36	36	12	80	31
88	Vale of Taunton and Quantock Fringes	51	44	27	15	74	43
20	Holderness	33	25	50	41	46	62
84	Mendip Hills	66	23	62	4	70	32
8	Yorkshire Dales	62	66	27	56	5	45
93	The Culm	43	17		56	45	57
27	Mosses and Meres	30	50	48	33	35	68
43	Midlands Plateau	57	39	24	41	37	67
80	South Wessex Downs	18	65	48	41	70	35
51	East Anglian Chalk	60	73	56	54	12	23
53	Bedfordshire Greensand Ridge	55	55	36	56	56	21
17	North York Moors and Hills				56	13	72
61	Dean Plateau and Wye Valley	65	52		19	31	72
23	South Magnesian Limestone	35	64	70	40	44	37
15	Pennine Dales Fringe	60	71	8	56	31	65
58	Clun and North West Herefordshire Hills			31	56	37	72
95	Cornish Killas and Granites	46	43		56	52	49
65	Chilterns	63	54	50	56	33	41
79	Berkshire and Marlborough Downs	59	72	31	49	41	50
38	Lincolnshire and Rutland Limestone	54	41	68	56	41	42
21	Humber Estuary	34	37	66	47	61	63
59	Central Herefordshire	42	58	53	56	56	44
44	Midland Clay Pastures	39	53	43	50	75	53
69	North Downs		56	31	45	67	66
55	Cotswolds	36	51	64	56	64	48
28	Potteries and Churnet Valley			70	56	19	72
1	North Northumberland Coastal Plain			43	56	50	72
40	Needwood and South Derbyshire Claylands	40	62	47	56	73	60
14	Southern Pennines	63	68		56	23	72
42	Shropshire Hills			17	56	81	72
18	Vale of Pickering	47	67	70	56	30	70
34	North Lincolnshire Coversands and Clay Vales	49	60	56	56	53	71
24	Coal Measures	38	59	68	56	82	45
29	South West Peak	71	74		56	18	72
31	Derbyshire Peak Fringe and Lower Derwent	58	63		31	79	64
36	Lincolnshire Coast and Marshes	70	42	66	52	69	59
25	Dark Peak	53	68		56	65	58
30	White Peak	69	68		56	59	55
32	Sherwood			59	39	78	72

NA number	Natural Area	1	2	3	4	5	6
45	Rockingham Forest			64	56	67	68
54	Yardley-Whittlewood Ridge			59	56	83	72

NOTE: Other Natural Areas scored 0 for all attributes, and were consequently jointly ranked last

Table 1 (Part 3)

		Mean and final biological ranks		Marsh Area Rank		Rank Comparison
NA number	Natural Area	Mean	Final	Area (ha)	Rank	Biological minus area
48	The Broads	6.0	1	11579.04	5	-4
77	New Forest	10.8	2	2023.85	27	-25
49	Suffolk Coast and Heaths	14.2	3	3215.95	21	-18
37	The Fens	15.0	4	5046.33	12	-8
16	Vale of York and Mowbray	15.0	4	1709.96	30	-26
74	South Downs	16.8	6	1343.03	35	-29
47	North Norfolk	17.0	7	1848.27	29	-22
70	Wealden Greensand	17.0	7	1302.27	37	-30
67	Greater Thames Estuary	17.7	9	12786.88	3	6
71	Romney Marshes	17.8	10	4770.16	13	-3
81	Dorset Heaths	18.0	11	2712.44	24	-13
68	North Kent Plain	20.3	12	1391.84	34	-22
85	Somerset Levels and Moors	20.7	13	43429.81	1	12
10	Cumbria Fells and Dales	20.8	14	8660.90	7	7
87	Exmoor and the Quantocks	21.3	15	534.92	52	-37
75	South Coast Plain and Hampshire Lowlands	22.5	16	2902.54	23	-7
5	Northumbria Coal Measures	24.2	17	255.41	63	-46
22	Humberhead Levels	25.0	18	6023.18	11	7
73	Low Weald and Pevensey	26.2	19	4640.51	14	5
86	Mid Somerset Hills	28.2	20	4213.29	15	5
11	West Cumbria Coastal Plain	28.2	20	3301.17	20	0
7	Tees Lowlands	28.8	22	789.21	46	-24
3	Solway Basin	29.2	23	9652.93	6	17
76	Isle of Wight	29.5	24	580.50	47	-23
13	Lancashire Plain and Valleys	31.0	25	12209.54	4	21
62	Bristol, Avon Valleys and Ridges	32.2	26	565,25	50	-24
46	Breckland	32.7	27	1024.62	40	-13
63	Thames and Avon Vales	32.7	27	6731.80	10	17
72	High Weald	33.3	29	566.21	49	-20
9	Eden Valley	34.8	30	280.05	61	-31
66	London Basin	35.0	31	2673.51	25	6
56	Severn and Avon Vales	35.2	32	13941.36	2	30
26	Urban Mersey Basin	35.5	33	2442.48	26	7
12	Forest of Bowland	36.0	34	1313.60	36	-2
64	Midvale Ridge	36.6	35	202.89	68	-33
91	South Devon	36.8	36	575.78	48	-12
90	Devon Redlands	36.8	37	3945.83	17	20
50	East Anglian Plain	37.7	38	4006.91	16	22
78	Hampshire Downs	38.2	39	1544.58	32	7

		Mean and final biological ranks		Marsh Area Rank		Rank Comparison
NA number	Natural Area	Mean	Final	Area (ha)	Rank	Biological minus area
33	Trent Valley and Rises	38.8	40	6845.59	9	31
89	Blackdowns	39.0	41	885.26	43	-2
52	West Anglian Plain	39.0	41	7202.19	8	33
83	Wessex Vales	40.5	43	1217.12	39	4
88	Vale of Taunton and Quantock Fringes	42.3	44	1533.90	33	11
20	Holderness	42.8	45	3110.04	22	23
84	Mendip Hills	42.8	45	163.51	73	-28
8	Yorkshire Dales	43.5	47	487.07	53	-6
93	The Culm	43.6	48	899.94	42	6
27	Mosses and Meres	44.0	49	1915.44	28	21
43	Midlands Plateau	44.2	50	920.08	41	9
80	South Wessex Downs	46.2	51	3931.91	18	33
51	East Anglian Chalk	46.3	52	390.36	55	-3
53	Bedfordshire Greensand Ridge	46.5	53	137.74	75	-22
17	North York Moors and Hills	47.0	54	208.01	66	-12
61	Dean Plateau and Wye Valley	47.8	55	123.15	77	-22
23	South Magnesian Limestone	48.3	56	553.39	51	5
15	Pennine Dales Fringe	48.5	57	95.34	79	-22
58	Clun and North West Herefordshire Hills	49.0	58	166.34	72	-14
95	Cornish Killas and Granites	49.2	59	317.68	58	1
65	Chilterns	49.5	60	341.59	57	3
79	Berkshire and Marlborough Downs	50.3	61	304.02	59	2
38	Lincolnshire and Rutland Limestone	50.3	61	137.70	76	-15
21	Humber Estuary	51.3	63	813.64	45	18
59	Central Herefordshire	51.5	64	212.17	65	-1
44	Midland Clay Pastures	52.2	65	824.47	44	21
69	North Downs	53.0	66	62.14	80	-14
55	Cotswolds	53.2	67	1227.91	38	29
28	Potteries and Churnet Valley	54.3	68	284.36	60	8
1	North Northumberland Coastal Plain	55.3	69	205.53	67	2
40	Needwood and South Derbyshire Claylands	56.3	70	1679.85	31	39
14	Southern Pennines	56.4	71	99.60	78	-7
42	Shropshire Hills	56.5	72	453.38	54	18
18	Vale of Pickering	56.7	73	3692.75	19	54
34	North Lincolnshire Coversands and Clay Vales	57.5	74	27.72	81	-7
24	Coal Measures	58.0	75	215.08	64	11
29	South West Peak	58.2	76	11.70	82	-6
31	Derbyshire Peak Fringe and Lower Derwent	59.0	77	349.78	56	21

		Mean and final biological ranks		Marsh Area Rank		Rank Comparison
NA number	Natural Area	Mean	Final	Area (ha)	Rank	Biological minus area
36	Lincolnshire Coast and Marshes	59.7	78	172.47	70	8
25	Dark Peak	60.0	79	269.05	62	17
30	White Peak	61.4	80	0.17	83	-3
32	Sherwood	62.0	81	167.01	71	10
45	Rockingham Forest	63.8	82	140.06	74	8
54	Yardley-Whittlewood Ridge	67.5	83	199.13	69	14

NOTE: All other Natural Areas had no area of grazing marsh and were omitted from the final ranking

Table 2A. Area (ha) of each project type by Natural Area from ITE Survey

Natural Area	Creation	Rehabilitation	Enhancement
Breckland	60		
Devon Redlands			453
Dorset Heaths			125
Exmoor and the Quantocks	80		
Greater Thames Estuary	319	1783	1338
Humberhead Levels	25	1000	
Lancashire Plain and Valleys		169	129
Lincolnshire Coast and Marshes	71	6	
London Basin	50	100	249.5
Midlands Plateau	50		23
Mosses and Meres		45	
North Kent Plain			5
North Norfolk	135		
Rockingham Forest	250	250	
Romney Marshes	100		25
Severn and Avon Vales	80	10	
Somerset Levels and Moors	12.5	305.7	10
South Coast Plain and Hampshire Lowlands		18	
South Downs	2050	2050	2050
South Magnesian Limestone	50		50
Suffolk Coast and Heaths		15.4	
Tees Lowlands		240	120
Thames and Avon Vales	111.7	113	311
The Broads	319	20	1975
The Fens	532.4		978
Trent Valley and Rises	300	306	
Urban Mersey Basin		152	165
Wealden Greensand		158	532
West Anglian Plain	49	474	489

Table 2 B. Number of projects without area information by Natural Area

Natural Area	Creation	Rehabilitation	Enhancement
Bedfordshire Greensand Ridge	1		
Cumbria Fells and Dales	1	1	
Dorset Heaths			4
Greater Thames Estuary	1	1	4
Humber Estuary		1	
Humberhead Levels		4	4
Isle of Wight	1	4	2
London Basin	1	2	1
Low Weald & Pevensey		1	
Mosses and Meres		1	
North Downs		1	
North Norfolk			3
Romney Marshes	1		1
Somerset Levels and Moors		6	
South Coast Plain and Hampshire Lowlands	1	1	
Suffolk Coast and Heaths	1	1	
Thames and Avon Vales	2		
The Broads			2
The Fens	2		
Trent Valley and Rises	2	2	
Vale of York & Mowbray		2	2
Wealden Greensand	1	1	
West Cumbria Coastal Plain		1	

Table 3. Ongoing and planned schemes for (re-)creation, restoration/rehabilitation and enhancement within and without ESAs

The table summaries those data presented in Table 2, having overlaid them with ESA boundaries. Total areas (ha) of schemes inside and outside ESAs grouped by type and time scale (see Appendix 2C) are shown below. Where a scheme had been classified under more than one time scale, it was assigned to the most optimistic. A few schemes comprised more than one type of restoration activity and may be included more than once in the table. Values in parenthesis represent the number of schemes without area information.

Time scale	Creation/Re-creation		Restoration/rehabilitation		Improvement/enhancement		Not specified		Grand Total	
	Inside ESA	Outside ESA	Inside ESA	Outside ESA	Inside ESA	Outside ESA	Inside ESA	Outside ESA	Inside ESA	Outside ESA
In progress	183 (0)	141 (0)	390 (1)	124 (2)	1675 (2)	2000 (3)	0 (0)	60 (0)	2248 (3)	2324 (5)
Planned (advanced stage)	111 (0)	110 (1)	1208 (0)	237 (1)	215 (0)	152 (3)	0 (0)	0 (0)	1534 (0)	499 (5)
Planned (early stage)	19 (0)	350 (1)	32 (5)	792 (2)	1785 (0)	501 (1)	0 (0)	60 (2)	1836 (5)	1703 (6)
Proposal	126 (0)	1036 (2)	0 (0)	1915 (1)	0 (0)	450 (2)	0 (0)	1300 (17)	126 (0)	4701 (22)
Suggested	2074 (2)	430 (5)	2050 (1)	466 (12)	2050 (0)	0 (9)	0 (0)	30 (1)	6174 (3)	926 (27)
Not specified	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0)	0 (0)	2 (0)	0 (0)
Grand Total	**2513 (2)**	**2067 (9)**	**3680 (7)**	**3534 (18)**	**5725 (2)**	**3103 (18)**	**2 (0)**	**1450 (20)**	**11920 (11)**	**10153 (65)**

Table 4. English Nature Natural Areas: Area of land (hectares) below 5m AOD contour and/or liable to river flood

Land included for five Land Cover categories (see below), and classified by whether it occurs within or without Lowland Wet Grassland (LWG) polygons (Dargie, 1993, 1995).

"LWG" = ITE Land Cover Map categories **6,7, 8 & 19** (*ie* Mown/Grazed turf, Meadow/Verge/Semi-Natural, Rough/Marsh Grass, Ruderal weed). Tilled land = ITE Land Cover Map category **18**.

Natural Area	Area inside Dargie polygon (ha)			Area outside Dargie polygon (ha)			Grand total
	LWG	Tilled land	Total	LWG	Tilled land	Total	(ha)
The Fens	122	57	179	1261	11403	12664	12843
Humberhead Levels	92	67	159	502	2861	3363	3522
Trent Valley and Rises	139	41	180	625	1230	1855	2035
West Anglian Plain	156	46	202	538	895	1433	1635
Lincolnshire Coast and Marshes	2	1	3	385	1084	1469	1472
Somerset Levels and Moors	999	151	1150	138	74	212	1362
London Basin	53	11	64	753	424	1177	1241
Thames and Avon Vales	131	36	167	557	500	1057	1224
The Broads	373	34	407	233	495	728	1135
Greater Thames Estuary	260	17	277	292	544	836	1113
Romney Marshes	123	26	149	253	589	842	991
Holderness	39	40	79	155	692	847	926
North Lincolnshire Coversands and Clay Vales	0	0	0	151	750	901	901
Severn and Avon Vales	182	54	236	280	236	516	752
Vale of York and Mowbray	29	7	36	271	425	696	732
Lancashire Plain and Valleys	199	26	225	293	206	499	724
East Anglian Plain	87	16	103	305	271	576	679
South Coast Plain and Hampshire Lowlands	46	18	64	238	343	581	645
Low Weald and Pevensey	103	4	107	346	154	500	607

Natural Area	Area inside Dargie polygon (ha)			Area outside Dargie polygon (ha)			Grand total
	LWG	Tilled land	Total	LWG	Tilled land	Total	(ha)
Mosses and Meres	35	4	39	371	164	535	574
Humber Estuary	7	9	16	76	413	489	505
Lincolnshire and Rutland Limestone	1	1	2	72	402	474	476
Urban Mersey Basin	37	4	41	270	166	436	477
Breckland	24	3	27	221	225	446	473
Suffolk Coast and Heaths	63	13	76	177	168	345	421
Cumbria Fells and Dales	159	14	173	189	44	233	406
East Anglian Chalk	5	6	11	111	277	388	399
Central Herefordshire	5	1	6	234	159	393	399
Solway Basin	161	7	168	164	32	196	364
North Norfolk	34	5	39	99	218	317	356
Wessex Vales	24	6	30	239	72	311	341
Vale of Pickering	44	15	59	63	211	274	333
North Kent Plain	34	7	41	106	182	288	329
South Wessex Downs	98	5	103	121	31	152	255
Border Uplands	0	0	0	142	92	234	234
South Magnesian Limestone	5	3	8	66	157	223	231
Midland Clay Pastures	12	4	16	105	110	215	231
Midlands Plateau	11	2	13	111	88	199	212
The Culm	16	1	17	152	28	180	197
Devon Redlands	66	21	87	63	45	108	195
Cornish Killas and Granites	7	0	7	161	24	185	192
Mid Somerset Hills	88	17	105	54	25	79	184
Cotswolds	23	4	27	101	57	158	185
Dorset Heaths	64	5	69	87	27	114	183
Coal Measures	2	3	5	78	99	177	182
High Weald	12	1	13	121	44	165	178

Natural Area	Area inside Dargie polygon (ha)			Area outside Dargie polygon (ha)			Grand total
	LWG	Tilled land	Total	LWG	Tilled land	Total	(ha)
Needwood and South Derbyshire Claylands	25	5	30	106	40	146	176
Chilterns	8	2	10	109	57	166	176
Tees Lowlands	3	4	7	61	107	168	175
New Forest	47	2	49	72	26	98	147
Wealden Greensand	15	2	17	87	35	122	139
Northumbria Coal Measures	2	1	3	47	90	137	140
Forest of Bowland	33	3	36	77	18	95	131
Yorkshire Dales	9	3	12	83	33	116	128
Eden Valley	3	0	3	89	23	112	115
South Devon	8	3	11	64	28	92	103
West Cumbria Coastal Plain	42	5	47	42	13	55	102
Hampshire Downs	34	5	39	40	20	60	99
Dean Plateau and Wye Valley	1	0	1	46	47	93	94
Vale of Taunton and Quantock Fringes	20	8	28	31	28	59	87
Pennine Dales Fringe	1	0	1	42	42	84	85
Exmoor and the Quantocks	12	1	13	52	19	71	84
Bristol, Avon Valleys and Ridges	7	2	9	52	19	71	80
Shropshire Hills	4	1	5	47	24	71	76
Midvale Ridge	2	1	3	41	31	72	75
Clun and North West Herefordshire Hills	2	1	3	56	13	69	72
North Northumberland Coastal Plain	5	0	5	23	39	62	67
The Lizard	0	0	0	57	10	67	67
Isle of Wight	10	0	10	40	14	54	64
Blackdowns	18	2	20	33	8	41	61
North York Moors and Hills	1	0	1	32	25	57	58
Berkshire and Marlborough Downs	3	1	4	34	19	53	57
Sherwood	4	0	4	24	25	49	53

Natural Area	Area inside Dargie polygon (ha)			Area outside Dargie polygon (ha)			Grand total
	LWG	Tilled land	Total	LWG	Tilled land	Total	(ha)
North Pennines	0	0	0	32	20	52	52
North Downs	2	0	2	29	19	48	50
Southern Pennines	2	0	2	35	12	47	49
Rockingham Forest	1	1	2	19	23	42	44
Yorkshire Wolds	0	0	0	15	24	39	39
Malvern Hills and Teme Valley	0	0	0	22	17	39	39
Lincolnshire Wolds	0	0	0	13	24	37	37
West Penwith	0	0	0	27	9	36	36
Potteries and Churnet Valley	4	0	4	26	5	31	35
Bedfordshire Greensand Ridge	4	1	5	15	15	30	35
Derbyshire Peak Fringe and Lower Derwent	6	1	7	20	4	24	31
Isles of Portland and Purbeck	0	0	0	23	9	32	32
South Downs	2	1	3	21	6	27	30
Dark Peak	6	0	6	15	3	18	24
Black Mountains and Golden Valley	0	0	0	18	6	24	24
Dartmoor	0	0	0	14	4	18	18
Yardley-Whittlewood Ridge	3	1	4	6	8	14	18
Durham Magnesian Limestone Plateau	0	0	0	8	9	17	17
White Peak	0	0	0	9	2	11	11
Charnwood	0	0	0	6	4	10	10
Mendip Hills	2	1	3	5	1	6	9
South West Peak	0	0	0	7	2	9	9
Bodmin Moor	0	0	0	8	0	8	8
Oswestry Uplands	0	0	0	3	1	4	4
Isles of Scilly	0	0	0	0	0	0	0