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Evaluation of Land Use Bias in Covered Versus Not Covered Breeding Bird Survey Squares

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CONTENTS

1. INTRODUCTION

The Breeding Bird Survey (BBS) began in 1994 with the aim of taking over the role of the Common Birds Census (CBC) as the main tool by which populations of our common birds are monitored. The BBS aims to increase regional and habitat coverage within the UK and as a consequence increase the number of species that we are able to monitor when compared with the CBC.

The BBS, which is supported by the BTO, the Joint Nature Conservation Committee and the Royal Society for the Protection of Birds, is based on surveys of randomly selected 1km squares on the national grid. Fieldwork, which is largely carried out by volunteer birdwatchers, requires two 1km transect counts through each 1km square during the main bird breeding season. A stratified random sampling strategy is used to select squares within each of 83 regions, the number of squares selected for each region being dependent upon the number of potential volunteer observers (as defined by the number of BTO members). In all, 1568 1km squares were surveyed in the United Kingdom in 1994 with 1748 in 1995 and 1900 in 1996.

A list of selected 1km squares is given to each of the Regional Organisers to allocate to the observers that volunteer in their region. While it is endeavoured that observer choice does not influence the squares that are surveyed, it is inevitable that accessibility factors such as difficult terrain, distance of square from observers and refusal of access by landowners will influence which squares are covered.

As it is essential to maintain the random nature of squares surveyed, it is important that reasons for squares not being covered are well documented so that we can investigate for potential bias. This report examines the squares covered and not covered during the years 1994 to 1996 with respect to their landscape and land use and reports on the reasons stated for squares not being covered.

2. METHODS

Comparisons of the proportions of the Institute for Terrestrial Ecology (ITE) "Landclass" (Bunce *et al.*, 1996) and "Land cover" (Fuller & Parsell, 1990) types between those BBS squares that were covered and those that were not covered are made for the years 1994 to 1996. Not covered squares include those that are uncoverable due to access or terrain difficulties, and those for which nominated observers failed to complete the fieldwork. Each of the 10 NUTS (Nomenclature of Territorial Units for Statistics) regions of Great Britain are examined separately (see Figure 2.1). ITE Landclass and Land cover are not available for Northern Ireland which is therefore excluded from the analysis.

The BBS Regional Organisers are asked to complete a form annually, describing habitat type and stating reasons for certain squares in their region not being covered. These squares are classified as "uncoverable" or "not covered". Table 3.1.1 shows the reasons given for squares not being covered and Table 3.1.2 shows the reasons for squares being classified as uncoverable. These figures are for all not covered squares, including those in Northern Ireland.

Each 1km square of the national grid is categorised as one of 32 Landclasses based on its geography, topography, landscape, land use, soil and vegetation. Broad descriptions of these Landclasses are listed in Table 2.4. To test whether there was a significant bias overall in the landclass of squares covered against those that were not covered, a Generalised Linear Model approach was used. To investigate the sources of bias further, Chi-square tests on the Landclass of covered and not covered squares are carried out for each of the 10 NUTS regions and each of the three years. Appendix 1 shows the number of covered and not covered squares in each of the Landclasses and the percentage of all selected squares in each Landclass falling into these two categories. To identify which of the individual Landclasses had the most bias in coverage, cells where the cell chi-square values are greater than 1.5 are identified in bold. These are only identified for Landclasses where the sample combined for both covered and not covered is greater than 10.

Land cover values indicate what percentage of each square is in each of 25 categories. ITE Land cover types are listed in Table 2.5. T-tests are carried out to test whether there is any bias in land cover types between covered and not covered squares. Appendix 2 presents the mean percentage of each land cover type across the covered and not covered samples and indicates the Land cover types for which there is a statistically significant bias.

The results of the chi-square tests for differences between Landclasses and T-tests for differences between Land cover types should be treated with some caution due to the problem of multiple testing. With tests for 10 Nuts regions and three years, we carried out a total of 30 chi-square tests on the differences between Landclasses. This results in a possibility that we will draw an incorrect conclusion from at least one of the 30 tests. The problem of multiple testing is even greater for the T-tests for differences between Land cover types as there are in effect 750 T-tests (25 landclass, 10 Nuts regions and 3 years). There is the potential for several cases of incorrect conclusions being reached for such a large number of tests.

The specific differences between covered and not covered squares for both Landclass and Land cover are presented in Appendix 3. Statistically significant biases are shown in bold.

Figure 2.1: **United Kingdom showing level 1 NUTS regions of the European Community. Key: 71 North England; 72 Yorkshire/Humberside; 73 East Midlands; 74 East Anglia; 75 Southeast England; 76 Southwest England; 77 West Midlands; 78 Northwest England; 79 Wales; 7A Scotland; and 7B Northern Ireland.**

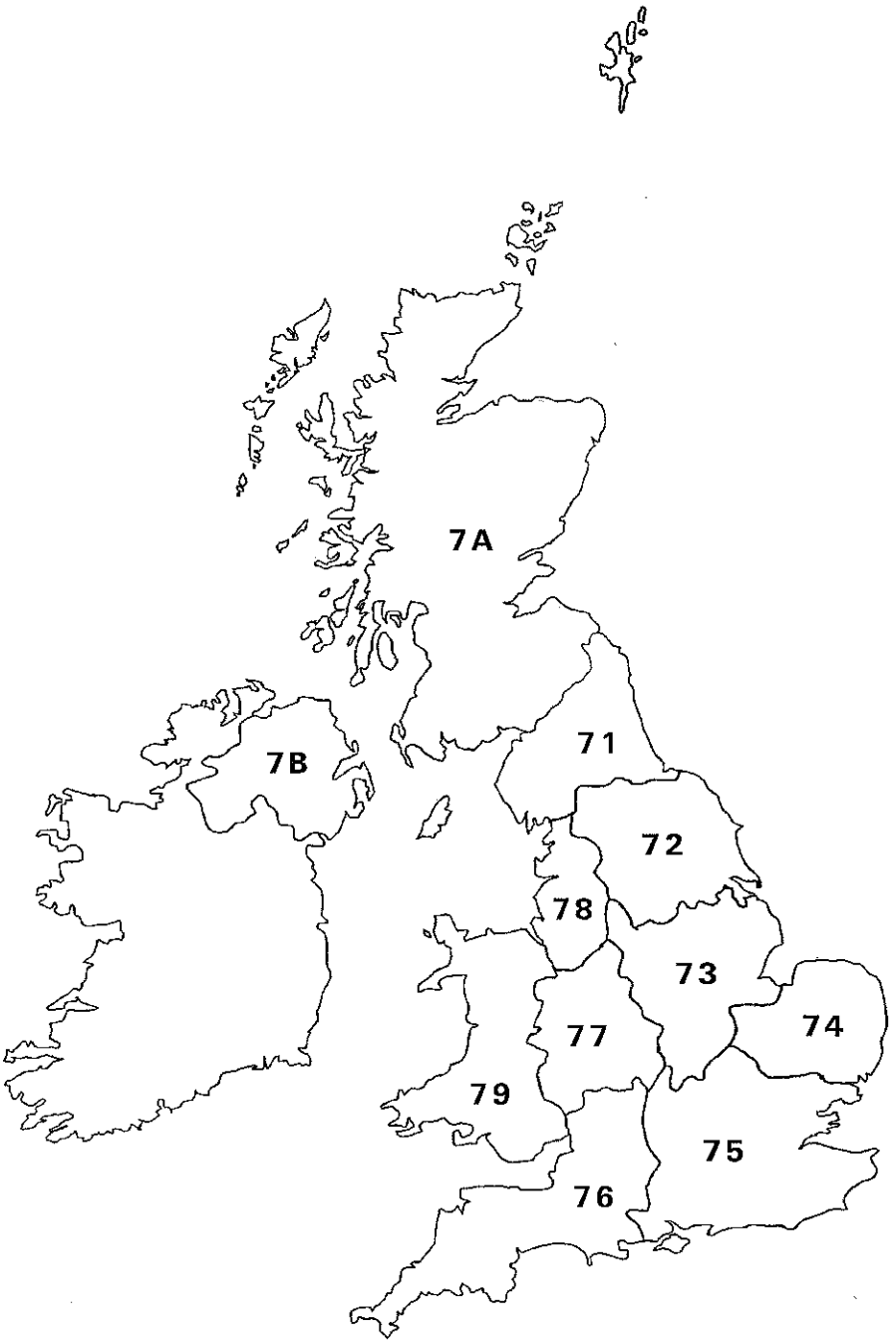

Table 2.1 Breeding Bird Survey Coverage by NUTS Region for 1994

	NUTS Region											
	71	72	73	74	75	76	77	78	79	7A	7B	Total
1 km squares issued	107	141	170	134	518	291	143	152	191	505	75	2,427
1 km squares covered	79	86	122	91	396	204	99	96	123	246	26	1,568
1 km squares not covered	19	45	42	38	102	69	33	51	54	206	49	708
Uncoverable 1 km squares	9	10	6	5	20	18	11	5	14	53	0	151

Table 2.2 Breeding Bird Survey Coverage by NUTS Region for 1995

	NUTS Region											
	71	72	73	74	75	76	77	78	79	7A	7B	Total
1 km squares issued	128	152	184	157	593	326	150	162	210	538	77	2,677
1 km squares covered	83	91	134	116	442	236	117	108	123	281	17	1,748
1 km squares not covered	34	50	44	35	128	73	22	47	73	193	58	757
Uncoverable 1 km squares	11	11	6	6	23	17	11	7	14	64	2	172

Table 2.3 Breeding Bird Survey Coverage by NUTS Region for 1996

	NUTS Region											
	71	72	73	74	75	76	77	78	79	7A	7B	Total
1 km squares issued	137	170	212	181	648	358	173	182	219	568	79	2,927
1 km squares covered	87	106	146	116	460	248	114	135	117	305	66	1,900
1 km squares not covered	41	54	63	60	169	93	51	39	93	221	12	896
Uncoverable 1 km squares	9	10	3	5	19	17	8	8	9	42	1	131

Table 2.4: ITE Landclasses

1	Undulating country; varied agriculture; mainly grassland. S Wales, SW England, S England.
2	Open gentle slopes; varied agriculture; often wooded or built-up. S England, SW Midlands.
3	Flat arable land; mainly cereals; little native vegetation. E Anglia, SE England.
4	Flat; intensive agriculture; otherwise mainly built up. E Anglia (margins), S England, S Midlands.
5	Lowland somewhat enclosed land; varied agriculture and vegetation. S England, SW England, SW Midlands, S Wales.
6	Gently rolling enclosed country; mainly fertile pastures. SW England, S Wales, SW Midlands.
7	Coastal, with varied morphology and vegetation. S England, SW England, Wales coasts.
8	Coastal, open estuarine; mainly pasture, otherwise built-up. E Anglia, S England, Wales, NW England coasts.
9	Fairly flat; open intensive agriculture, often built-up. N Midlands, NE England, SE Scotland.
10	Flat plains with intensive farming, often arable/grass mixtures. N Midlands, NE England, SE Scotland.
11	Rich alluvial plains, mainly open with arable, leys or built-up. E Midlands, Central Midlands.
12	Very fertile coastal plains with productive crops. E Midlands and Fens.
13	Somewhat variable land forms, heterogeneous land use including urban. N Wales, NW England, SW Scotland.
14	Level coastal plains with arable, otherwise often urbanized. NW England, NE England, SW Scotland.
15	Valley bottoms with mixed agriculture, predominantly pastoral. Wales, N England.
16	Undulating lowlands, variable agriculture and native vegetation. N England, SW Scotland.
17	Rounded intermediate slopes, mainly improved permanent pasture. SW England, Wales, N England.
18	Rounded hills, some steeper slopes; varied moorlands. Wales, N England, W Scotland.
19	Smooth hills, mainly heather moors; often afforested. N England, S Scotland.
20	Midvalley slopes, wide range of vegetation types. N England, S Scotland.
21	Upper Valley, rocky outcrops and bogs. Central Scotland, N Scotland.
22	Margins of high mountains, moorlands; often afforested. N England, S Scotland, Central Scotland, N Scotland.
23	High mountain summits, with well drained moorlands. N England, Central Scotland, N Scotland.

24 Upper steep mountain slopes, usually bog covered.
Central Scotland, W Scotland.

25 Lowlands with variable land use, mainly arable.
NE England, SE Scotland, Central Scotland, NE Scotland.

26 Fertile lowlands with intensive agriculture.
NE England, Central Scotland, E Scotland.

27 Fertile lowland margins with mixed agriculture.
N England, Central Scotland, E Scotland, NE Scotland.

28 Varied lowland margins with heterogeneous use.
N England, S Scotland, SE Scotland.

29 Sheltered coasts with varied land use, often crofting.
W Scotland.

30 Exposed coasts dominated by bogs.
Extreme W Scotland.

31 Cold exposed coasts with variable land use and crofting.
N Scotland and Isles.

32 Windswept low hills covered with bogs.
NW Scotland and Isles.

Table 2.5: ITE Land cover types

1	Sea/estuary
2	Inland waters
3	Beach/flats
4	Saltmarsh/seaweed
5	Lowland grass heaths
6	Pasture/amenity turf
7	Meadows, verges and seminatural cropped swards
8	Marsh/rough grassland
9	Montane/hill grass
10	Dwarf shrub/grass moorland
11	Upland dwarf shrub moorland
12	Bracken
13	Lowland heath
14	Scrub/orchard
15	Deciduous wood
16	Evergreen wood
17	Upland bog
18	Arable land
19	Ruderal weeds
20	Suburban farms
21	Urban/industrial
22	Bare ground
23	Felled forest
24	Lowland bog
25	Dwarf shrub/grass heaths

3. RESULTS

3.1 Reasons for non-coverage of squares

A break-down of the reasons given for squares being classified as uncoverable is given in table 3.1.1 while reasons for squares not being covered are given in table 3.1.2.

The most common reason for squares being classified as uncoverable was that the landowner would not give necessary permission for the volunteer to carry-out the survey. The proportion of uncoverable squares falling into this category was stable between 1994 and 1996 at around or just under 40%. The second most common reason was that the square was largely in the sea, freshwater or intertidal, between one-quarter and one-fifth of uncoverable squares falling into this category. Difficult terrain was also a commonly cited problem, the percentage of uncoverable squares falling into this category increasing from 11.9% in 1994 to 16.1% in 1996.

The most common reasons for coverable squares not being covered were that no observer could be found or that a designated observer failed to carry out the fieldwork. The percentage of squares for which observers could not be found went up from around 35% in 1994 and 1995 to 55% of none covered squares in 1996. Conversely, the number of squares for which observers failed to complete fieldwork fell from 175 in 1994 to 83 in 1995 and 98 in 1996, an encouraging drop.

Table 3.1.1: Reasons for squares being classified as uncoverable

	No reason given		Square is largely sea, freshwater or intertidal		Landowner's permission for access to land refused		Terrain not suitable for walking		Landowner's permission refused and terrain not suitable for walking		Terrain not suitable for walking and other reasons		Landowner's permission refused plus other reasons		Other	
1994	3	2.1%	36	25.2%	54	37.8%	17	11.9%	3	2.1%	1	0.7%	3	2.1%	26	18.2%
1995	8	6.3%	27	21.3%	51	40.2%	19	15.0%	1	0.8%	1	0.8%			20	15.8%
1996	11	11.8%	23	24.7%	36	38.7%	15	16.1%	1	1.1%	1	1.1%	2	2.2%	4	4.3%
mean		6.7%		23.7%		38.9%		14.3%		1.3%		0.9%		1.4%		12.8%

Table 3.1.2: Reasons for coverable squares not being covered

	No reason given		No observer could be found		Observer failed to carry out fieldwork		Landowner could not be traced		Observer failed to carry out fieldwork and landowner not traced		Landowner not traced plus other reasons		Other	
1994	10	2.8%	123	34.6%	175	49.2%	5	1.4%	2	0.6%	3	0.8%	38	10.7%
1995	31	13.5%	81	35.4%	83	36.2%	4	1.8%	1	0.4%			29	12.7%
1996	14	5.2%	148	55.0%	98	36.4%	1	0.4%					8	3.0%
mean		7.2%		41.7%		40.6%		1.2%		0.3%		0.3%		8.8%

3.2 Differences in Landclass types of covered and not covered squares

The generalised linear model showed a significant effect of NUTS Region, Landclass and the NUTS Region * Landclass interaction on the proportion of squares covered or not covered in all three years. The results are shown in table 3.2.1.

Table 3.2.1: Type 1 Analysis results of Generalised Linear Model by NUTS Region and Landclass

1994

Source	Deviance	Degrees of Freedom	χ^2	Prob>χ^2
Intercept	3027.2	0	.	.
NUTS Region	2926.3	9	100.9	0.0001
Landclass	2844.9	31	81.4	0.0001
NUTS * Landclass	2692.9	98	151.9	0.0004

1995

Source	Deviance	Degrees of Freedom	χ^2	Prob>χ^2
Intercept	3311.5	0	.	.
NUTS Region	3216.1	9	95.4	0.0001
Landclass	3110.4	31	105.7	0.0001
NUTS * Landclass	2969.4	100	141.0	0.0044

1996

Source	Deviance	Degrees of Freedom	χ^2	
Intercept	3706.9	0	.	.
NUTS Region	3641.9	9	65.1	0.0001
Landclass	3524.7	31	117.2	0.0001
NUTS * Landclass	3398.2	102	126.4	0.0508

As was expected, there was a significant difference between the proportion of covered and not covered squares between NUTS regions. Regions in less populated areas tend to have a lower proportion of selected squares covered in any one year than those in the more densely populated regions such as Southeast England.

There was also a significant effect for Landclass in all three years. This suggests that overall, there is a difference in Landclasses between covered and not covered squares. To identify the NUTS Regions for which there is the greatest bias, the Generalised Linear Models were applied to the data omitting one region at a time. The Landclass variable was still a significant effect when nine of the ten regions were dropped (in all three years) but when Scotland was dropped, Landclass was not a significant effect in 1994, although remained significant in both subsequent years (Prob>χ^2=0.26 in 1994, 0.0038 in 1995 and 0.0035 in 1996).

To investigate the source of bias in Landclass types between covered and not covered squares χ^2 tests were carried out for each NUTS region and each year. Out of the 30 tests, eight showed significant deviation in Landclass type between covered and not covered squares (Appendix 1). For five of the 10 regions there was no significant difference between Landclass of the covered and not covered squares (in any of the three years but for East Anglia and Wales there was a significant difference in 1994, for North-west England there was a significant difference in 1995, for South-west England there was a significant difference in 1995 and 1996 and for Scotland there was a significant difference in all three years. Scotland was the only region for which there was significant bias for several Landclasses in each year.

3.3 Differences in Land cover types of covered and not covered squares

Some bias was found in individual Land cover types in all but one of the ten regions, but only in Scotland was there considerable bias in all three years (Appendix 2). Bias was found in 9 regions in 1994, 5 in 1995 and 4 in 1996, suggesting that initially, the more appealing squares were allocated but as coverage increased, the overall bias was reduced. Overall, levels of bias in covered and not covered squares were small, that is, the percentage of Land cover types rarely differ by more than 10%. The only exception is Scotland where although the percentages of Land cover types were quite similar a large number of categories (8 in 1994 and 7 in 1995 and 1996) were significantly different (Appendix 2j).

4. DISCUSSION

These results suggest that there is little overall bias in the sample of covered Breeding Bird Survey squares when compared with those that are not covered. Generally, statistically significant biases seem to be random in nature, both between regions and between years with no discernible pattern. However, there is consistently more bias evident in the sample of squares in Scotland. Squares in Landclasses of remote areas such as high mountain summits and exposed coasts are less well covered than squares in more accessible areas. A degree of observer choice may be introduced into the BBS sample as in some cases observers will shy away from visiting remote sites that may be difficult to reach, especially if they will encounter few birds when they get there.

Analysis of reasons for squares being classified as uncoverable indicates that refusal by landowner's to grant access their land is the commonest problem. Reasons for coverable squares not being covered are mainly that no observer could be found or that the observer failed to cover their allocated square.

Further evaluation of the Land cover data would be useful to identify whether there was an overall bias in Land cover types for each region and year. Compositional analysis could be used to test for significant differences overall but there is insufficient staff time at present to devote to this as it would be computationally labour intensive.

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APPENDIX 1

ITE Landclass of covered and not covered BBS squares

Appendix 1a NUTS Region 71: Northern England and Isle of Man

Appendix 1b NUTS Region 72: Yorkshire/Humberside

Appendix 1c NUTS Region 73: East Midlands

Appendix 1d NUTS Region 74: East Anglia

Appendix 1e NUTS Region 75: South-east England

Appendix 1f NUTS Region 76: South-west England

Appendix 1g NUTS Region 77: West Midlands

Appendix 1h NUTS Region 78: North-west England

Appendix 1i NUTS Region 79: Wales

Appendix 1j NUTS Region 7A: Scotland

APPENDIX 1a ITE Landclass of covered and not covered BBS squares

NUTS Region 71: Northern England and Isle of Man

			ITE Landclass																					
			5	6	7	8	9	10	13	14	15	16	17	18	19	20	22	23	24	25	26	27	28	Total
1994	Covered	n	0	5	2	0	3	7	4	1	4	3	2	2	9	0	11	1	0	11	4	8	5	79
		%	0	67	100	0	75	58	80	100	80	100	100	67	90	0	73	25	0	73	80	80	100	74
χ^2=21.5 - n.s.	Not covered	n	0	1	0	1	1	5	1	0	1	0	0	1	1	1	4	3	1	4	1	2	0	28
		%	0	33	0	100	25	42	20	0	20	0	0	33	10	100	27	75	100	27	20	20	0	26
	Covered	n	1	2	2	0	3	8	4	0	4	3	2	3	10	0	10	2	0	11	5	8	5	83
1995		%	100	67	67	0	75	62	67	0	80	100	100	75	83	0	50	50	0	58	63	80	83	65
χ^2=19.9 - n.s.	Not covered	n	0	1	1	1	1	5	2	1	1	0	0	1	2	1	10	2	2	8	3	2	1	45
		%	0	33	33	100	25	38	33	100	20	0	0	25	17	100	50	50	100	42	38	20	17	35
	Covered	n	1	2	2	0	3	9	4	0	5	3	1	3	10	0	12	1	0	13	5	8	5	87
1996		%	100	67	50	0	75	69	57	0	83	100	50	60	71	0	60	25	0	65	63	80	71	64
χ^2=19.2 - n.s.	Not covered	n	0	1	2	2	1	3	3	1	1	0	1	2	4	1	8	3	2	7	3	2	2	50
		%	0	33	50	100	25	31	43	100	17	0	50	40	29	100	40	75	100	35	37	20	79	36

Significant contributions to overall χ^2 value indicated in bold. These indicate cell χ^2 values of more than 1.5 for Landclasses with more than 10 squares in the sample of covered and Not covered squares.

APPENDIX 1b ITE Landclass of covered and not covered BBS squares

NUTS Region 72: Yorkshire/Humberside

			ITE Landclass																
			7	8	9	10	13	14	15	16	17	18	19	20	22	23	26	28	Total
1994	Covered	n	1	0	12	29	1	1	1	4	**10**	5	8	2	9	2	1	2	86
		%	100	0	55	62	100	50	100	57	**91**	83	42	100	60	67	100	2	61
χ^2=17.3 - n.s.	Not covered	n	0	2	10	18	0	1	0	3	1	1	**11**	0	6	1	0	1	55
		%	0	100	45	38	0	50	0	43	**9**	17	**58**	0	40	33	0	100	39
	Covered	n	1	0	11	30	2	1	1	4	9	5	12	2	10	2	1	0	91
1995		%	100	0	48	57	100	50	100	57	82	83	57	67	67	67	100	1	60
χ^2=13.6 - n.s.	Not covered	n	0	2	12	23	0	1	0	3	2	1	9	1	5	1	0	1	61
		%	0	100	52	43	0	50	0	43	18	17	43	33	33	33	0	100	40
	Covered	n	1	0	13	41	2	1	1	3	**11**	5	14	2	9	1	1	1	106
1996		%	100	0	50	63	100	50	100	43	**100**	63	67	67	56	33	100	100	62
χ^2=18.1 - n.s.	Not covered	n	0	2	13	24	0	1	0	4	0	3	7	1	7	2	0	0	64
		%	0	100	50	37	0	50	0	57	0	37	33	33	44	67	0	0	38

Significant contributions to overall χ^2 value indicated in bold. These indicate cell χ^2 values of more than 1.5 for Landclasses with more than 10 squares in the sample of covered and Not covered squares.

APPENDIX 1c ITE Landclass of covered and not covered BBS squares

NUTS Region 73: East Midlands

			ITE Landclass													
			1	4	8	9	10	11	12	14	15	16	17	18	19	20	Total
1994	Covered	n	2	6	0	19	20	44	20	1	0	1	6	0	2	1	122
		%	100	75	0	61	74	71	83	50	0	50	86	0	100	100	72
χ^2=12.1 - n.s.	Not covered	n	0	2	0	12	7	18	4	1	1	1	1	1	0	0	48
		%	0	25	0	39	26	29	17	50	100	50	14	100	0	0	28
1995	Covered	n	2	7	0	24	23	47	21	1	1	1	5	0	1	1	134
		%	100	87	0	69	79	70	78	50	100	50	71	0	50	100	73
χ^2=8.1 - n.s.	Not covered	n	0	1	0	11	6	20	6	1	0	1	2	1	1	0	50
		%	0	13	0	31	21	30	22	50	0	50	29	100	50	0	27
1996	Covered	n	2	7	0	25	23	50	24	1	1	1	8	1	1	2	146
		%	100	78	0	64	70	65	77	50	100	50	89	100	50	67	69
χ^2=7.7 - n.s.	Not covered	n	0	2	1	14	10	27	7	1	0	1	1	0	1	1	66
		%	0	22	100	36	30	35	23	50	0	50	11	0	50	33	11

Significant contributions to overall χ^2 value indicated in bold. These indicate cell χ^2 values of more than 1.5 for Landclasses with more than 10 squares in the sample of covered and Not covered squares.

APPENDIX 1d ITE Landclass of covered and Not covered BBS squares

NUTS Region 74: East Anglia

			ITE Landclass					
			3	4	8	11	12	Total
1994	Covered	n	59	24	4	0	4	91
		%	72	65	100	0	57	68
χ^2=11.5 - SIGNIFICANT DIFFERENCE	Not covered	n	23	13	0	4	3	43
		%	28	35	0	100	43	32
1995	Covered	n	74	33	3	2	4	116
		%	75	79	75	40	57	74
χ^2=4.5 - n.s.	Not covered	n	25	9	1	3	3	41
		%	25	21	25	60	43	26
1996	Covered	n	73	34	3	3	3	116
		%	62	74	60	60	43	64
χ^2=3.6 - n.s.	Not covered	n	45	12	2	2	4	65
		%	38	26	40	40	57	36

Significant contributions to overall χ^2 value indicated in bold. These indicate cell χ^2 values of more than 1.5 for Landclasses with more than 10 squares in the sample of covered and Not covered squares.

APPENDIX 1e ITE Landclass of covered and Not covered BBS squares

NUTS Region 75: South-east England

			ITE Landclass										
			1	2	3	4	7	8	9	10	11	12	Total
1994	Covered	n	70	134	101	36	3	7	0	2	35	8	396
		%	83	80	75	69	100	78	0	100	69	62	76
χ^2=16.2 - n.s.	Not covered	n	**14**	34	33	16	0	2	2	0	16	5	122
		%	**17**	20	25	31	0	22	100	0	31	38	24
1995	Covered	n	77	149	118	41	4	9	0	2	**33**	9	442
		%	82	79	75	72	80	69	0	100	**56**	64	75
χ^2=23.1 - n.s.	Not covered	n	**17**	40	40	16	1	4	2	0	**26**	5	151
		%	**18**	21	25	28	20	31	100	0	**44**	36	25
1996	Covered	n	76	155	125	48	4	11	0	1	**31**	9	460
		%	73	74	74	73	67	65	0	50	**53**	64	71
χ^2=17.8 - n.s.	Not covered	n	28	54	44	18	2	6	2	1	**28**	5	188
		%	27	26	26	27	33	35	100	50	**47**	36	29

Significant contributions to overall χ^2 value indicated in bold. These indicate cell χ^2 values of more than 1.5 for Landclasses with more than 10 squares in the sample of covered and Not covered squares.

APPENDIX 1f ITE Landclass of covered and Not covered BBS squares

NUTS Region 76: South-west England

			ITE Landclass													
			1	2	3	4	5	6	7	8	10	11	12	17	18	Total
1994	Covered	n	48	54	1	5	37	40	3	6	0	5	1	2	0	202
		%	70	68	100	71	77	77	43	67	0	71	100	25	0	70
χ^2=15.8 - n.s.	Not covered	n	21	25	0	2	11	12	4	3	1	2	0	6	0	87
		%	30	32	0	29	23	23	57	33	100	29	0	75	0	30
1995	Covered	n	56	60	0	5	50	41	3	10	0	4	0	4	1	234
		%	75	68	0	63	85	76	38	91	0	57	0	40	100	72
χ^2=27.2 - SIGNIFICANT DIFFERENCE (1% l.o.s.)	Not covered	n	19	28	1	3	**9**	13	5	1	1	3	1	**6**	0	90
		%	25	32	100	37	**15**	24	62	9	100	43	100	**60**	0	28
1996	Covered	n	58	61	1	4	**57**	41	4	**10**	0	4	0	**5**	1	246
		%	71	64	100	50	**86**	66	44	**91**	0	57	0	**45**	100	69
χ^2=26.1 - SIGNIFICANT DIFFERENCE (5% l.o.s.)	Not covered	n	24	35	0	4	**9**	21	5	**1**	1	3	1	**6**	0	110
		%	29	36	0	50	**14**	34	56	**11**	100	43	100	**55**	0	31

Significant contributions to overall χ^2 value indicated in bold. These indicate cell χ^2 values of more than 1.5 for Landclasses with more than 10 squares in the sample of covered and Not covered squares.

APPENDIX 1g ITE Landclass of covered and Not covered BBS squares

NUTS Region 77: West Midlands

			ITE Landclass														
			1	3	4	9	10	11	12	13	15	16	17	18	19	20	Total
1994	Covered	n	33	1	0	16	34	2	0	2	3	1	6	1	0	0	99
		%	73	100	0	64	67	100	0	100	75	50	86	100	0	0	69
χ^2=11.5 - n.s.	Not covered	n	12	0	1	9	17	0	0	0	1	1	1	0	1	1	44
		%	27	0	100	36	33	0	0	0	25	50	14	0	100	100	31
1995	Covered	n	41	1	0	17	38	2	2	2	4	2	8	1	0	1	117
		%	82	100	0	65	75	100	100	100	100	100	100	100	0	100	78
χ^2=16.3 - n.s.	Not covered	n	9	0	1	**9**	13	0	0	0	0	0	0	0	1	0	33
		%	18	0	100	**35**	25	0	0	0	0	0	0	0	100	0	22
1996	Covered	n	43	0	0	16	40	1	0	2	4	1	6	0	0	1	114
		%	75	0	0	53	65	50	0	100	80	50	75	0	0	100	66
χ^2=14.9 - n.s.	Not covered	n	**14**	1	1	14	22	1	0	0	1	1	2	1	1	0	59
		%	**25**	100	100	47	35	50	0	0	20	50	25	100	100	0	34

Significant contributions to overall χ^2 value indicated in bold. These indicate cell χ^2 values of more than 1.5 for Landclasses with more than 10 squares in the sample of covered and Not covered squares.

APPENDIX 1h ITE Landclass of covered and Not covered BBS squares

NUTS Region 78: North-west England

			ITE Landclass													
			8	9	10	13	14	15	16	17	18	19	20	22	26	Total
1994	Covered	n	0	6	4	41	1	9	13	2	12	4	0	1	3	96
		%	0	100	67	56	100	64	76	100	67	57	0	100	75	63
χ^2=14.3 - n.s.	Not covered	n	2	0	2	32	0	5	4	0	6	3	1	0	1	56
		%	100	0	33	44	0	36	24	0	33	43	100	0	25	37
1995	Covered	n	0	4	4	**45**	1	12	15	2	15	7	0	1	2	108
		%	0	67	67	**56**	100	75	88	100	83	100	0	100	50	67
χ^2=22.8 - SIGNIFICANT DIFFERENCE (5% l.o.s.)	Not covered	n	2	2	2	**36**	0	4	**2**	0	**3**	0	1	0	2	54
		%	100	33	33	**44**	0	25	**12**	0	**17**	0	100	0	50	33
1996	Covered	n	1	3	4	60	1	18	17	2	16	7	1	1	4	135
		%	20	50	67	71	50	90	81	100	76	88	100	100	100	74
χ^2=17.5 - n.s.	Not covered	n	4	3	2	25	1	**2**	4	0	5	1	0	0	0	47
		%	80	50	33	29	50	**10**	19	0	24	12	0	0	0	26

Significant contributions to overall χ^2 value indicated in bold. These indicate cell χ^2 values of more than 1.5 for Landclasses with more than 10 squares in the sample of covered and Not covered squares.

APPENDIX 1i ITE Landclass of covered and Not covered BBS squares

NUTS Region 79: Wales

			ITE Landclass															
			1	3	5	6	7	8	9	10	13	14	15	16	17	18	20	Total
1994	Covered	n	**16**	1	5	**12**	6	2	2	0	3	0	8	3	55	6	4	123
		%	**89**	100	38	**43**	75	33	67	0	43	0	62	100	73	67	67	64
χ^2=25.2 - SIGNIFICANT DIFFERENCE	Not covered	n	**2**	0	**8**	**16**	2	4	1	1	4	0	5	0	**20**	3	2	68
		%	**11**	0	**62**	**57**	25	66	33	100	57	0	38	0	**27**	33	33	36
1995	Covered	n	**17**	1	5	16	5	3	5	0	2	0	9	2	50	4	4	123
		%	**85**	100	36	53	63	50	100	0	29	0	69	67	57	44	67	59
χ^2=19.2 - n.s.	Not covered	n	**3**	0	**9**	14	3	3	0	1	5	0	4	1	37	5	2	87
		%	**15**	0	**64**	47	37	50	0	100	71	0	31	33	43	56	33	41
1996	Covered	n	16	1	5	18	5	3	5	0	2	0	6	1	47	3	4	117
		%	67	50	36	60	63	50	100	0	29	0	46	33	53	33	67	53
χ^2=15.3 - n.s.	Not covered	n	8	1	9	12	3	3	0	1	5	1	7	2	42	6	2	102
		%	33	50	64	40	37	50	0	100	71	100	54	67	47	67	33	47

Significant contributions to overall χ^2 value indicated in bold. These indicate cell χ^2 values of more than 1.5 for Landclasses with more than 10 squares in the sample of covered and Not covered squares.

APPENDIX 1j ITE Landclass of covered and Not covered BBS squares

NUTS Region 7A: Scotland

			ITE Landclass																								Total
			7	8	10	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
1994	Covered	n	0	0	2	3	2	1	0	1	12	**8**	7	**25**	25	**12**	15	**32**	20	19	**30**	**3**	8	**9**	12	246
		%	0	0	50	37	40	50	0	50	63	**80**	64	**63**	49	**30**	42	**63**	54	58	**81**	**17**	32	**25**	36	49
χ^2=64.4 - SIGNIFICANT DIFFERENCE (1% l.o.s.)	Not covered	n	2	4	2	5	3	1	1	1	7	**2**	4	15	26	**28**	21	**19**	17	14	**7**	**15**	17	**27**	21	259
		%	10	10	50	63	60	50	10	50	37	**20**	36	37	52	**70**	58	**37**	46	42	**19**	**83**	68	**75**	64	51
1995	Covered	n	0	1	2	5	2	1	1	2	10	**10**	7	25	29	21	**13**	33	25	**25**	**32**	**6**	**8**	**8**	15	281
		%	0	25	50	63	40	50	50	10	48	**91**	58	63	55	46	**34**	59	64	**69**	**84**	**30**	**27**	**22**	45	52
χ^2=68.9 - SIGNIFICANT DIFFERENCE	Not covered	n	2	3	2	3	3	1	1	0	11	**1**	5	15	24	25	**25**	23	14	**11**	**6**	**14**	**22**	**28**	18	257
		%	10	75	50	37	60	50	50	0	52	9	42	38	45	54	**66**	41	36	**61**	16	**70**	**73**	**78**	55	48
1996	Covered	n	0	0	2	5	2	1	1	2	13	8	8	27	34	20	18	**44**	27	**28**	**32**	**4**	**9**	**7**	13	305
		%	0	0	50	63	33	50	50	10	62	62	62	65	56	43	47	**67**	64	**74**	**82**	**20**	**30**	**19**	39	54
χ^2=77.4 - SIGNIFICANT DIFFERENCE	Not covered	n	2	4	2	3	4	1	1	0	8	5	5	14	27	27	20	**22**	15	**10**	**7**	**16**	**21**	**29**	60	263
		%	10	10	50	37	67	50	50	0	38	38	38	34	44	57	53	**33**	36	**26**	**18**	**80**	**70**	**81**	61	46

Significant contributions to overall χ^2 value indicated in bold. These indicate cell χ^2 values of more than 1.5 for Landclasses with more than 10 squares in the sample of covered and Not covered squares.

APPENDIX 2

ITE Land cover of covered and not covered BBS squares

Appendix 2a NUTS Region 71: Northern England and Isle of Man

Appendix 2b NUTS Region 72: Yorkshire/Humberside

Appendix 2c NUTS Region 73: East Midlands

Appendix 2d NUTS Region 74: East Anglia

Appendix 2e NUTS Region 75: South-east England

Appendix 2f NUTS Region 76: South-west England

Appendix 2g NUTS Region 77: West Midlands

Appendix 2h NUTS Region 78: North-east England

Appendix 2i NUTS Region 79: Wales

Appendix 2j NUTS Region 7A: Scotland

APPENDIX 2a ITE Land cover of covered and Not covered BBS squares

NUTS Region 71: Northern England and Isle of Man

		% of sample area in each ITE Land cover type																								
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1994	Covered	0	0	0	0	4.3	15.7	26.7	0.4	7.3	2.0	0.8	4.3	0	0	3.1	4.5	0.4	20.7	0	4.9	0.5	0.1	0	0.2	0.1
	Not covered	0	0	0	0	2.9	10.4	15.1	0.5	13.3	5.3	4.0	4.6	0	0	1.8	9.0	0.2	21.9	0	1.8	3.1	0.7	0	0.4	0.2
	level of significance							**5%**																		
1995	Covered	0	0	0	0	3.9	14.8	25.6	0.5	9.4	2.1	0.8	4.5	0	0	3.3	7.4	0.4	17.0	0	5.0	0.7	0.1	0.1	0.2	0.2
	Not covered	0	0	0	0	3.8	14.0	18.8	0.5	11.3	4.8	2.7	3.8	0	0	1.5	3.4	0.4	25.8	0	1.8	1.9	0.5	0	0.3	0.1
	level of significance																				**5%**					
1996	Covered	0	0	0	0	4.8	14.9	26.2	0.5	7.3	1.8	0.7	4.3	0	0	3.5	7.1	0.3	18.5	0	5.0	0.6	0.1	0.1	0.2	0.2
	Not covered	0	0	0	0	2.5	14.3	18.3	0.5	14.8	6.3	2.8	4.5	0	0	1.9	3.1	0.4	21.6	0	1.9	1.9	0.4	0.1	0.2	0.1
	level of significance					**5%**		**5%**													**5%**					

T-tests are used to identify those Land cover types for which there is a significant difference between the mean area covered in the sample of covered squares compared with not covered squares.

APPENDIX 2b ITE Land cover of covered and Not covered BBS squares

NUTS Region 72: Yorkshire/Humberside

		% of sample area in each ITE Land cover type																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1994	Covered	0.4	0	0	0	4.3	10.0	13.8	0.1	12.2	4.2	3.2	2.0	0.5	0.1	3.6	1.2	0.3	27.1	0	7.3	3.1	1.3	0	0	0.6
	Not covered	4.3	0	0.2	0	1.7	7.5	13.8	0.3	7.7	5.0	3.6	4.7	0	0.1	3.1	1.3	0.3	33.9	0	5.1	2.6	0.8	0	0	0.2
	level of significance													**5%**												**5%**
1995	Covered	0.3	0	0	0	3.6	9.1	13.4	0.2	12.2	4.6	4.5	2.8	0	0.1	4.0	1.9	0.3	25.4	0	6.9	3.5	1.4	0	0	0.7
	Not covered	3.9	0	0.2	0	2.7	8.9	14.3	0.2	6.1	4.1	3.1	3.1	0	0.1	2.9	0.3	0.3	37.6	0	5.5	2.0	0.7	0	0	0.4
	level of significance																		**5%**							
1996	Covered	0.3	0.5	0	0	3.7	9.1	13.8	0.1	8.9	4.0	4.4	2.5	0.4	0.1	4.0	1.7	0.3	27.7	0	7.8	3.8	2.3	0	0	0.5
	Not covered	3.7	0	0.2	0	2.2	9.6	11.8	0.2	9.2	4.5	2.0	2.9	0	0.1	2.3	0	0.3	36.5	0	6.9	3.0	0.5	0	0	0.5
	level of significance																									

T-tests are used to identify those Land cover types for which there is a significant difference between the mean area covered in the sample of covered squares compared with not covered squares.

APPENDIX 2c ITE Land cover of covered and Not covered BBS squares

NUTS Region 73: East Midlands

		% of sample area in each ITE Land cover type																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1994	Covered	0	0.2	0	0	1.6	9.0	16.6	0.6	1.2	0.8	0.2	0.3	0.2	0.2	4.7	2.1	0	44.6	0	9.6	3.3	1.2	0	0	0
	Not covered	0	0.7	0	0	0.7	8.4	16.1	0.3	0.9	0.2	1.7	0.1	0.1	0.1	2.8	1.4	0	45.9	0	11.5	4.4	1.3	0	0	0.1
	level of significance																									
1995	Covered	0	0.2	0	0	1.4	9.0	17.4	0.6	0.7	0.7	0.1	0.2	0.2	0.2	4.2	1.8	0	45.0	0	10.4	3.3	1.0	0	0	0
	Not covered	0	0.5	0	0	1.2	10.5	15.6	0.4	1.8	0.3	1.7	0.2	0.2	0.3	3.8	1.6	0	43.8	0	9.4	3.7	1.6	0	0	0.1
	level of significance																									
1996	Covered	0	0.2	0.0	0	1.5	8.6	16.0	0.5	1.3	1.1	0.7	0.2	0.2	0.2	3.9	1.5	0	45.7	0	10.5	3.3	1.0	0	0	0
	Not covered	0	0.4	1.5	0	1.4	11.0	16.8	0.5	0.7	0.6	0.3	0.1	0.2	0.2	4.5	2.6	0	42.2	0	7.8	3.2	2.2	0	0	0.1
	level of significance																									

T-tests are used to identify those Land cover types for which there is a significant difference between the mean area covered in the sample of covered squares compared with not covered squares.

APPENDIX 2d ITE Land cover of covered and Not covered BBS squares

NUTS Region 74: East Anglia

		% of sample area in each ITE Land cover type																								
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1994	Covered	0	0.1	0	0.3	1.9	2.7	12.7	2.2	0	0	0	0.4	0.1	0.1	2.1	1.1	0	61.5	0.9	7.9	0.5	1.4	0	0	0
	Not covered	0	0.1	0.1	0.1	0.9	4.0	10.1	1.4	0	0	0	0.1	0	0	1.2	0.7	0	60.1	0.7	10.0	0.5	0.3	0	0	0
	level of significance																						**5%**			
1995	Covered	0	0.1	0	0.0	1.6	2.9	12.8	2.2	0	0	0	0.3	0.1	0.1	2.2	1.1	0	62.4	0.8	8.2	0.4	0.9	0	0	0
	Not covered	0	0.1	0	0.8	1.1	3.9	9.9	1.2	0	0	0	0	0	0.1	1.6	1.7	0	58.2	0.9	8.9	0.7	0.9	0	0	0
	level of significance																									
1996	Covered	0	0.3	0	0.3	1.8	2.6	12.1	2.1	0	0	0	0.3	0.1	0.1	2.1	1.1	0	63.9	0.8	7.3	0.3	0.9	0	0	0
	Not covered	0	0.1	0.1	0.6	1.8	4.4	12.8	1.9	0	0	0	0.3	0	0.1	1.7	1.3	0	54.9	0.6	9.4	0.6	0.9	0	0	0
	level of significance																		**5%**							

T-tests are used to identify those Land cover types for which there is a significant difference between the mean area covered in the sample of covered squares compared with not covered squares.

APPENDIX 2e ITE Land cover of covered and Not covered BBS squares

NUTS Region 75: South-east England

		% of sample area in each ITE Land cover type																								
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1994	Covered	0.7	0.3	0.4	0.2	0.6	10.9	22.3	0.7	0	0	0	0	0.2	0.3	8.0	1.2	0	31.6	0.8	13.7	3.0	0.8	0	0	0.4
	Not covered	0.7	0.9	0	0	0.5	10.4	20.3	0.7	0	0	0	0	0	0.2	5.2	0.6	0	37.6	1.1	13.2	3.4	0.7	0.1	0	0.2
	level of significance															**1%**			**5%**							
1995	Covered	0.7	0.3	0.3	0.2	0.6	11.1	22.7	0.7	0	0	0	0	0.2	0.3	8.1	1.1	0	31.2	0.7	13.1	3.3	0.8	0	0	0.3
	Not covered	2.0	0.6	0.2	0.1	0.5	9.7	18.6	0.7	0	0	0	0	0	0.2	6.2	0.9	0	37.5	1.0	13.5	3.2	0.6	0.1	0	0.3
	level of significance																		**5%**							
1996	Covered	0.8	0.3	0.4	0.4	0.6	10.5	22.2	0.7	0	0	0	0	0.2	0.3	8.0	1.1	0	31.6	0.8	13.3	3.6	0.8	0	0	0.3
	Not covered	2.6	0.5	0.2	0.2	0.6	11.7	19.8	0.8	0	0	0	0	0.1	0.2	7.8	0.9	0	33.4	0.8	12.7	2.5	0.7	0.1	0	0.3
	level of significance																									

T-tests are used to identify those Land cover types for which there is a significant difference between the mean area covered in the sample of covered squares compared with not covered squares.

APPENDIX 2f ITE Land cover of covered and Not covered BBS squares

NUTS Region 76: South-west England

		% of sample area in each ITE Land cover type																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1994	Covered	0.9	0.3	0.4	0.1	3.2	18.0	24.3	0.8	0.1	0	0	0.4	0.3	0.5	7.6	1.7	0	24.4	0	9.9	0.9	0.5	0.4	0	0.8
	Not covered	3.7	0.1	1.0	0.1	2.2	18.9	26.5	0.9	1.0	0.3	0	0.3	0.2	0.2	4.6	1.6	0	23.4	0	7.0	0.4	1.5	0.3	0.1	1.0
	level of significance					**5%**									**1%**	**1%**					**5%**					
1995	Covered	0.7	0.4	0.5	0.1	3.2	19.1	25.2	0.7	0.1	0	0	0.4	0.3	0.5	7.6	1.7	0	22.7	0	9.2	1.1	0.5	0.3	0	0.8
	Not covered	4.1	0.1	0.8	0	2.3	16.2	24.8	0.9	0.9	0.2	0	0.3	0.3	0.3	5.8	1.6	0.2	24.9	0	8.5	0.5	1.4	0.3	0.1	1.0
	level of significance																									
1996	Covered	0.8	0.4	0.5	0.1	3.2	19.7	24.8	0.7	0.3	0.1	0	0.4	0.3	0.5	7.1	1.6	0	22.5	0	9.6	1.0	0.5	0.3	0	0.8
	Not covered	3.4	0	0.6	0	2.6	16.7	27.3	0.9	0.6	0.2	0	0.4	0.2	0.3	7.2	2.5	0	21.9	0	7.3	0.7	1.2	0.3	0.1	1.0
	level of significance																									

T-tests are used to identify those Land cover types for which there is a significant difference between the mean area covered in the sample of covered squares compared with not covered squares.

APPENDIX 2g ITE Land cover of covered and Not covered BBS squares

NUTS Region 77: West Midlands

		% of sample area in each ITE Land cover type																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1994	Covered	0	0	0	0	2.7	18.9	14.6	0.4	0.8	0.2	0	0.2	0.3	0.3	5.5	0.5	0	28.9	0	18.3	2.1	1.6	0.1	0	0.6
	Not covered	0	0	0	0	3.2	19.0	14.3	0.4	1.4	0	0	0	0.7	0.5	3.9	0.8	0	35.0	0	11.5	3.5	1.1	0	0	0.4
	level of significance																				**5%**					
1995	Covered	0	0	0	0	2.7	18.6	14.5	0.5	0	0	0	0.2	0.4	0.4	5.5	0.8	0	29.3	0	17.6	1.9	0.7	0.1	0	0.6
	Not covered	0	0	0	0	3.0	18.0	14.2	0.3	0	0	0	0	0.5	0.1	3.0	0.1	0	38.1	0	12.3	4.4	1.2	0	0	0.5
	level of significance																									
1996	Covered	0	0	0	0	2.5	18.3	15.4	0.5	0.8	0.1	0.2	0.2	0.4	0.3	5.5	0.8	0	29.9	0	16.9	1.9	1.0	0.1	0	0.6
	Not covered	0	0	0	0	2.9	19.6	13.9	0.2	0.8	0.1	0.4	0.1	0.3	0.2	3.3	0.1	0	33.0	0	15.6	3.5	1.1	0.2	0	0.5
	level of significance																									

T-tests are used to identify those Land cover types for which there is a significant difference between the mean area covered in the sample of covered squares compared with not covered squares.

APPENDIX 2h ITE Land cover of covered and Not covered BBS squares

NUTS Region 78: North-west England

		% of sample area in each ITE Land cover type																								
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1994	Covered	0	0.2	0.1	0	6.7	24.5	20.0	0.5	6.6	1.2	0.3	0.1	0.5	0.2	2.9	0.1	0	15.8	0	12.9	2.4	0.6	0	0	0.5
	Not covered	0.2	0	4.9	0	8.4	17.6	20.9	0.4	2.9	0.2	0.1	0.4	0.5	0.1	3.0	0.1	0	15.8	0	16.0	3.0	0.3	0	0	0.4
	level of significance						**5%**																			
1995	Covered	0	0.2	0.1	0	7.6	21.5	21.1	0.6	6.9	0	0.3	0.1	0.5	0.2	3.1	0.1	0	15.0	0	13.2	3.2	0.6	0	0	0.5
	Not covered	0.2	0.1	5.1	0	6.7	20.9	18.0	0.3	1.0	0	0	0.4	0.5	0.1	2.8	0	0	17.8	0	17.5	3.4	0.5	0	0	0.4
	level of significance									**1%**																
1996	Covered	0	0.5	0.9	0	7.3	18.4	20.3	0.5	6.0	0.9	0.2	0.2	0.4	0	3.2	0.1	0	16.2	0	15.7	3.4	0.5	0	0	0.5
	Not covered	0	0.1	7.4	0	6.4	24.7	18.8	0.4	3.2	0.6	0.1	0.4	0.5	0	2.9	0.1	0.1	14.2	0	10.4	2.9	0.5	0	0	0.3
	level of significance			**5%**																						

T-tests are used to identify those Land cover types for which there is a significant difference between the mean area covered in the sample of covered squares compared with not covered squares.

APPENDIX 2i ITE Land cover of covered and Not covered BBS squares

NUTS Region 79: Wales

		% of sample area in each ITE Land cover type																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1994	Covered	1.7	0.2	0.5	0.2	3.7	20.4	20.7	2.6	4.3	2.7	1.7	4.4	0.5	0.3	13.9	4.9	0.5	5.1	0	2.3	0.1	0.6	0	0.2	3.2
	Not covered	7.6	0.7	1.1	0.3	3.3	18.4	20.2	3.9	5.6	2.0	1.5	4.5	0.2	0.2	8.7	2.2	0.8	6.4	0	4.2	0.3	0.5	0	0.1	2.6
	level of significance															**1%**										
1995	Covered	1.7	0.1	0.2	0.2	4.1	19.9	20.6	3.3	5.0	2.5	1.6	4.6	0.4	0.3	13.3	4.6	0.8	5.8	0	2.1	0.1	0.4	0	0.2	3.0
	Not covered	6.0	0.6	1.3	0.2	3.0	19.3	21.8	2.5	4.1	1.9	1.4	4.3	0.4	0.3	10.9	3.3	0.3	5.2	0	3.9	0.3	0.6	0	0.1	3.3
	level of significance																									
1996	Covered	1.8	0.2	0.3	0.2	4.2	20.6	21.0	3.4	3.8	2.2	1.6	5.2	0.5	0.4	12.3	4.4	0.8	6.2	0	2.1	0.1	0.4	0	0.1	3.1
	Not covered	5.1	0.5	1.0	0.2	3.1	18.3	20.6	2.7	5.6	2.2	1.6	3.7	0.4	0.4	12.7	3.6	0.3	5.3	0	3.9	0.3	0.5	0	0.1	2.9
	level of significance																									

T-tests are used to identify those Land cover types for which there is a significant difference between the mean area covered in the sample of covered squares compared with not covered squares.

APPENDIX 2j ITE Land cover of covered and Not covered BBS squares

NUTS Region 7A: Scotland

		ITE Land cover																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1994	Covered	1.7	1.0	0.5	0	1.6	5.7	9.0	1.4	9.9	23.6	5.7	1.4	0.4	0	1.9	7.5	3.2	12.9	0	2.2	0.1	1.5	0.2	0.5	3.7
	Not covered	12.4	2.0	1.5	0.1	1.1	4.0	8.7	2.0	10.8	25.7	5.7	1.2	0.3	0	1.3	3.9	3.1	7.3	0	0.8	0	1.5	0	0.3	2.0
	level of significance	**0.1%**		**5%**			**5%**									**5%**	**1%**		**1%**		**5%**					**5%**
1995	Covered	1.7	1.0	0.5	0.1	1.7	5.7	10.0	1.6	9.5	23.2	5.5	1.2	0.4	0	1.9	7.5	3.3	13.3	0	1.7	0.1	1.4	0.2	0.5	3.6
	Not covered	12.8	1.9	1.5	0.1	1.2	3.8	7.6	1.9	11.3	26.2	5.7	1.3	0.4	0	1.4	3.8	3.5	6.6	0	1.1	0	1.4	0	0.3	2.3
	level of significance	**0.1%**		**5%**			**5%**	**5%**									**1%**		**1%**							**5%**
1996	Covered	1.3	1.2	0.4	0.1	1.8	6.4	10.2	1.6	9.8	22.4	5.9	1.2	0.4	0	1.8	7.0	3.4	13.4	0	1.8	0.1	1.2	0.2	0.4	3.7
	Not covered	13.0	1.6	1.5	0	1.2	3.8	8.3	1.8	10.8	26.1	5.1	1.5	0.4	0	1.5	4.0	3.1	7.1	0	0.9	0	1.6	0	0.3	2.2
	level of significance	**0.1%**		**5%**		**5%**	**0.1%**										**5%**		**0.1%**							**5%**

T-tests are used to identify those Land cover types for which there is a significant difference between the mean area covered in the sample of covered squares compared with not covered squares.

APPENDIX 3

Statistically significant bias in the Landclass and Land cover types between covered and Not covered squares by NUTS region.

NUTS Region 71: Northern England and Isle of Man

No overall significant difference between Landclass of covered and not covered squares.

Bias towards **lowland grass heaths** significant in 1996.
Bias towards **meadows and semi-natural cropped swards** significant in 1994 and 1996.
Bias towards **suburban/farms** significant in 1995 and 1996.

NUTS Region 72: Yorkshire/Humberside

No overall significant difference between Landclass of covered and not covered squares.
Landclasses showing most bias were:
to **17** (rounded intermediate slopes, mainly improved permanent pasture) in 1994 and 1996.
away from **19** (smooth hills, mainly heather moors) in 1994.

Bias away from **arable** land significant in 1995.
Bias away from **bracken** significant in 1994.
Bias towards **dwarf shrub/grass heath** significant in 1994.

NUTS Region 73: East Midlands

No overall significant difference between Landclass of covered and not covered squares.

No significant bias between Landclass cover types.

NUTS Region 74: East Anglia

Significant difference between Landclass of covered and not covered squares in 1994.
Landclasses showing most bias were:
away from **11** (rich alluvial plains, open with arable, leys or built-up) in 1994.

Bias towards **arable** land significant in 1996.
Bias towards **bare ground** significant in 1994.

NUTS Region 75: South-east England

No overall significant difference between Landclass of covered and not covered squares.
Landclasses showing most bias were:
to **1** (undulating country, varied agriculture; mainly grassland) in 1994 and 1995.
away from **11** (rich alluvial plains, with arable, leys or built-up) in 1995 and 1996.

Bias towards **deciduous woodland** significant in 1994.
Bias away from **arable** land significant in 1994 and 1995.

NUTS Region 76: South-west England

Significant difference between Landclass of covered and not covered squares in 1995 and 1996.
Landclasses showing most bias were:
to **5** (lowland somewhat enclosed land; varied agriculture and vegetation) in 1995 and 1996.
to **8** (coastal, open estuarine; mainly pasture, otherwise built-up) in 1996.
away from **17** (rounded intermediate slopes, mainly improved pasture) in 1995 and 1996.

Bias towards **lowland grass heaths** significant in 1994.
Bias towards **scrub/orchard** significant (at 1% level of significance) in 1994.
Bias towards **deciduous woodland** significant (at 1% level of significance) in 1994.
Bias towards **suburban/farms** significant in 1994.

NUTS Region 77: West Midlands

No overall significant difference between Landclass of covered and not covered squares.
Landclasses showing most bias were:
to **1** (undulating country; varied agriculture; mainly grassland) in 1996.
away from **9** (fairly flat; open intensive agriculture, often built-up) in 1995.

Bias towards **suburban/farms** significant in 1994.

NUTS Region 78: North-west England

No overall significant difference between Landclass of covered and not covered squares.
Landclasses showing most bias were:
away from **13** (variable land forms, heterogeneous land use including urban) in 1995.
to **15** (valley bottoms with mixed agriculture, predominantly pastoral) in 1996.
to **16** (undulating lowlands, variable agriculture and native vegetation) in 1995.
to **18** (rounded hills, some steeper slopes, manly improved permanent pasture) in 1995.

Bias away from **beach/flats** significant in 1996.
Bias toward **pasture/amenity turf** significant in 1994.
Bias towards **montain/hill grass** significant (at 1% level of significance) in 1995.

NUTS Region 79: Wales

Significant overall difference between Landclass of covered and not covered squares in 1994.
Landclasses showing most bias were:
to **1** (undulating country; varied agriculture; mainly grassland) in 1994 and 1995.
away from **5** (lowland, enclosed land; varied agriculture and vegetation) in 1994 and 1995.

away from **6** (gently rolling enclosed country; mainly fertile pastures) in 1994.
to **17** (rounded intermediate slopes, mainly improved permanent pasture) in 1994.

Bias towards **deciduous woodland** in significant (at 1% level of significance) in 1994.

NUTS Region 7A: Scotland

Significant difference between Landclass of covered and not covered squares in all three years.
Landclasses showing most bias were:
to **19** (smooth hills, mainly heather moors, often afforested) in 1994 and 1995.
to **21** (upper valley, rocky outcrops and bogs) in 1994.
away from **23** (high mountain summits, with well drained moorlands) in 1994.
away from **24** (upper steep mountain slopes, usually bog covered) in 1995.
to **25** (lowlands with variable land use, mainly arable) in 1994 and 1996.
to **27** (fertile lowlands margins with mixed agriculture) in 1995 and 1996.
to **28** (varied lowland margins with heterogeneous use) in all three years.
away from **29** (sheltered coasts with varied land use, often crofting) in all three years.
away from **30** (exposed coasts dominated by bogs) in 1994 and 1995.
away from **31** (cold exposed coasts with variable land use and crofting) in all three years.

Bias away from **sea/estuary** significant (at 0.1% level of significance) in all three years.
Bias away from **beach/flats** significant in all three years.
Bias towards **lowland grass heaths** significant in 1996.
Bias towards **pasture/amenity turf** in all three years.
Bias towards **meadows** significant in 1995.
Bias away from **marsh/rough grassland** significant in 1994.
Bias towards **deciduous woodland** significant in 1994.
Bias towards **evergreen woods** significant in all three years (1% level of significance in 1994 and 1995).
Bias towards **arable** land significant in all three years (1% level of significance in 1994 and 1995, 0.1% in 1996).
Bias towards **suburban/farms** significant in 1994.
Bias towards **dwarf shrub/grass heath** significant in all three years.