LANDSCAPE MONITORING

OF

ENVIRONMENTALLY

SENSITIVE AREAS

IN NORTHERN IRELAND

SUMMARY REPORT

1997

Monitoring Team

The ESA monitoring programme in Northern Ireland is funded by the Department of Agriculture (DANI) through its Science Service, or through Queens University, Belfast (QUB).

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SUMMARY

1. An extensive map based database has been completed for each ESA, using PC ARC/INFO and ArcView. This enables the areas of the major habitats, and the areas under an ESA agreement in each ESA to be estimated.

2. Grassland was the major habitat in each ESA. Improved grassland was most prevalent in the Mournes and Slieve Croob ESA (56% of total area) and the Antrim Coast, Glens and Rathlin ESA (42% of total area).

3. Woodland eligible for the ESA scheme was most common in the Antrim Coast, Glens and Rathlin ESA (9% of total area) and in the West Fermanagh and Erne Lakeland ESA and in the Slieve Gullion ESA (6% of total area).

4. Heather was most prevalent in the Sperrins ESA with an estimated 35077 hectares, 33% of the total area.

5. The greatest length of hedges were found in the West Fermanagh and Erne Lakeland ESA. However, the densest field boundary network system was found in the Slieve Gullion ESA with 25 kilometres of boundary per kilometre square.

6. Bracken was most prevalent in the Slieve Gullion ESA dominating an estimated 10% of the land area.

7. The longest established ESAs, the Mournes and Slieve Croob ESA and the Antrim Coast, Glens and Rathlin ESA have the highest proportion of land under agreement at the time of monitoring in 1995. In all ESAs, the trends are rising for land under ESA agreement as high numbers of ESA applicants were recorded.

8. Landscape re-monitoring in 1998, after three years will enable broad changes in the character of the ESA to be recorded. This will involve quantifying the change in quality of field boundaries and other habitats subject to ESA prescriptions and enhancement plans and comparing with habitats which have not participated in the ESA scheme. This will provide an assessment of the effectiveness of the scheme and may permit refinement of management prescriptions where necessary.

1.0.   INTRODUCTION

1.1. Summary of Northern Ireland's Environmentally Sensitive Areas' Monitoring Programme

Northern Ireland has five Environmentally Sensitive Areas, covering 20% of the land area. The ESAs in order of designation (1988-1994) are The Mournes and Slieve Croob ESA, The Antrim Coast, Glens and Rathlin ESA, The West Fermanagh and Erne Lakeland ESA, The Sperrins ESA and The Slieve Gullion ESA. A long term monitoring programme was established by the Department of Agriculture for Northern Ireland in October 1992.

1.1.1. Monitoring Aim

To ascertain if the ESA scheme is fulfilling its objectives which are to maintain and enhance the landscape, wildlife and historic value of designated areas by encouraging environmentally sensitive farming practices.

1.1.2. Monitoring Strategy

Monitoring of the ESAs requires an integrated multi-disciplinary approach, involving biological, landscape, historical and socio-economic monitoring. An extensive biological monitoring programme has been initiated in all ESAs. Baseline biological monitoring detailed the current wildlife status of habitats targeted for specific ESA management guidelines (McAdam *et al.* 1994,1995). This was achieved by monitoring plant and invertebrate species. Historical monitoring in ESAs has commenced under the authority of the Environment and Heritage service (Dr.C Foley). Socio-economic monitoring is conducted by the Department of Agricultural Economics, Queens University (Dr. J. Moss).

Figure 1. Location of monitored 25ha squares in the Northern Irelans Environmentally Sensitive Areas

Antrim Coast,
Glens & Rathlin

Mournes &
Slieve Croob

Slieve
Gullion

Sperrins

West Fermanagh
& Erne Lakeland

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1.2. Landscape Monitoring

Landscape monitoring involves providing an overview of the landscape character of each ESA, carried out as soon as possible after designation. This involves describing and quantifying land cover, vegetation, buildings, field boundaries and historical features, resulting in a general landscape assessment. Monitoring provides the basis for environmental management as the landscape elements reflect the broad ecological and cultural patterns of the ESA.

1.2.1. Aim of Landscape monitoring

To evaluate the impact of the ESA scheme on the character and the quality of the landscape.

Landscape monitoring forms an important link with the biological, historical and management monitoring to assess the effectiveness of the ESA scheme. Landscape monitoring over time will enable broad changes in the character of the ESA to be recorded and assess the impact of ESA management practices on the character and quality of the landscape. This will involve quantifying the change in quality of field boundaries and other habitats subject to ESA prescriptions and enhancement plans and comparing with habitats which have not participated in the ESA scheme. This may permit refinement of management prescriptions where necessary.

In 1995 a baseline landscape monitoring programme was carried out in all of Northern Ireland's ESAs.

1.2.2. Aim of Baseline Landscape Monitoring

To provide an overview of the landscape character of each ESA and act as a benchmark to assess change.

2.0.   MONITORING STRATEGY

2.1. Sampling strategy

The Northern Ireland land classification (Cooper, 1986) provided a stratified random sampling method. This provided a greater dispersion and representation of samples and potentially greater accuracy and precision of estimates than simple random sampling. ESA boundaries were digitised onto a map of Northern Ireland using "Maps in Action", (computer mapping package, held by the Environment and Heritage Service), which contained Northern Ireland grid square land classification information. A colour coded map of each ESA was produced and the number of one kilometre grid squares from each NI land class (1 to 23) was calculated.

A sampling intensity of 1.5%-2.0% by ESA area was chosen to give a reasonable estimate of common land cover types, and on the basis of time and financial constraints. All five ESAs were surveyed between May and September 1995. The sampling unit was a 25 hectare square. Figure 1 illustrates the distribution of sample squares throughout the NI ESAs. Maps of each ESA are given in Appendix 1.

Some land classes were recorded in small numbers, so similar land classes were combined to form land class groups, still using the same criterion that the main hierarchical divisions in the land classification be retained (Cooper, 1986). The main land class groups lowland (land classes 1-16) and upland (land classes 17-23) can be used to illustrate spatial differences and compare with equivalent studies. In the Sperrins the majority of land is upland, so the upland landclass group was sub-divided into 3 smaller land class groups (B-D), Table 1, to ensure a wide distribution of land cover resources was recorded, with landclass group A representing the lowland landclasses. Similarly in the West Fermanagh and Erne Lakeland ESA, the majority of the land area is lowland so this landclass groups

was sub-divided into two groups A and B, Table 1, with group C representing the upland land class group.

The main emphasis will be on estimates for the entire ESA, as sample size in some ESAs is small when lowland and upland land class groups are divided. Details of the land class distribution and number of squares sampled in each ESA are listed in Table 1. Appendix 2 lists the grid reference of each sample square in the Environmentally Sensitive Areas.

Table 1. The land class composition of each Environmentally Sensitive Area and the number of sample squares (25 hectares) monitored.

Environmentally Sensitive Area	Land class group	Land classes	% of total ESA area	Number of sample squares
Antrim Coast, Glens and Rathlin	Lowland	1-16	39	9
	Upland	17-23	61	13
	Total ESA			**22**
Mournes and Slieve Croob	Lowland	1-16	58	13
	Upland	17-23	42	9
	Total ESA			**22**
Slieve Gullion	Lowland	1-16	50	8
	Upland	17-23	50	8
	Total ESA			**16**
Sperrins	A	6-16	6	4
	B	17-19	38	24
	C	20-21	22	14
	D	22-23	34	22
	Lowland	1-16	6	4
	Upland	17-23	94	60
	Total ESA			**64**
West Fermanagh and Erne Lakeland	A	1-5	39	23
	B	6-16	34	20
	C	17-23	27	16
	Lowland	1-16	73	43
	Upland	17-23	27	16
	Total ESA			**59**
All ESAs				**183**

2.2. Recording land cover

Land cover features were recorded directly in the field onto 1:10 000 Ordnance Survey maps. An example of a 25 hectare square and a fully comprehensive list of field code descriptors used to record each land cover element are given in Appendix 3. Details of habitats, vegetation types and management definitions are listed in Appendix 4. The main landscape features were divided into seven groups, as listed below, with a separate map and specific recording codes for each group.

1. Grassland /Crops
2. Woodland
3. Field boundaries
4. Heather moorland
5. Buildings/amenities
6. Other vegetation types
7. Historical monuments

The landscape monitoring records similar information to the NI landscape ecological surveys (Cooper *et al.*, 1989-1992). Initially, when recording habitats, field code definitions for landscape monitoring were derived from guidelines issued by the Department of Agriculture. These guidelines were used by DANI staff to classify ESA farms and in relation to habitat management plans.

Further descriptive codes are given in relation to the presence of common and indicator species which are characteristic of a common type of habitat, as derived from previous biological monitoring results (McAdam *et al.,* 1994, 1995). This enables the landscape monitoring programme to be fully integral with biological monitoring. Details of management practices, grazing, types of animals observed were also coded. Farm ownership boundaries have since been added to each sample square in the ESAs with the assistance of DANI County staff, to enable comparison between ESA participants and non-participants. This information will be used to assess the effectiveness of the ESA scheme, by analysing land cover differences between participants and non-participants.

2.3. Data storage, access and retrieval

The Geographic information system PC ARC/INFO in conjunction with ArcView was used to store and process all map information. Initially every square was digitised using PCARC/INFO and all field codes for each land cover type are stored as database files (Dbase V).

ArcView was used to assign each parcel on the map square a unique parcel number and link to the appropriate database file. ArcView functions to display and easily access the map data and any associated information. It can also be used to calculate resource estimates and produce graphic and tabular presentations.

The ratio estimate method was used to calculate land cover estimates, standard errors (SE) and coefficient of variation (CV), were used to describe the precision of the estimate (Cochran, 1977; Murray *et al*, 1992). The CV is an expression of the standard error as a percentage of the estimate and is simpler to present. It also enables standard errors of different resource types to be compared. The smaller the CV, the more accurate the estimate if repeated samples of a resource were taken from a population. A high CV indicates a very small number of samples, so there is a large variation of the estimate if repeated samples of a resource were drawn from a population. The range of CVs for the ESA estimates varies between 3 and 100 for all recorded resources.

3.0. RESULTS

3.1. Overview of landscape habitat results

An extensive map-based database has been completed for each ESA, accessed and processed using ArcView. This enables areas of the major habitats in each ESA to be predicted (Figure 2). Grassland was the major habitat in each ESA. Improved grassland was most prevalent in the Mournes and Slieve Croob ESA (56% of total area) and the Antrim Coast, Glens and Rathlin ESA (42% of total area), Table 2a. Woodland eligible for the ESA scheme was most common in the Antrim Coast, Glens and Rathlin ESA (9% of total area) and in the West Fermanagh and Erne Lakeland ESA and in the Slieve Gullion ESA (6% of total area). Heather was most prevalent in the Sperrins ESA with an estimated 35077 hectares, 33% of the total area. Bracken was also most prevalent in the Slieve Gullion ESA dominating an estimated 10% of the land area. The greatest length of hedges were found in the West Fermanagh and Erne Lakeland ESA, Table 2b. However the densest field boundary network system was found in the Slieve Gullion ESA with 25.3km/km^2.

The predicted areas of habitats under ESA agreement at the time of sampling in 1995 are given in Table 3a. The longest established ESAs, the Mournes and Slieve Croob ESA and the Antrim Coast, Glens and Rathlin ESA have the highest proportion of land under agreement. The actual areas of habitats under agreement from 1993 to January 1997 are listed in Table 3b.

Figure 2. The predicted areas of habitat as a percentage of the ESA land area.
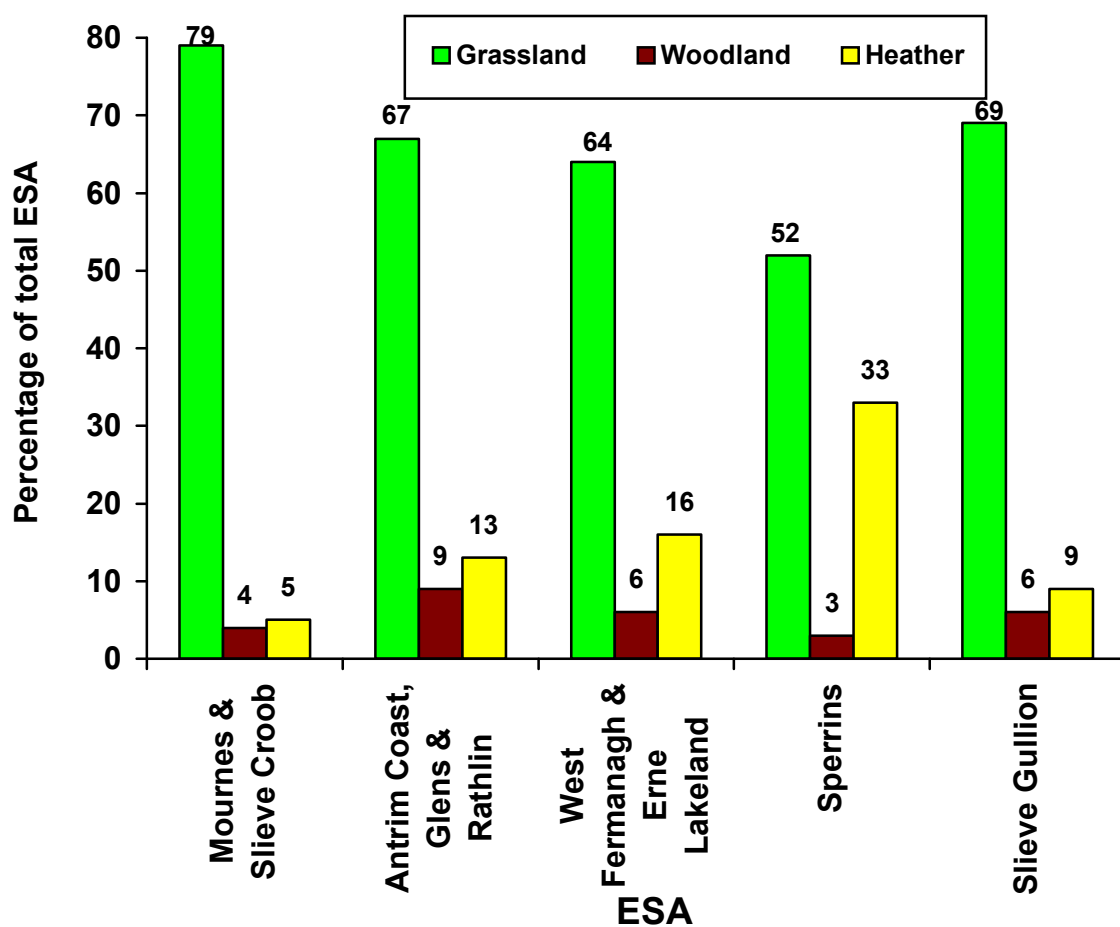
Table 2a. The predicted area of habitats in hectares in the Environmentally Sensitive Areas.

% = habitat area as % of total ESA area CV=coefficient of variation (precision of estimate)

| | Environmentally Sensitive Areas | | | | | | | | | |
| | Mournes & Slieve Croob | | Antrim Coast, Glens & Rathlin | | West Fermanagh & Erne Lakeland | | Sperrins | | Slieve Gullion | |
Habitat	Area	%	Area	%	Area	%	Area	%	Area	%
Grassland	28500	79	28200	76	60372	64	55225	52	11050	69
	cv=7		cv=9		cv=6		cv=9		cv=9	
improved	20100	56	15700	42	25759	27	23630	22	5260	33
	cv=10		cv=18		cv=15		cv=16		cv=16	
unimproved	8400	23	12500	34	34613	37	31595	30	5790	36
	cv=21		cv=21		cv=11		cv=13		cv=16	
Woodland	1470	4	3272	9	5225	6	3490	3	960	6
	cv=47		cv=49		cv=22		cv=28		cv=45	
Heather	1792	5	4876	13	15539	16	35077	33	1361	9
	cv=47		cv=48		cv=25		cv=14		cv=54	
wet heath	149	1	3867	10	13478	14	32896	31	110	1
	cv=68		cv=57		cv=27		cv=14		cv=100	
dry heath	1643	4	1009	3	2061	2	2181	2	1251	8
	cv=48		cv=100		cv=59		cv=75		cv=58	
Bracken	750	2	1690	5	291	0.3	748	1	1664	10
	cv=41		cv=71		cv=82		cv=44		cv=48	
Total Area	36300		37200		94800		106200		16000	

Table 2b. The predicted length of field boundaries in the Environmentally Sensitive Areas.
CV=coefficient of variation (precision of estimate)

| | Environmentally Sensitive Areas | | | | | | | | | |
| | Mournes & Slieve Croob | | Antrim Coast, Glens & Rathlin | | West Fermanagh & Erne Lakeland | | Sperrins | | Slieve Gullion | |
Field boundary	Length (km)	km/km^2	Length (km)	km/km^2	Length (km)	km/km^2	Length (km)	km/km^2	Length (km)	km/km^2
Hedge/hedge on wall	5924	16.3	3907	10.5	10835	11.4	8125	7.7	2838	17.7
	cv=9		cv=16		cv=9		cv=13		cv=10	
River/stream /ditch with or without trees	1320	3.6	1949	5.2	7647	8.1	5539	5.2	808	5.1
	cv=20		cv=19		cv=12		cv=10		cv=21	
Total field boundary	8528	23.5	6374	17.1	15193	16.0	15281	14.4	4041	25.3
	cv=6		cv=10		cv=8		cv=8		cv=6	

Table 3a. The estimated areas of habitats (hectares) and length of field boundaries (km)under an Environmentally SensitiveArea agreement in each ESA.

% = habitat area under ESA agreement as % of total habitat area eligible for ESA.
CV=coefficient of variation (precision of estimate)

| Habitat | Environmentally Sensitive Areas | | | | | | | | | |
| | Mournes & Slieve Croob | | Antrim Coast, Glens & Rathlin | | West Fermanagh & Erne Lakeland | | Sperrins | | Slieve Gullion | |
	Area	%	Area	%	Area	%	Area	%	Area	%
Grassland	11671	**41**	14411	**51**	17174	**28**	16469	**30**	2161	**20**
	cv=19		cv=18		cv=19		cv=21		cv=36	
improved	8019	**40**	6883	**44**	7094	**28**	6578	**28**	1077	**20**
	cv=23		cv=27		cv=37		cv=25		cv=35	
unimproved	3652	**43**	7528	**60**	10080	**29**	9891	**31**	1084	**19**
	cv=29		cv=26		cv=25		cv=30		cv=56	
Woodland	151	**10**	1393	**43**	1263	**24**	291	**8**	264	**28**
	cv=47		cv=31		cv=31		cv=30		cv=83	
Heather	1117	**62**	3509	**72**	3715	**24**	12121	**35**	0	
	cv=57		cv=52		cv=37		cv=28			
wet heath	88	**59**	2500	**65**	3065	**23**	12121	**37**	0	
	cv=100		cv=61		cv=41		cv=28			
dry heath	1029	**63**	1009	**100**	651	**32**			0	
	cv=61		cv=100		cv=85					
Total Field Boundary	3318 9.1 km/km^2	**39**	3032 8.2 km/km^2	**48**	4326 4.6 km/km^2	**30**	3794 3.6 km/km^2	**25**	574 3.6 km/km^2	**14**
	cv=6		cv=10		cv=22		cv=19		cv=36	

Table 3b. Areas of habitat under ESA agreements between 1993 and 1997 (DANI Statistics 13.02.97).

| Habitat | Area of habitat in hectares in theEnvironmentally Sensitive Areas | | | | |
	Mournes & Slieve Croob	Antrim Coast, Glens & Rathlin	West Fermanagh & Erne Lakeland	Sperrins	Slieve Gullion
Grassland					
Improved grassland	10925	7184	5000	14314	1409
Unimproved grassland	1520	9482	13243	2592	557
Rough moorland grazing	1044	2015	1577	11648	209
Heather	461	1148	3611	15344	78
Woodland	299	318	1206	1480	9

3.2.   FIELD BOUNDARIES

Field boundaries were described in terms of their type, structure, management and component plant species. These descriptors help quantify the differences in field boundary type and composition between and within ESAs.

3.2.1. Field Boundary Type

The predicted lengths of the major field boundary types in each ESA are listed in Table 4. Hedges were most frequent in the West Fermanagh and Erne Lakeland ESA with stone walls dominant in the Mournes and Slieve Croob ESA. The Mournes and Slieve Croob ESA had the most stone walls which had been recently constructed, 51 kilometres (cv=45). This is a very small estimation according to the actual length of walls which have been built or repaired under the scheme since it commenced in 1988. This is probably due to the fact that repaired walls, and walls more than 1 or 2 years in existence are difficult to distinguish from old walls, especially when constructed with old stones from ruined stone walls.

The length of boundaries estimated to be under ESA agreement are listed in Table 5. Over 40% of field boundaries in The Mournes and Slieve Croob ESA and the Antrim Coast, Glens and Rathlin ESA were predicted to be under an ESA agreement in 1995.

3.2.2. Field boundary structure

The majority of hedges in all ESAs were gappy, with less than 35% of hedges in any ESA being a stockproof, complete boundary without the use of fencing wire (Table 6).

Table 4. The estimated lengths of field boundaries in the Environmentally Sensitive Areas
(% = % of total field boundary length in each ESA)
CV= coefficient of variation (precision of estimate)

	Environmentally Sensitive Areas									
	Mourne & Slieve Croob		Antrim Coast, Glens & Rathlin		West Fermanagh & Erne Lakeland		Sperrins		Slieve Gullion	
Type	Length	%	Length	%	Length		Length	%	Length	%
Hedge	3527	41	2205	52	11553	76	8799	58	1627	40
	cv=18		cv=19		cv=9		cv=11		cv=20	
Wall	4179	49	1893	30	716	5	1580	10	1742	43
	cv=18		cv=30		cv=32		cv=30		cv=19	
Fence	668	8	799	13	2746	18	3445	23	443	11
	cv=19		cv=18		cv=10		cv=10		cv=24	
River/stream / ditch without trees	154	2	3707	5	178	1	1457	9	229	6
	cv=45		cv=42		cv=30		cv=17		cv=32	
Total Field Boundary km	8528 23.5km/ km^2		6374 17.1km/k m^2		15193 16.0km/ km^2		15281 14.4km /km^2		4041 25.3km /km^2	
	cv=6		cv=10		cv=7		cv=8		cv=6	

Table 5: The estimated length of field boundaries under an Environmentally Sensitive Area agreement in each ESA.
CV=coefficient of variation (precision of estimate)
% of total field boundary length

	Environmentally Sensitive Areas									
Boundary	Mournes & Slieve Croob		Antrim Coast, Glens & Rathlin		West Fermanagh & Erne Lakeland		Sperrins		Slieve Gullion	
Type	Length	%	Length	%	Length	%	Length	%	Length	%
Hedge	949	27	1259	57	3473	30	2146	24	326	20
	cv=28		cv=28		cv=23		cv=21		cv=49	
Wall	2205	53	1098	58	266	37	304	19	120	7
	cv=26		cv=36		cv=47		cv=42		cv=57	
Fence	139	21	346	43	557	20	880	26	74	17
	cv=27		cv=25		cv=26		cv=26		cv=52	
River/stream / ditch without trees	22	24	330	9	30	17	464	32	54	24
	cv=71	14	cv=47		cv=49		cv=29		cv=59	
Total Field Boundary	3315 9.1km/ km^2	39	3033 8.2km/ km^2	48	4326 4.6km/k m^2	29	3794 3.6km/ km^2	25	574km 3.6km/ km^2	14
	cv=36		cv=6		cv=22		cv=10		cv=36	

Table 6. The length of complete and gappy field boundaries in each ESA.

Boundary Structure	Length of field boundaries in kilometres in the Environmentally Sensitive Areas (coefficient of variation)									
	Mournes & Slieve Croob		Antrim Coast, Glens & Rathlin		West Fermanagh & Erne Lakeland		Sperrins		Slieve Gullion	
	km	%	km	%	km	%	km	%	km	%
Boundary with gaps	1466 (23)	17	1005 (21)	16	5171 (14)	36	4109 (12)	28	1100 (14)	27
Boundary with filled gaps (wire etc)	4036 (10)	48	3175 (13)	51	4376 (10)	30	6444 (12)	44	1819 (14)	45
Complete boundary	2915 (13)	35	2088 (18)	33	4955 (10)	34	4131 (11)	28	1118 (12)	28

3.2.3. Field boundary management

The majority of field boundaries were unmanaged, with the Sperrins and Slieve Gullion ESAs having the most unmanaged boundaries (Table 7).

Table 7. The length of managed and unmanaged field boundaries in each ESA

Boundary management	Length of field boundaries in kilometres in the Environmentally Sensitive Areas (coefficient of variation)									
	Mournes & Slieve Croob		Antrim Coast, Glens & Rathlin		West Fermanagh & Erne Lakeland		Sperrins		Slieve Gullion	
	km	%	km	%	km	%	km	%	km	%
Unmanaged	5763 (9)	75	4140 (14)	79	8183 (11)	69	10699 (9)	90	2340 (14)	86
Managed	1967 (10)	25	1102 (16)	21	3628 (16)	31	1202 (12)	10	396 (58)	14

3.2.4. Hedge Plant Species

The hedges recorded in each ESA were classified into nine vegetation groups based on the tree and shrub composition and four hedge ground flora groups according to their dominant species, Figures 3 and 4. Willow/Alder/Hazel dominated hedges were most frequent in the West Fermanagh and Erne Lakeland ESA (42% of hedges), Figure 3. Gorse/Rowan hedges were the commonest hedge found in the Sperrins ESA (45% of hedges). Hawthorn/Ash hedges were the most frequent hedge type in the Antrim Coast, Glens & Rathlin ESA (46% of hedges) and in the Slieve Gullion ESA (50% of hedges). The West Fermanagh and Erne Lakeland ESA had the greatest length of hedges with a species-rich hedge bottom (44% of hedges), Figure 4. Slieve Gullion had the highest percentage of hedges (85%) with a species-poor hedge bottom.

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Figure 3 . The tree and shrub types of field boundaries in the ESAs.

Legend:
- Hawthorn/Ash
- Gorse/Rowan
- Hawthorn/Blackthorn
- Willow/Alder/Hazel
- Blackthorn/Hazel/Holly
- Garden species
- Conifer
- Mature Deciduous trees
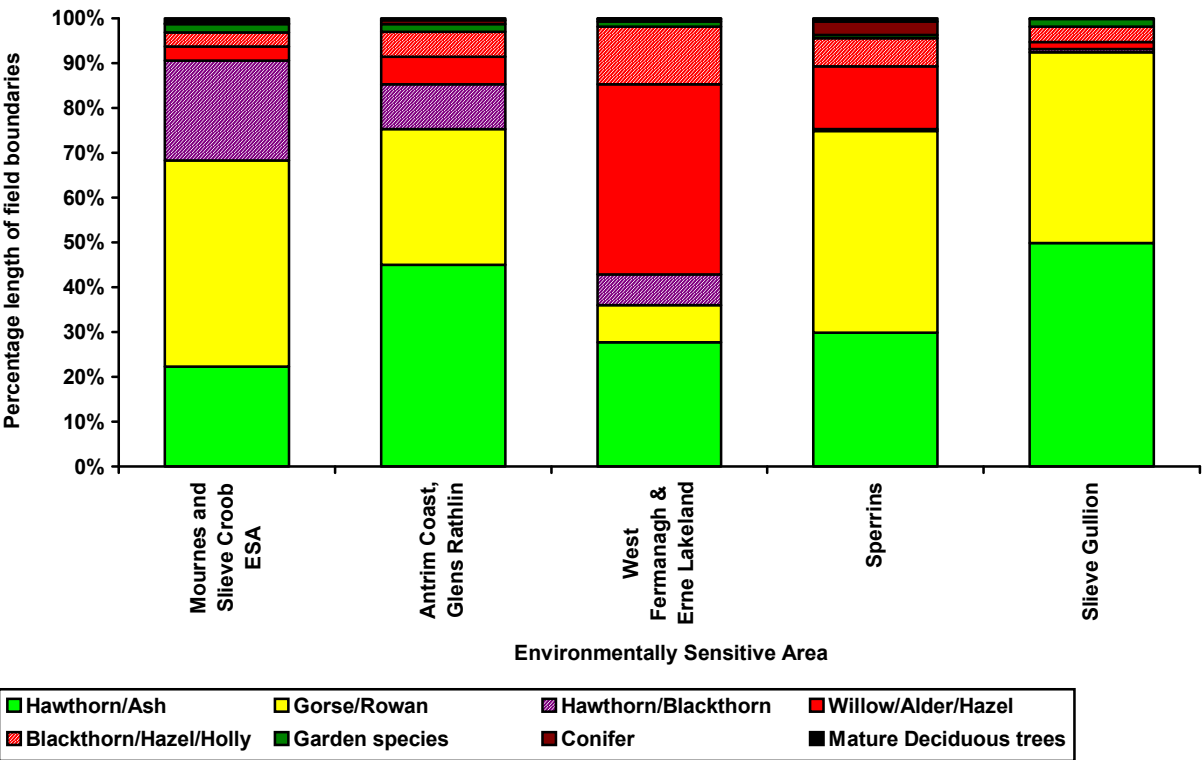
Figure 4 . The distribution of hedge ground flora types throughout each ESA

Legend:
- Species-poor: Grasses/weeds
- Species-poor: Daisy/overgrazed
- Species-rich: Primrose/ivy
- Species-rich: upland foxglove/bilberry
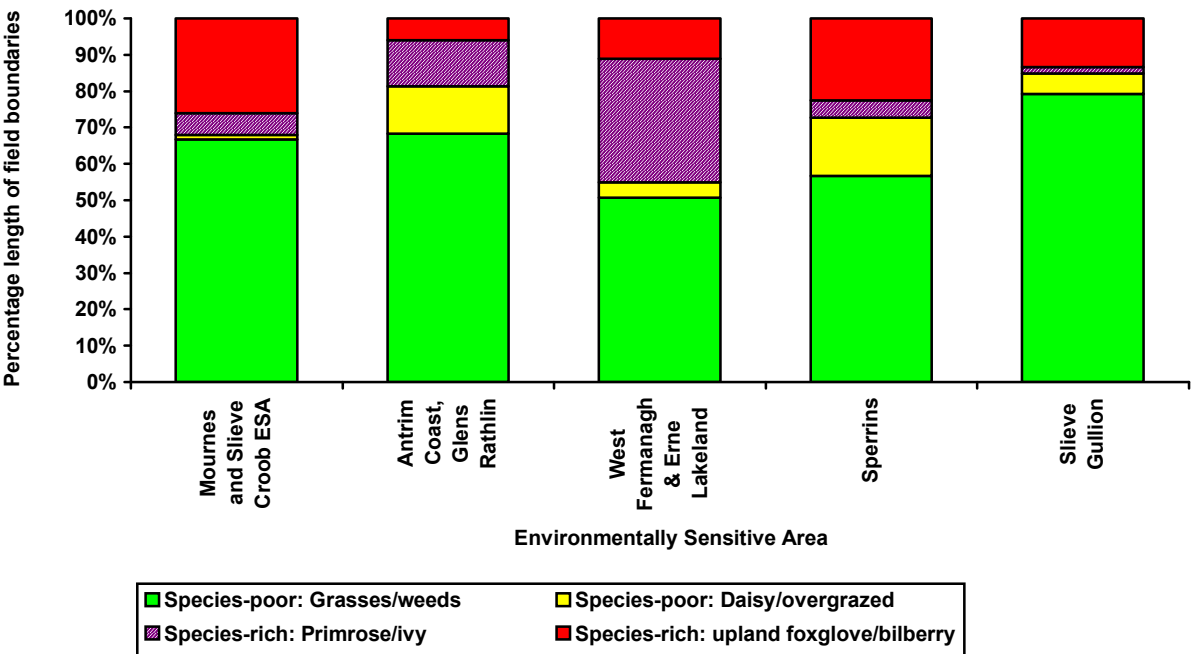
3.3.   HEATHER MOORLAND

Different heather types dominate each ESA, with wet heath the common heather type in the Sperrins ESA, The Antrim Coast, Glens and Rathlin and in the West Fermanagh and Erne Lakeland. Dry heath was more frequent in the Mournes and Slieve Croob ESA and in the Slieve Gullion ESA (Table 8). Grassy wet heath is a wet heath subtype dominated by grasses, bilberry and cross-leaved heath and indicates high grazing intensities. The majority of the Sperrins ESA was classified as grassy wet heath (71%) and half of the Antrim Coast, Glens & Rathlin ESA.

Over half of the heather area predicted in the Mournes and Slieve Croob ESA and in the Antrim Coast, Glens and Rathlin ESA was predicted to be under agreement at the time of monitoring in 1995 (Table 8). Notably, no heather was predicted to be under an ESA agreement in the Slieve Gullion area in 1995, but this ESA was only launched in 1994.

Table 8. The estimated area of each heather types in hectares in each of the Environmentally Sensitive Areas.
% = heather type area as % of total heather area in the ESA.
CV=coefficient of variation (precision of estimate)

Heather vegetation type	Mournes & Slieve Croob		Antrim Coast, Glens & Rathlin		West Fermanagh & Erne Lakeland		Sperrins		Slieve Gullion	
	Area	% of total	Area	% of total	Area	% of total	Area	% of total	Area	% of total
Typical wet heath	-	-	1424	**29**	7760	**50**	8100	**23**	-	-
			cv=76		cv=37		cv=31			
Grassy wet heath	149	**8**	2443	**50**	5769	**37**	24796	**71**	110	**8**
	cv=69		cv=80		cv=39		cv=18		cv=100	
Typical dry heath	184	**10**	277	**6**	1738	**11**	1596	**5**	132	**10**
	cv=68		cv=100		cv=69		cv=100		cv=100	
Grassy dry heath	1459	**82**	732	**15**	272	**2**	586	**1**	1119	**82**
	cv=55		cv=100		cv=59		cv=73		cv=66	
Total Heather	1792		4876		15539		35077		1361	

Table 9. The estimated area of heather types in hectares under an ESA agreement in each of the Environmentally Sensitive Areas.

% = heather type area under ESA agreement as % of total heather type area in the ESA.

CV=coefficient of variation (precision of estimate)

Heather vegetation type	Mournes & Slieve Croob		Antrim Coast, Glens & Rathlin		West Fermanagh & Erne Lakeland		Sperrins	
	Area	% of total	Area	% of total	Area	% of total	Area	% of total
Typical wet heath	-		1328	**93**	1155	**15**	1832	**23**
			cv=99		cv=63		cv=44	
Grassy wet heath	88	**59**	1172	**48**	1909	**33**	10289	**42**
	cv=100		cv=77		cv=43		cv=31	
Typical dry heath	85	**46**	277	**100**	635	**37**	-	
	cv=100		cv=100		cv=87			
Grassy dry heath	944	**65**	732	**100**	16	**6**	-	
	cv=67		cv=100		cv=100			
Total Heather	1117	**62**	3509	**72**	3715	**24**	12121	**35**

3.4. GRASSLAND

Species-rich unimproved grassland was most frequent in the West Fermanagh and Erne Lakeland ESA and common in the Sperrins and the Antrim Coast, Glens and Rathlin (Table 10). The majority (67%) of species-rich grassland in the Antrim Coast, Glens and Rathlin ESA was predicted to be under ESA agreement (Table 11), Figure 5.

Table 10. The estimated area of each grassland type in hectares in each of the Environmentally Sensitive Areas.
% = grassland type area as % of total grassland area in the ESA.
CV=coefficient of variation (precision of estimate)

|	Mournes & Slieve Croob		Antrim Coast, Glens & Rathlin		West Fermanagh & Erne Lakeland		Sperrins		Slieve Gullion	
	Area	%	Area	%	Area	%	Area	%	Area	%
Unimproved grassland										
species-rich	646	**2**	4199	**15**	16397	**27**	8777	**16**	330	**3**
	cv=37		cv=38		cv=19		cv=25		cv=49	
species-poor	7754	**27**	8301	**29**	18216	**30**	22818	**41**	5460	**49**
	cv=23		cv=21		cv=13		cv=16		cv=15	
Improved grassland										
species-rich	2991	**11**	2012	**7**	3250	**6**	3636	**7**	261	**3**
	cv=28		cv=41		cv=26		cv=31		cv=53	
species-poor	17109	**60**	13688	**49**	22509	**37**	19994	**36**	4999	**45**
	cv=12		cv=19		cv=16		cv=16		cv=15	
Total grassland	**28500**		**28200**		**60372**		**55225**		**11050**	

Table 11. The estimated area of each grassland type in hectares under an ESA agreement in each of the Environmentally Sensitive Areas.
% = grassland type area under ESA agreement as % of total grassland type area in the ESA.
CV=coefficient of variation (precision of estimate)

	Mournes & Slieve Croob		Antrim Coast, Glens & Rathlin		West Fermanagh & Erne Lakeland		Sperrins		Slieve Gullion	
	Area	%	Area	%	Area	%	Area	%	Area	%
Unimproved grassland										
species-rich	249	**39**	2831	**67**	4774	**29**	1277	**15**	230	**69**
	cv=64		cv=55		cv=34		cv=74		cv=71	
species-poor	3403	**44**	4697	**57**	5306	**29**	8614	**38**	854	**16**
	cv=28		cv=30		cv=28		cv=33		cv=56	
Improved grassland										
species-rich	1968	**66**	989	**49**	1261	**38**	1246	**34**	158	**61**
	cv=36		cv=56		cv=39		cv=47		cv=72	
species-poor	5783	**34**	5894	**43**	5833	**26**	5332	**27**	919	**18**
	cv=25		cv=29		cv=40		cv=29		cv=34	
Total grassland	11671	**41**	14411	**51**	17174	**28**	16469	**30**	2161	**20**

Figure 5. The estimated area of species-rich unimproved grassland in each ESA.
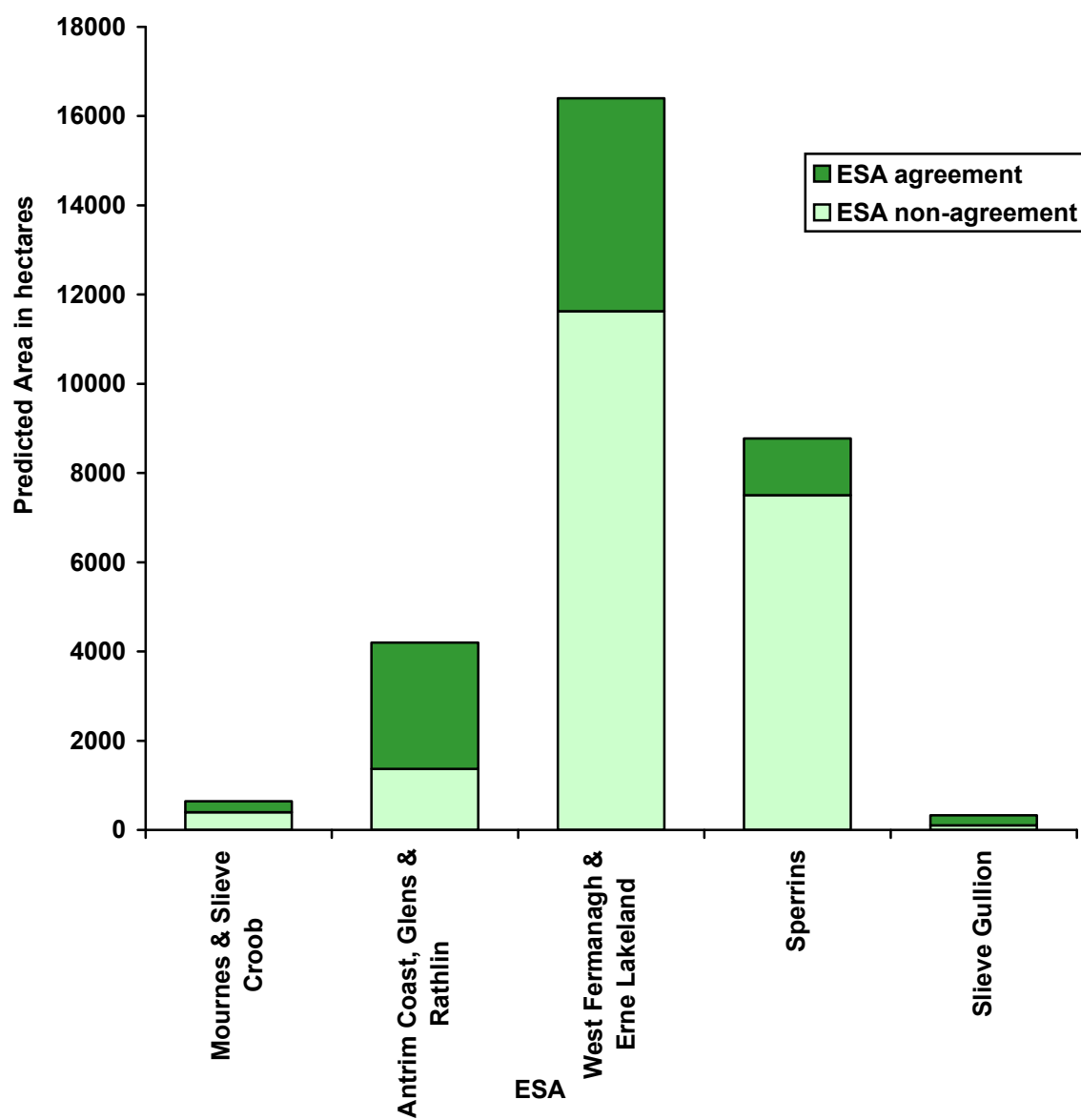
In the West Fermanagh and Erne Lakeland ESA, grasslands were classified into the habitat types wet grasslands, hay meadows and limestone grasslands (Table 12). Hay meadows constitute an estimated 5% of the total grassland area, with the majority of these described as species-rich. Wet grasslands occupied a further 5% , with limestone grasslands representing 1% of the total predicted grassland area.

Table 12. Areas in hectares of Grassland Habitats in the West Fermanagh and Erne Lakeland ESA. (CV=coefficient of variation (precision of estimate))

Habitat	Area	% of total grassland area	Area under ESA agreement in 1995	% of habitat	Area under ESA application in 1995	Actual area under agreement in Jan 1997
Hay meadow	**3139**	**5**	**971**	**31**	**223**	**1079**
	cv=32		cv=45		cv=87	
Species-rich hay meadows	2362		759	32		
	cv=38		cv=52			
Species-poor hay meadows	777		211	27		
	cv=54		cv=98			
Wet grassland	**2787**	**5**	**214**	**8**	**470**	**880**
	cv=33.9		cv=56		cv=58	
Species-rich wet grassland	1262		75	6		
	cv=38		cv=69			
Species-poor wet grassland	1525		139	9		
	cv=40		cv=78			
Unimproved grassland	**30521**	**51**	**8853**	**29**	**6971**	**13243**
	cv=10.8		cv=37		cv=31	
Species-rich	12304		3547	29		
	cv=19		cv=34			
Species-poor	18217		5306	29		
	cv=13		cv=28			
Improved grassland	**23065**	**38**	**6642**	**29**	**2457**	**5000**
	cv=15.3		cv=37		cv=37	
Species-rich	3250		1261	39		
	cv=26		cv=39			
Species-poor	19815		5381	27		
	cv=16		cv=40			
Limestone	**860**	**1**	**494**	**57**	**-**	**999**
	cv=46.0		cv=55			
Species-rich	469		392	84		
	cv=56		cv=59			
Species-poor	391		102	26		
	cv=71		cv=100			
TOTAL GRASSLAND	**60372**		**17174**	**28**		
	cv=6		cv=19			

3.5.   WOODLAND

The areas of the main woodland types in each ESA are listed in Table 13. The areas of conifer wood and gorse scrub, although not eligible for inclusion in the ESA scheme are included in this table, as an indication of the overall ESA landscape patterns. All ESAs have similar proportions of broad-leaf seminatural woodlands, with mixed woods being more common in the Slieve Gullion and the West Fermanagh and Erne Lakeland ESAs. Scrub was the dominant woodland type in the Antrim Coast, Glens & Rathlin ESA. Gorse scrub was most prominent in the Slieve Gullion ESA covering 8% of the land area.

Table 13. The estimated area of woodland types (in hectares) in each of the Environmentally Sensitive Areas.
(% = % of woodland of total ESA area)
CV=coefficient of variation (precision of estimate)

Woodland Type	Mournes & Slieve Croob		Antrim Coast, Glens & Rathlin		West Fermanagh & Erne Lakeland		Sperrins		Slieve Gullion	
	Area	%	Area	%	Area	%	Area	%	Area	%
Broad -leaf seminatural	570 cv=55	1.5	469 cv=66	1.3	1347 cv=33	1.4	2003 cv=72	1.9	187 cv=47	1.2
Mixed wood	202 cv=69	0.5	140 cv=75	0.4	1059 cv=41	1.1	155 cv=39	0.2	250 cv=69	1.6
Conifer	1578 cv=99	4.4	67 cv=56	0.2	7184 cv=39	7.6	6723 cv=40	6.3	1074 cv=57	6.7
Scrub	674 cv=53	1.9	2662 cv=60	7.2	2494 cv=29	2.6	1336 cv=36	1.3	568 cv=56	3.6
Gorse	786 cv=37	2.2	1213 cv=35	3.3	931 cv=32	0.9	405 cv=39	0.4	1316 cv=60	8.2
Total Woodland eligible for scheme	1470 cv=47	4	3272 cv=49	9	5225 cv=22	6	3490 cv=28	3	960 cv=45	6

The estimated area of woodland types in hectares under an ESA agreement are listed in Table 14. The highest proportion of woodland area (eligible for payment in the ESA scheme) under an ESA agreement at the time of monitoring was in the Antrim Coast, Glens & Rathlin ESA (9% of total land area).

Table 14. The estimated area of woodland types in hectares under an ESA agreement in each of the Environmentally Sensitive Areas.
(% = % of each woodland type in ESA area)
CV=coefficient of variation (precision of estimate)

Woodland Type	Mournes & Slieve Croob		Antrim Coast, Glens & Rathlin		West Fermanagh & Erne Lakeland		Sperrins		Slieve Gullion	
	Area	%	Area	%	Area	%	Area	%	Area	%
Broad -leaf seminatural	-	-	456 cv=68	97	307 cv=54	23	29 cv=60	1.4	3 cv=100	2
Mixed wood	12 cv=71	6	19 cv=83	14	240 cv=46	23	52 cv=53	34	37 cv=100	15
Conifer	3 cv=100	0.01	18 cv=72	27	14 cv=66	0.1	283 cv=47	4	-	-
Scrub	140 cv=74	21	918 cv=94	34	394 cv=46	16	210 cv=57	16	224 cv=100	39
Gorse	546 cv=53	69	696 cv=50	57	113 cv=63	12	29 cv=61	7	3 cv=100	0.2
Total woodland eligible for payment in ESA scheme	151 cv=47	10	1393 cv=31	43	1263 cv=31	24	291 cv=30	8	264 cv=83	28

4.0.   CONCLUSIONS

A comprehensive baseline map based database has been established for each ESA providing estimates of the areas of all habitats targeted under the ESA scheme for maintenance and enhancement. This database provides an indication of the extent and distribution of the wide range of habitats throughout each ESA, and the areas under ESA agreement at the time of sampling (1995). The GIS system facilitates presentation and queries relating to the ESA landscape. Currently the biological monitoring data is being transferred to this system.

The major benefits of the current landscape monitoring programme are that the habitats are initially classified according to DANI ESA guidelines (1993), so the results can be directly related to the ESA scheme. Details of habitat subtypes such as species-rich and species-poor, are based on indicator and common plant species, identified from the biological monitoring programme. These descriptions and the recording of current management will help to assess the effectiveness of the ESA scheme. Predictions of the areas of habitats targeted by the ESA scheme are valuable to both the ESA scheme promoters, planners and monitoring team.

The results indicate that, as would be expected, the areas of land under agreement are highest in the two longest running ESA schemes, the Mournes & Slieve Croob and the Antrim Coast, Glens & Rathlin ESA. The percentage of land farmed by ESA applicants suggests a continued rise in the land under ESA agreement.

The landscape monitoring of all five ESAs will be repeated in 1998, revisiting all 183 sample squares. This will provide the initial broad evaluation of the ESA scheme, after three years. Whilst the overall changes in the landscape may occur at a slow rate, the changes brought about by ESA enhancement grants and more noticeable ESA measures are undertaken, can be estimated. Landscape monitoring in conjunction with the biological, socio-economic and historical

monitoring results will help assess the overall effectiveness of the ESA scheme and where necessary help redefine management guidelines.

5.0. REFERENCES

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List of Appendices

Appendix 1

Distribution and location of monitored 25ha landscape squares in the ESAs

Figure 1. The Mournes and Slieve Croob ESA showing landscape monitoring 25ha squares

Lowland land classes (1-16)
Upland land classes (17-23)

30
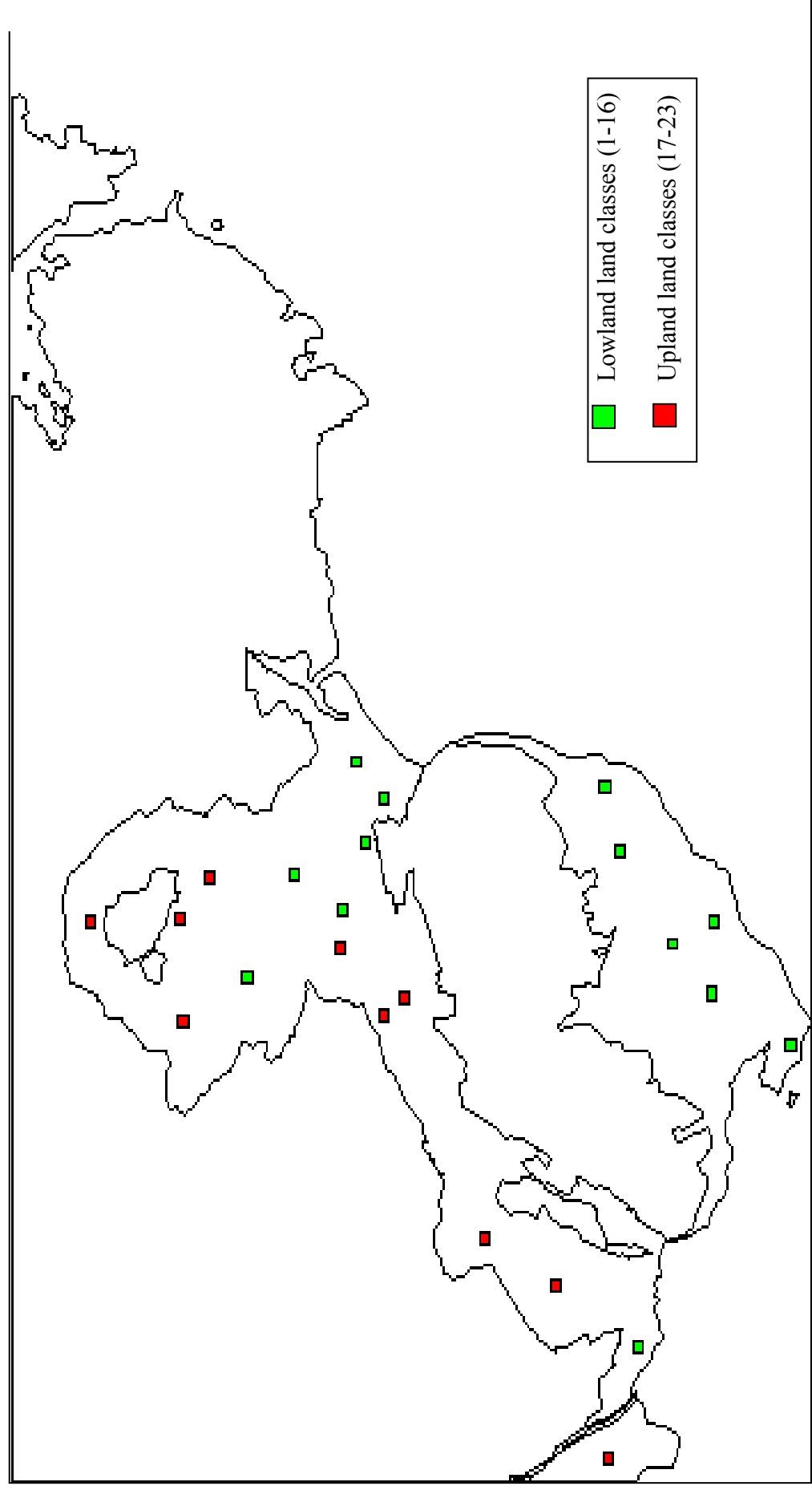
Figure 2. The Antrim Coast Glens & Rathlin ESA showing landscape monitoring 25ha squares

Lowland land classes (1-16)

Upland land classes (17-23)
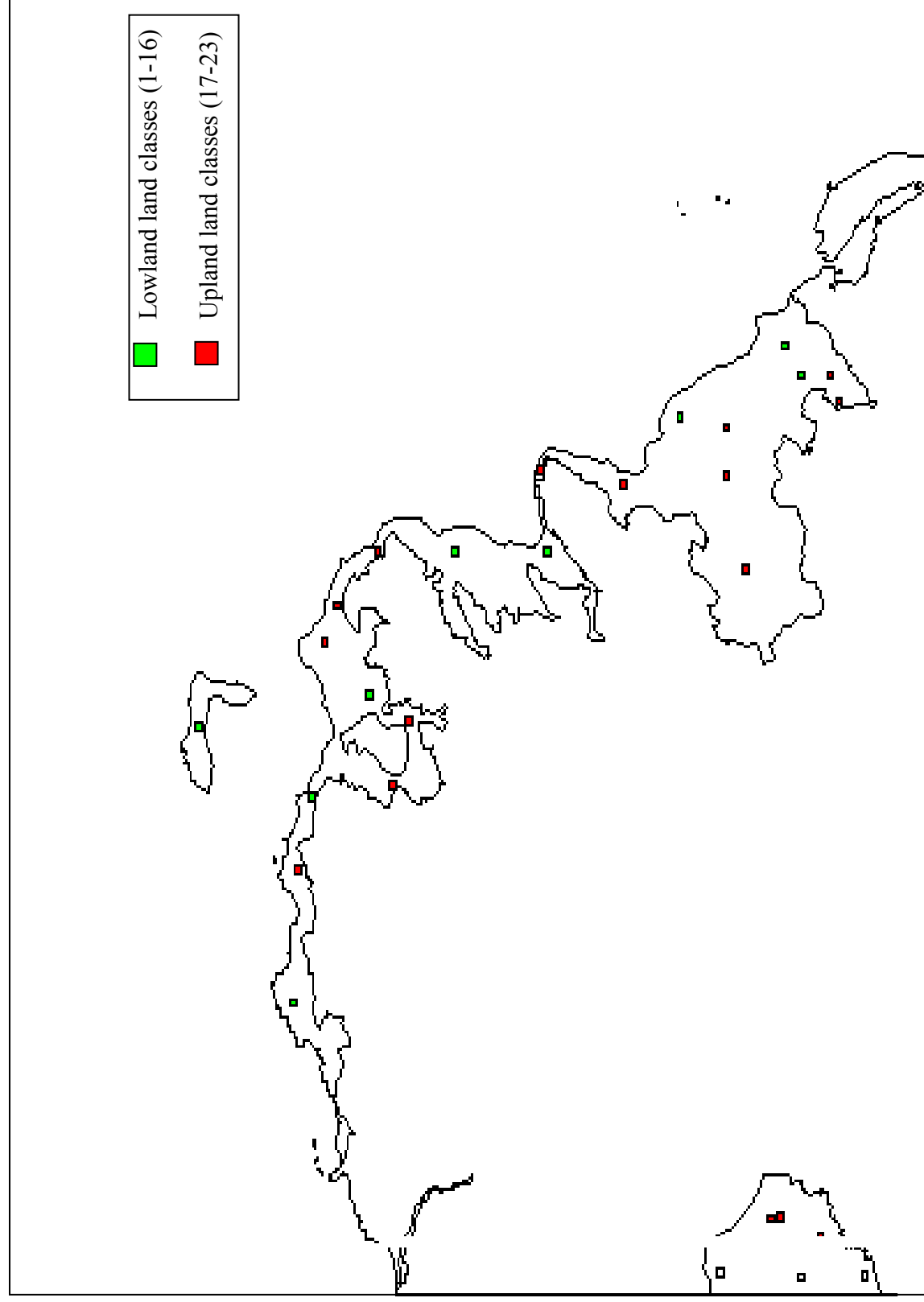
Figure 3. The West Fermanagh and Erne Lakeland ESA showing landscape monitoring 25ha squares

Lowland land classes (1-16)

Upland land classes (17-23)
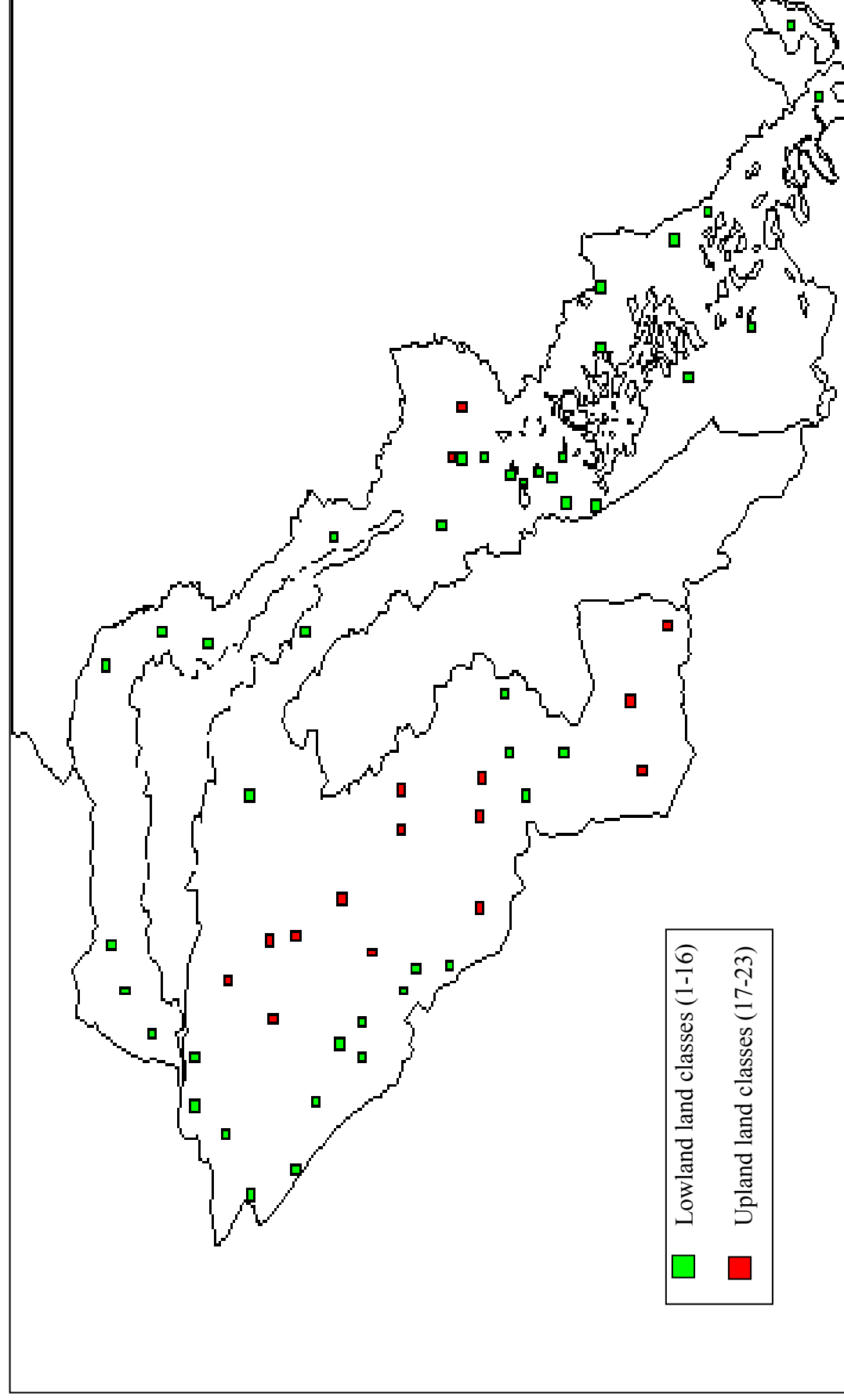
Appendix 2

Grid references and 1:10, 000 Ordnance survey sheet numbers of monitored squares in the ESAs

Land class groups and individual land classes are listed (from Cooper 1986).

The grid reference listed is the location of the bottom left hand corner of the 25ha square.

The Mournes and Slieve Croob ESAs' monitored 25ha squares.

Number	Landclass Group A	Landclass	1:10000 Map sheet no.
1	J360205	1	279
2	J330195	3	278
3	J300175	3	278
4	J310155	1	284
5	J280155	2	284
6	J260115	1	284
7	J130195	1	277
8	J360325	2	255
9	J380345	1	255
10	J340335	14	255
11	J290395	14	239
12	J330375	14	255
13	J330345	13	255
Number	Landclass Group B	Landclass	Map 1:10000 sheet no.
14	J160235	17	267
15	J180275	18	267
16	J280315	17	254
17	J290305	21	254
18	J300345	17	254
19	J330415	17	223/240
20	J310425	23	222
21	J270425	17	222
22	J310475	17	222

The Antrim Coast, Glens and Rathlin ESA monitored squares

Number	Landclass Group A	Landclass	1:10000 Map sheet no.
1	D130515	16	3
3	C960445	1	16
14	D350055	14	70/58
8	D090425	16	8
18	D150385	16	9
19	D240315	16	17
20	D370065	16	58
21	D230235	16	35
22	D320145	16	46
Number	Landclass Group B	Landclass	1:10000 Map sheet no.
2	D040435	21	8
4	D090365	20	15
5	D130355	19	16
6	D180415	21	9
7	D200405	20	9
9	D295240	21	35
10	D270185	21	35
11	D280105	18	57
12	D320105	23	58
13	D230085	18	57
15	D350025	18	70
16	D330015	23	70
17	D245370	20	17

WEST FERMANAGH AND ERNE LAKELAND ESA

No	Landclass Group A	land class	Map 1:10000 sheet no.	21	H000465	15	209
				22	H020445	15	209
5	H230465	3	211	23	H020425	15	209
7	H170575	5	173	34	H090545	15	172
9	H160645	5	153	37	H160525	15	191
13	G950585	5	170	39	H255385	10	229
14	G980585	5	171	40	H285375	10	230
16	G930535	5	189	41	H280365	10	230
18	G970495	5	189	47	H120385	15	228
19	G960485	5	189	56	H120355	15	228
35	H910555	5	170	No	Landclass Group C	land class	Map 1:10000 sheet no.
38	H260405	5	229/230	3	H280455	19	212
42	H290345	5	245	4	H310445	19	212
43	H260345	5	244/245	24	H050415	17	190
44	H250325	5	244	25	H080415	20	210/228
45	H355325	5	245	26	H070455	22	210
46	H320315	5	245	27	H101455	22	209
48	H360285	5	246/261	28	H030475	20	210
49	H300265	5	260	29	H050495	22	209
50	H330235	5	260	30	H030515	20	190
51	H370255	5	261	31	H030535	22	190
52	H470215	5	273	32	G980535	20	190
53	H420205	5	272	33	H000565	21	171
54	H150395	4	228	36	H110415	22	210/228
55	H090375	5	228	59	H110320	22	243
N o	Landclass Group B	land class	Map 1:10000 sheet no.	60	H170295	22	243
1	H280415	14	212/230				
2	H280445	15	212				
6	H230505	7	192				
8	H180605	15	173/154				
10	H030645	8	152				
11	H010635	8	152				
12	G990615	15	152				
15	G940565	7	170				
17	G950525	7	189				
20	G980485	15	190				

SPERRINS ESA

No	Landclass Group A	land class	Map 1:10000 sheet no.	No	Landclass Group C	land class	Map 1:10000 sheet no.
19	H510855	6	105	2	H470945	21	74
1	H480915	14	89	21	H570935	20	75
39	H790995	14	64	12	H570885	21	90
53	H700075	15	51	24	H670945	21	76
				30	H680875	20	91
No	**Landclass Group B**	**land class**	**Map 1:10000 sheet no.**	46	C830065	20	52
14	H470795	19	121	51	C720085	21	51
16	H530795	19	121	54	C660035	21	63
6	H510915	17	89	56	C600025	21	62
4	H450989	19	73	62	H520885	20	89
22	H620935	19	75	63	H640935	21	75
10	H550905	17	89	64	H520985	21	74
13	H560835	19	106	**No**	**Landclass Group D**	**landclass**	**Map 1:100000 sheet no.**
17	H600805	19	106	15	H500795	23	121
26	H640845	19	106	7	H530975	22	74
27	H650825	19	107	3	H470965	23	74
28	H630775	19	122	8	H590955	23	75
29	H670855	19	107	20	H590985	22	75
31	H700825	19	107	11	H570905	23	90
33	H710905	19	91	18	H610875	22	90
34	H750885	19	92	23	H640895	22	90
37	H800920	19	92	25	H680915	23	91
38	H770985	19	77	32	H710845	23	107
42	C810025	19	64	35	H790905	22	92
45	C830050	18	64	36	H810875	23	92
49	C750065	17	52	40	H690995	23	63
57	H610855	19	106	41	H680965	22	76
58	H500865	19	89	43	C770025	22	64
59	H60865	19	90	44	C790045	22	64
60	H640865	19	90	47	C790100	22	52
No	**Landclass Group C**	**land class**	**Map 1:10000 sheet no.**	48	C800085	22	52
5	H490895	21	89	50	C720045	23	63
9	H530935	21	74	52	C730085	23	51
				55	C640025	22	62
				61	H560855		106

SLIEVE GULLION

No	Landclass group	land class	Map 1:10000 Sheet no.
2	J050155	3	282
3	J030175	2	275/276
4	J040195	2	276
5	J050215	2	276
6	J070225	3	266
7	J080205	3	276
12	H970165	2	275
13	H950195	3	275
No	Landclass group	land class	Map 1:10000 Sheet no.
1	J040145	17	282
8	J090215	17	276
9	J060245	17	266
10	J020225	23	265
11	H990175	17	275
14	H940225	17	265
15	H970245	17	265
16	H990245	17	265

Appendix 3

Example of 25 hectare monitored square
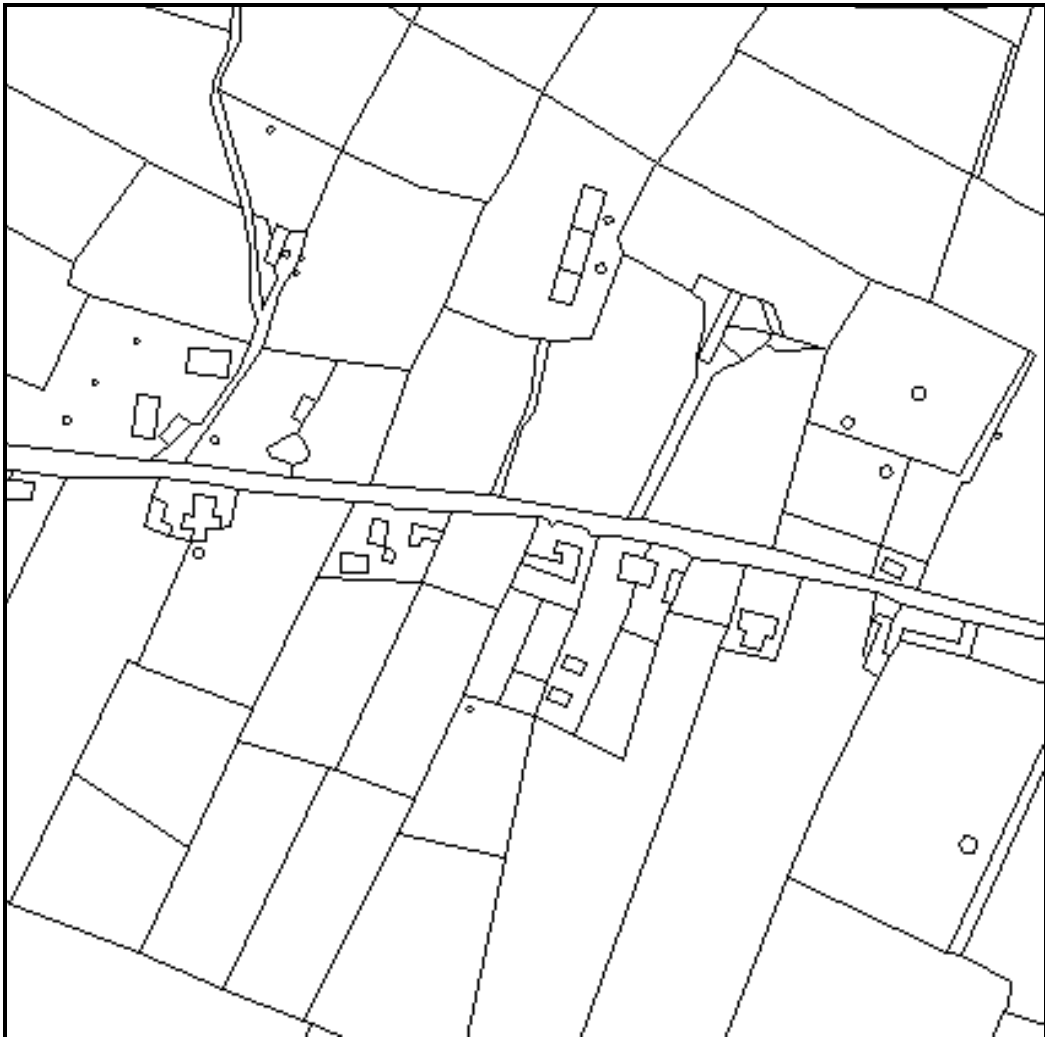
Field recording sheets and code descriptors

LAND COVER MONITORING RECORD SHEETS

1. GRASSLAND

2. HEATHER MOORLAND

3. WOODLAND

4. BOUNDARIES

5. BUILDING/AMENITIES

6. HISTORIC MONUMENTS

7.OTHER VEGETATION TYPES

GRASSLAND

HABITAT
1. Hay meadow 2. Wet grassland 3. Unimproved 4. Improved 5. Limestone 6. Crops

VEGETATION TYPE
1. Species -rich   2. Species-poor

VEGETATION SUB-TYPE

1. HAY MEADOW 1a. Species-rich damp 1b. Species-rich dry 2a. Species-poor 2b. Overgrazed
3.UNIMPROVED 2a Weed infested (docken, thistle, nettles) 3. Bent/fescue hill pasture 4. Rough grazing
(Rush/Molinia upland) 5. Rush dominated
4.IMPROVED 2a. Weed infested (docken, thistle, nettles)
5.LIMESTONE 3 Mat grass dominated
6.CROPS 1. Barley 2. Wheat 3. Potatoes 4. Oats 5. Turnips

MANAGEMENT 1. Weed control 2.Rush Topping 3. Reseed 7. Silage 8. Hay 10 Ploughed

DRAINAGE 3.Drainage -open new 4. Drainage - open old 5.Closed drainage

GRAZING 6. Grazed

ANIMALS 1. Store cattle 2. Dairy cattle 3. Suckler cattle 4. Sheep 5. Calves 6. Donkey 7. Pony 8. Goats 9.
Poultry

PARCEL	HABITAT	VEGETATION		DOMINANT SPECIES			MANAGEMENT		ANIMALS	
		Type	Sub-Type				Manage	Drainage	Grazing	Animals

HEATHER

GENERAL DESCRIPTION
1. Blanket bog 2. Raised bog 3. Peat hag 4. Erosion/bare peat 6. Heath

HEATHER TYPE
1. Wet heath
2. Dry heath

SUBTYPE 1 Typical wet heath 2. Grassy wet heath 3. Typical dry heath 4. Grassy dry heath with bilberry

MANAGEMENT

BURNING 1. Burning recent <1yr a. Accidental b. management practice 2. Past burning a. a. Accidental b. management practice

PEAT CUTTING 3. Hand cutting - present 4. Hand cutting - past 5. Mechanised peat cutting - present
6. Mechanised peat cutting - past 10. Mechanised peat cutting past & present 11. Hand cutting past & present 12. Hand & Mechanised peat cutting

DRAINAGE 7. Open drainage - new 8. Open drainage - past 9. Closed drainage

GRAZING 1. Grazed 2. Ungrazed

ANIMALS 1. Store cattle 2. Dairy cattle 3. Suckler cattle 4. Sheep 5. Calves 6. Donkey 7. Pony 8. Goats 9. Suckler cattle & sheep 10. Pony, Donkey & sheep 11. Donkey & Goats

PAR	DESCRIPTION	VEGETATION		DOMINANT SPECIES			MANAGEMENT				
		Type	Sub-type				Burning	Peat cutting	Drainage	Grazing	Anim

WOODLAND

TYPE
1. Broadleaf woodland seminatural 2. Broadleaf - planted
3. Coniferous woodland seminatural   4. Coniferous woodland - planted
5. Mixed wood -seminatural   6. Mixed wood - planted
7. Dense scrub   8. Scattered scrub   9.Gorse scrub
10. Parkland   11. Scattered isolated trees 12. Line of trees   13. Fen carr   14. Orchard
15. New wood 16. Dead Tree

LANDSCAPE 1. Location of woods
1. Riverside   2. Lakeside   3. Field parcel   4. Farm buildings   5. Road side   6. Cosat
LANDSCAPE 2. Topography
1. Flat   2. Sloping   3. Steep   4. Hill top   5. Escarpment   6. Valley bottom
STRUCTURE
1. Wood height 0-1m   2. 1-3m   3. 3-10m   4. >10m

TREE & SHRUB TYPE
1. Mature Deciduous woods 2.Alder/Willow woods   3. Mixed species woods   4. Scrub a. mixed b.blackthorn c.
hawthorn d. hazel e.Gorse f.Willow g.Holly h. Birch i. Rowan. 5. Conifer Wood 6. Apple.

GROUND FLORA TYPE
1. Species-rich a. dry b. wet 2. Species-poor 3. Grass dominated 4.Overgrown woods 5. Heath 6. Bare ground

SOILS
1. Waterlogged peat 2. Drained peat 3. Wet mineral 4. Drained mineral 5. Chalk/limestone

MANAGEMENT 1. Unmanaged 2. Managed

MANAGMENT TYPE
1. Thinning 2. Coppicing 3. Fenced 4. Felling 5. Planting 6. Amenity 7. Other 8. Burned 9. Weed Control

GRAZING: 1. Grazed 2. Ungrazed

ANIMALS
1. Store cattle   2. Dairy cattle   3. Suckler cattle 4. Sheep 5. Calves 6. Donkey 7. Pony 8. Goats
9. Birds 10. Rabbits 11. Hares 12. Badgers 13. Other 14. Sheep & Cattle 15. Pony & Donkey 16. Poultry 17.
Suckler cattle & Pony 18. Suckller cattle & sheep 19. Store cattle & sheep 20. Sheep, Pony & Donkey

		LANDSCAPE			VEGETATION			MANAGEMENT			
PAR.	TYP	1	2	STRUCT	Tree & Shrub	Ground flora	SOIL	Manage	Type	Grazing	Animals

BOUNDARIES

TYPE
1. Hedgebank 2. Hedgerow 3. Hedge on a wall 4. Earthbank 5. Dry stone wall (new)
6. Dry stone wall (old). 7. Ruined dry stone wall 8.. Mortar/brick/concrete wall 9.Fence 14. River Boundary
15. Stream 16. Ditch
FENCE TYPE:9 Sheep wire fence 10. Cattle wire fence (strands of wire) 11. Wooden fences 15. Chain link/ DoE
Road fence 16. Electric fence 17. Palettes 18. Corrugated Tin 19. Hen wire 20. Sheep & cattle **wire**
TRADITIONAL GATE/GATE POST 12. Traditional gateposts 13. Traditional gates 14. Gates & Posts 15.
Wooden Gates
SUBTYPE: 1. New boundary   2. Townland boundary
STRUCTURE 1: 1. Boundary with gaps 2. Boundary with filled gaps 3. Complete boundary
STRUCTURE 2

Hedge height	1. <1.0m	2. 1.1-2.0m	3. 2.1-3.0m.	4. 3.1-4.0m	5. >4.1m
Hedge width	1. <1.0m	2. 1.1-2.0m	3. 2.1-3.0m	4. >3.1m	
Ditch width	1. <0.5m	2. 0.6-1.0m	3. 1.1-2.0m	4.>2.0m	
Gaps in hedge	1. <10%	2. 11-30%	3. 31-50%	4. 51-70%	5. >71%

Hedge shape
1. Box shaped 2. 'A' shaped 3. Flat "A" shaped 4. Row of stumps 5. Overgrown row of tree or shrubs
6. Scattered trees or shrubs 7.Laid hedge 8. Box with trees 9. Flat A with trees 10. Sides only flailed

Ditch 1. River 2. Stream 3. Other permanently wet ditch 4. Seasonally wet ditch

MANAGEMENT: 1. Unmanaged 2. Managed (a). <2years (b). 2-5years (c). >5years

MECHANISM   1. Hand cut 2. Flail cutter 3. Circular saw 4. Burnt 5. Circular saw & flail cutter

				SUB TYPE	STR1	HEDGE STRUCTURE							
PAR	TYPE	FENCE TYPE	TRAD.			HGT	WDH	DT WDH	GAP	SHAPE	DITCH	MAN.	MECH.

BOUNDARIES
VEGETATION TYPE

TREE AND SHRUB TYPE

1. Gorse/ Bramble/Rowan   2. Willow/Alder/Hazel   3. Blackthorn/ Hazel/Hawthorn/Holly

4. Hawthorn/Ash hedge   5. Hawthorn/Rose hedges   6. Castlewellan Gold

7. Garden species Privet/Fuschia/Cotoneaster/Snowberry

8. Deciduous mature trees Elm/Oak/Beech   9. Conifer

GROUND FLORA TYPE

1. Species- poor hedges: a. Bramble/Nettle/grassy b. Daisy /sweet vernal grass

2. Species-rich hedges:a. Shady hedges ivy/primrose b. Upland species-rich hedges - foxglove/ bilberry/sweet vernal grass

PARCEL	TREE & SHRUB	GROUND FLORA	NOTES

BUILDINGS/AMENITIES

URBAN
1.Urban area 2. New urban area 3. Industrial area 4. New industrial area
BUILDINGS
5. New domestic building a. Bungalow b. House 6. New agricultural building 7. New industrial building 8. Sheep pen 9. Silo 10 Derelict traditional building 11 Derelict modern building 12 Derelict industrial building 13. Septic tank 14. Existing buildings (houses/sheds) 16. New school 17. Mobile home 18. Caravan 20. DOE water service 21. Lookout tower 23. Big bale silage 24. Peat bags 25. Foot bridge 26. Cattle grid
ROADS
1. A class 2. B class 3. Minor 4.Disused road 5. New road
LANES
1. New concrete lane 2. New unsurfaced lane 3. Surfaced lane 4. Unsurfaced lane 5. Disused lane 6. Track
AMENITIES
21 Recreation trails 22. Managed footpath 23. Amenity grassland 24. Caravan park/camping
25. Car park/layby 26. Roadside verge 27 Fishing 28 Hide 29. Horse jumps 30. Horse paddock 31. Garden 32. Horse cart 33 Shooting range 34 Animal farm pens 35. Golf course 36 Pylon/Transformer
MINERAL WORKING
29 Used hard rock quarry 30 Disused hard rock quarry 31. Used soft rock quarry 32. Disused soft rock quarry
GEOLOGY/LANDFORM
33. Sea clifF 34. Inland ClifF 35. Scree 36 Rock outcrops 37 Surface boulders 38 Canalised river bank
39 Moraine 40 Sink hole 41 Caves 42 Limestone pavement 43 Gorge
FAUNA 44 Rabbit warren 45 Fox hole 46 Badger set
WASTE DISPOSAL /DISTURBANCE
47 Domestic rubbish 48 Industrial rubbish 49 Farm rubbish 50 Other rubbish 51 Litter 52 Spoil
53 Land fill 54 Bare/disturbed ground 55 Land erosion 56 Abandoned vehicles 57 Pollution
58 Concrete standing 59. Hedge cuttings 60. Old farm machinery 61. Midden 62. Excavation 63. Dead animals 64. Silage bag covers 65. Skip 67 Sand 68. Blocks 69. Feeding trough
WATER 1. Pond 2. Lake

Parc	Urb	Build	Road	Lane	Amen	Min	Geol	Faun	Waste	Water

HISTORIC MONUMENTS

PERIOD
01 Neolithic 02 Bronze 03 Early Christian 04 Medieval 05 Pre-famine

SITE TYPE
01 Cairn
02 Cashel
03 Castle
04 Church
05 Crannog
06 Grave
07 Megalith
08 Midden Site
09 Motte
10 Ringbarrow
11 Sandhill
12 Souterrain
13 Standing stone
14. Rath
15. Kiln
16. Lazy beds

CONDITION
01 Well preserved 02 Substantial Remains 03 Some Remains 04 Slight Remains 05 No visible Remains
06 Destroyed 07 Excavated

FORM
1 Earthwork 2. Drystone structure 3. Orthostatic structure 4. Underground structure
5. Megalithic structure 6. Buried structure

PAST DAMAGE on site
1 No 2. Yes

RECENT DAMAGE
1. No 2. Yes

TYPES OF DAMAGE ON SITE
1. Cultivation 2. Livestock 3. Farm Improvement 4. Buildings 5. Vandalism 6. Dumping
7. Field Clearance 8. Tree planting 9. Tree removal 10. Rabbit burrowing 11. Reseeding
12. Badger Activity 13. Unsupervised Improvements - Landscaping, Tidying-up etc. 14. Cultivation 15. Overgrown

TYPE OF ENCLOSURE
1 Wooden Fence 2. Chain link fence 3. Barbed wire fence 4. Additional Ditch 5. Stone wall

PARC	PERIOD	TYPE	COND	FORM	PAST DAMAGE	PRES. DAMAGE	TYPE DAMAGE	ENCLOSURE

OTHER VEGETATION TYPES

COASTAL
1. Intertidal - saline muds and muddy sand with species such as glasswort.
2. Saltmarsh - common species include saltmarsh grass, scurvy grass and sea aster, plantain and sea rush
3. Shingle gravel /ridge - only record if vegetation present
4. Strandline - only record if vegetation present
5. Fore-dune - unstable new dunes probably dominated by marram grass
6. Dune grassland - stable dunes colonised by grasses and forbs. Bent/fescue common
7. Dune heath - stable dunes colonised by ericaceous shrubs
8. Dune scrub - stable dunes colonised by scrub woodland
9. Cliff vegetation - only if an abundance of vegetation
10 Dune slack vegetation - occurs in wet dune hollows
11.Reed beds - stands of common reed usually associated with lakeside water margin interface.
12. Freshwater vegetation - openwater veg. - yellow water lily , pondweed
13. Swamp - veg. of waterlogged mineral soils other than reedbeds - bulrush, marsh horsetail, common spikerush,lesser water plantain & sedges
14. Fen: Some inland parceks : sedges, yellow flag, forgetme not, creeping jenny, marsh horsetail, marsh penny wort, bogbean found on low lying peaty ground behind reedbeds and swamp zone at lake margins.

BRACKEN/ TALL HERB /FERN/ OTHER
1 Bracken continuous
2. Bracken scattered
3. Ruderal
4. Crevice/ledge vegetation

Parcel	Coastal	Bracken etc.	Other information		

Appendix 4.

Habitat vegetation and management definitions

VEGETATION AND MANAGEMENT TYPE DEFINITIONS

GRASSLAND

I. HABITAT DEFINITIONS

1. <u>Hay meadow</u>   any grassland which is cut for hay

2. <u>Wet grassland</u>   grassland in which soil is normally saturated with water and is liable to flooding.

3. <u>Unimproved grassland</u>   Land not reseeded within the last preceding 10 years

4. <u>Improved grassland</u>   Land reseeded within the last 10 years and with more t han 25% ryegrass species
5. <u>Limestone grassland</u>   grassland on chalk of limestone outcrops, rocks, very t hin soil and pH >7.0.

6. <u>Crops</u>   agricultural crops

II. VEGETATION TYPE DESCRIPTORS

1. SPECIES RICH   - grasslands with a high species diversity, characterised by presence of forbs, grasses such as red fescue, sedges and moss species.

2. SPECIES POOR   - grasslands with a low species diversity. Ryegrass constitutes at least 25% of the sward

III. VEGETATION SUB-TYPE DESCRIPTORS

HAY MEADOW - each described by characteristic and most frequent species (from previous TWINSPAN analysis of hay meadows, Botanical Monitoring programme 1993).

1. Species rich hay meadows - a high number of forbs species. Ryegrass species are usually absent.
a. Species-rich damp meadows - unimproved poorly drained grassland with a high number of forb species. Ryegrass species are usually absent. Common species are sedges, rush species, self heal, creeping buttercup, crested dogs-tail, meadow foxtail, meadow sweet, red clover and ladys' smock, meadow vetchling. These meadows have soils ranging from damp to water logged, which are highly susceptible to poaching from livestock.

b. Species -rich meadows - unimproved grasslands with drier soil conditions than (1), with a high number of forbs. Sweet vernal grass, is abundant, together with red fescue, rough meadow grass, yorkshire fog, sharp flowered rush, meadow buttercup, white clover.
2. Species-poor meadows - ryegrass species are common, few forb species
a. Species-poor meadows - Less forbs are present in these meadows. These meadows have been reseeded in the past, with ryegrass species and timothy grass common. Characteristic species of this type are ribwort plantain, knapweed, dandelion, sorrel and white clover. Grasses

such as crested dogstail, sweet vernal, meadow fescue, meadow foxtail and rough meadow grass are common.

b. Overgrazed species poor meadows - These meadows have been most recently reseeded, with ryegrass species frequent. They contain very few forb species. Species indicative of high grazing intensities are present such as daisy and sweet vernal grass. Other common grasses are meadow foxtail, yorkshire fog, cocksfoot, soft rush, rough meadow grass, meadow buttercup, sorrel and dandelion.

WET GRASSLAND

1. Species-poor wet grasslands - Wet grasslands which have been reseeded and probably drained in the last 5 years. Ryegrass species are frequent, with rough meadow grass and sorrel also very common. Few forbs are present. Other common species are creeping bent, yorkshire fog, soft rush and ladys smock.

2. Species-rich wet grasslands - These meadows are unimproved with no recent drainage and contain a wide variety of forbs adapted to grow in wet waterlogged soil conditions. Characteristic species are water mint, creeping jenny, marsh ragwort, lesser spearwort, lady's smock, meadow sweet and soft rush. Sedges such as *Carex flacca, Carex nigra, Carex panicea, Carex pallescens, Carex hirta, Carex lasiocarpa* are common. Grasses such as knead foxtail, creeping bent, rough meadow grass and fescues are frequent.

LIMESTONE GRASSLAND

1. Species-rich limestone grassland - grassland on very thin soil, pH >6.0, with a characteristic limestone flora. Typical species include yarrow, quaking grass, heath grass, crested dogstail, lady's bedstraw, thyme, bird's foot trefoil, tormentil and ribwort plantain.

2. Species-poor limestone grassland - limestone grassland which has been reseeded, improved and receives regular fertiliser additions. Characterised by ryegrass species and white clover. Other species such as creeping bent, crested dogstail. purple moor grass and daisy are often present in small frequencies.

3. *Nardus stricta* dominated limestone grassland - unimproved limestone grassland which shows signs of overgrazing. Mat grass is common, with grass species dominating the sward, bents, sheep's fescue and yorkshire fog and sorrel.

UNIMPROVED GRASSLAND

1. Species-rich unimproved grasslands - unimproved grasslands often with soils liable to poaching and waterlogging. The sward contains a high number of forbs. Common species are associated with wet conditions such as rush species, marsh ragwort, sedges (bottle sedge, carnation sedge, common sedge), meadow and creeping buttercup, lady's smock, bugle, devils bit. Bent grasses, crested dogstail, sweet vernal, and yorkshire fog are dominant.

2. Species-poor unimproved grasslands - these grasslands have been reseeded in the past as evident by the presence of ryegrass species and white clover. Less forb species present. Meadow foxtail, red fescue, yorkshire fog, soft rush and buttercups dominate the sward.

2a. Species-poor 'weed infested' unimproved grasslands - as above, with weed species such as dock, nettles, thistles dominating the sward.

IMPROVED GRASSLAND

1. Species-diverse improved grasslands - grasslands with some sedge species (*Carex hirta*) and grass species diversity, such as crested dogstail, red fescue, floating sweet-grass.

2. Species-poor improved grasslands - most recently reseeded grasslands, dominated by ryegrass species, timothy grass and white clover. Little species diversity. Common species are ragwort, sorrel, creeping bent, yorkshire fog, dandelion and buttercup.
2a. Species-poor 'weed infested' improved grasslands - as above, with weed species such as dock, nettles, thistles dominating the sward.

IV MANAGEMENT

1. Weed control -	Record if recent use of herbicide is evident or other method
2. Rush topping -	Record if recent signs of rushes being cut by mower
3. Reseed -	Note if field obviously resown
7. Silage	Field cut for silage
8. Hay	Field cut for hay
10. Ploughed	Field recently ploughed

GRAZING

6. Grazed trampling.	Obvious signs of recent grazing must be present, eg. animals, droppings,

DRAINAGE

3. Drainage - open new one drain	Only record if whole grassland is affected. Do not record if only
4. Drainage - open old	Drains which have now vegetation
5. Closed drainage	Only recorded if signs of new piped drainage is evident

HEATHER

Definition: more than 25% of area is dominated by ericaceous species.

I. GENERAL DESCRIPTION

1. **Blanket bog** - bog that covers large tracts of peatland. Occurs in lowlands and uplands
2. **Raised bog** - occurs primarily in river valleys and flat lowland areas. A pool and hummock complex is a notable feature
6. **Heath** - ericaceous species dominant

I. HEATHER TYPE

1. Wet heath - deep peaty soils with cross-leaved heath the characteristic species. Other common species are bog asphodel, bog cottons and sphagnum mosses.

2. Dry heath - thinner peat soils, much drier and characterised by the presence of bell heather.

II. HEATHER SUBTYPE

1a. **Typical wet heath** - this type contains the characteristic wet heath species such as cross-leaved heath, bog asphodel, deer grass, bog cottons, heath rush and sphagnum moss species. These soils are very acidic with high moisture and organic matter content.

1b. **Grassy wet heath** with bilberry - these sites contain wet heath species but contain more grass species such as sweet vernal grass, purple moor grass, wavy hair-grass and deer grass. Bilberry is very common and tormentil and moss species such as *Rhytidiadelphus triquetrus*, *Hylocomium splendens* are frequent. These soils have a high moisture content but are not as waterlogged as type 1a.

2a. **Typical dry heath** - Bell heather and gorse are the characteristic species of this type, with tormentil and purple moor grass also common.

2b**. Grassy dry heath with bilberry** - Grass species are much more prevalent in this type, for example sweet vernal grass, crested dogstail, fescues and wavy hair-grass. Bilberry is also a dominant species. Dry heath indicator species bell heather is also present.

III MANAGEMENT

BURNING - record only if visible signs present, charred stems, blackened ground
PEATCUTTING
3. Handcutting - present: Recently used hand-cut turf banks. Newly stacked turf, clean turf banks are common signs
4. Handcutting - past : Disused hand-cut turf banks. They may be shallow and confused with eroding peat.
5. Mechanised peat cutting - present: signs of turf logs, slits in peat, low plant species count. Deer-grass, heath rush and cotton grasses often only species present.
6. Mechanised peat cutting - past: No recent signs of peat cutting, no fresh disturbance.
.**DRAINAGE**

7. Drainage - open new one drain	Only record if whole grassland is affected. Do not record if only
8. Drainage - open old	Drains which have now vegetation
9. Closed drainage	Only recorded if signs of new piped drainage is evident

GRAZING

1. Grazed droppings, trampling	Obvious signs of recent grazing must be present, eg. animals,

WOODLAND

TYPE

1 Broadleaf woodland, **seminatural** - conifers less than 10% of trees.
2. Broadleaf woodland, plantation - broadleaf trees which have been planted, with regular spacing and uniform age structure.
3. Coniferous woodland, seminatural - conifers comprise more than 90% of trees
4. Coniferous woodland, plantation
5. Mixed woodland, seminatural - broadleaf trees with conifers more than 10%
6. Mixed woodland, plantation
7. Dense scrub - continuous cover of shrubs such as hawthorn, blackthorn or gorse. Excludes gorse scrub when it has no trees.
8. Scattered scrub - scrub forms mosaic with other vegetation types
9. Gorse scrub - where gorse is the dominant species
10. Parkland -scattered mature individual trees, mainly >10m apart.
11. Scattered/ isolated trees - occur singly or in small groups.
12. Line of trees - a distinct line one tree wide.
13. Fen carr - seminatural broadleaf woodland on fen peat with willow alder or birch as dominant tree species
14. Orchard - fruit trees
15. New wood - recently planted woodland

LANDSCAPE 1 - Location of woods

1. Riverside
2. Lakeside
3. Field parcel
4. Farm buildings
5. Road side
6. Coast
7. Field corner
8. Other

LANDSCAPE 2 - Topography - if woodland traverses different terrain assess the most prominent type.

1. Flat
2. Sloping
3. Steep
4. Hill top
5. Escarpment
6. Valley bottom

STRUCTURE

1. Woodland height 0-1m
2. 1-3m
3. 3-10m
4. >10m

TREE & SHRUB TYPE

1. Mature woods: uniform stands of deciduous trees, each type characterised by the dominance of species listed below
(a). mixed spp. (b) beech (c) oak (d) sycamore (e) elm
2. Alder/Willow woods: soils waterlogged, liable to poaching. Alder, willow species dominate the stand
3. Mixed species woods - deciduous and conifer trees constitute these woods often found on mineral soils, not waterlogged
4. Scrub - shrubs such as those listed below form the main constituent of the scrub (>50%)
(a) mixed species (b) blackthorn (c) hawthorn (d) hazel (e) Gorse (f) Willow (g) Holly (h) Birch (i) Rowan
5. Conifer wood : >90% conifers
6. Orchard

GROUND FLORA TYPE

1. Species-rich: high plant species diversity, particularly of forbs.
a. 'Ancient woodland': Species indicative of ancient woodland present - wood sorrel, bluebells, primrose, dog violet, wild strawberry
b. 'Damp woodland': species indicative of damp soil conditions are dominant, such as opposite leaved golden saxifrage, meadow sweet, lesser celandine, lesser spearwort and creeping buttercup
2. Species-poor: low plant species diversity
3. Grass dominated: predominantly species-poor grassland, with grasses such as ryegrass, creeping bent and cocksfoot common. Nettles may be common.
4. Overgrown woods: very dense shady conditions. Ground flora dominated by brambles, ivy, wood sorrel, bracken. Few forbs present.
5. Bare ground: No ground flora layer present, bare ground dominates.

SOILS -

1. Waterlogged peat
2. Drained peat
3. Wet mineral
4. Drained mineral
5. Chalk / limestone - only if rocks are protruding and visible

MANAGEMENT

1. Unmanaged
2. Managed

MANAGEMENT TYPE
1. Thinning - removal of odd trees from a wood
2. Coppicing - recent of past cutting leaving multiple stemmed trees
3. Fenced - fenced from grazing animals
4. Felling - recent clear felling
5. Planting - new planting
6. Amenity - woodland associated with parks or other recreation areas.
7. Other

GRAZING
1. Grazed - obvious signs of grazing
2. Not grazed - no recent signs of grazing

BOUNDARIES

TYPE

1. **Hedgebank**: a row of trees or shrubs on or alongside a bank. Note bank may have dry stone element.
2. **Hedgerow**: a row of trees or shrubs without a bank
3. **Hedge on a wall**: hedge planted on top of a dry stone wall
4. **Earth/wallbank**: earthbank with no planted shrubs. May have a dry stone component. Unplanted shrubs such as gorse or invasive scattered shrubs may be associated with these. Usually less than 40% shrub cover.
5. **Dry stone wall (old)**: traditional stone wall
6. **Dry stone wall (new)**: recently constructed or rebuilt old stone wall
7. **Ruined dry stone wall** : derelict old stone wall
8. **Mortar/brick/concrete wall**

TRADITIONAL GATE/GATEPOSTS
12. Traditional gateposts - stone mortared post generally >50cm in diameter with a stone cap.
13. Traditional gates - usually wrought iron.
.
STRUCTURE 1
1. Boundary with gaps - boundary not stockproof
2. Boundary with filled gaps - boundary made stockproof with the use of fence
3. Complete boundary - a hedge or wall with less than 2 gaps <15% of its length with gaps.

Hedge shape
1. Box shaped - hedge with squares edges
2. 'A' shaped - hedge managed to be wider at the base than at the top -
3. Flat "A' shaped - hedge with broad base, sloping sides and flat top
4. Row of stumps - usually trees cut back to within 1m of ground level.
5. Overgrown row of tree or shrubs - shrubs close together more than 2m in height
6. Scattered trees or shrubs, gaps in more than 10% of its length.
7. Laid hedge - a hedge with the shrubs positioned horizontally
8. Box with trees - box shaped with occasional unmanaged tree
9. Flat A with trees - occasional tree left unmanaged
10. Sides only flailed - overgrown row of tree/shrubs with only sides flailed

MANAGEMENT
1. Unmanaged - no evidence of hedge being managed
2. Managed
(a). <2years (b). 2-5years (c). >5years

MECHANISM
1. Hand cut
2. Flail cutter
3. Circular saw

BOUNDARY VEGETATION TYPE

TREE AND SHRUB TYPE

1. Gorse/ Rowan/ Bramble dominated hedges. Usually found in upland regions. Gorse and rowan are very common in these hedges. Common on earthbanks and gappy hedges.

2. Willow/Hazel hedges. These hedges contain a high species diversity and are dominated by willow, hazel and hawthorn. Many of these hedges are overgrown.

3. Blackthorn/ Hazel hedges. More scrub species in this type with blackthorn and hawthorn being the most dominant, with hazel and willow common. Very tall, wide overgrown hedges of Fermanagh are common in this group

4. Hawthorn/Ash hedges. Most common hedge type, dominated by hawthorn with ash. Many hedges managed. Little species diversity.

5. Hawthorn/Rose hedges. Hawthorn dominated hedge type with a small amount of species diversity such as rose species, blackthorn

GROUND FLORA TYPE

1. Species-rich poor hedges - these hedges have few forbs.

a. Bramble/Nettle hedges. Bramble, cleaver, cow parsley and nettles are common in this type. Species indicative of eutrophication are common here. Ryegrass, cocksfoot and timothy grass are frequent.

b. Sweet vernal /Daisy hedges: Grass species such as sweet vernal, yorkshire fog, ryegrass dominate this type, with daisy, docken and clover common.

2. Species-rich hedges: high species diversity, large number of forb species

a. Shady hedges ivy/primrose hedges: Species indicative of shady conditions are common in these edges such as ivy and ancient woodland indicator species such as primrose, stress tolerators such as wild strawberry, herb robert.

b. Upland species-rich hedges Sweet vernal grass/ *Polytrichum commune* hedges are usually found in upland areas where grass species dominate the sward and species such as foxglove, bilberry.