Long term ecological change in British woodland (1971-2001)

A re-survey and analysis of change based on the 103 sites in
the Nature Conservancy 'Bunce 1971' woodland survey

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Appendices

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Executive Summary

1. The countryside and its woods have changed greatly over the last 50 years. This project explores and measures changes in woodland soils, tree and shrub layers and the ground flora through a re-survey of woods first studied 30 years ago.

2. In 1971 103 woods across Britain were selected as representative of a wider sample of 2,453 woods (> 4 ha) surveyed in the late 1960s. Within each of the 103 woods sixteen 200m^2 plots were located at random and records made of soils, tree and shrub composition, and ground flora with each plot.

3. Between 2000 and 2003 (the '2001' survey) the sites were revisited and the plots re-recorded on as close to the same point as possible. The original recording methods were used. The results from the 2001 survey were compared with the original data and changes identified at plot and site levels.

4. **Losses of plots and changes in vegetation types**

    a. Between 1971 and 2001 sixteen of the 103 sites were affected by major change in land use and thirty-eight plots (2.3%) out of a total 1,648 locations were lost, with about equal contributions from urban development and agricultural activities.

    b. The overall balance of plot types, classified by National Vegetation Classification and Countryside Vegetation System remained the same, but with some increases in plots of more fertile and more open conditions.

5. **Soil changes**

    a. Soil pH increased across sites, with a large reduction in the number with soil pH<5 and a corresponding increase in the number of sites with more alkali soil pH.
    b. The soil pH increase was more marked in organic than in mineral soil, and in non-calcareous than calcareous soils.
    c. The increase is consistent with other national trends from the Countryside Survey 2000 and the re-survey of the National Soil Inventory.
    d. There was no overall change in soil organic matter (SOM) although there were significant changes within 23 sites, of which 15 sites showed an increase.
    e. There was no increase in the mean level of plot SOM, but the number of plot with low levels of SOM (<10%)decreased.
    f. SOM increased for lowland soils and mineral and organo-mineral soils but declined in organic soils.
    g. There was a positive correlation between changes in modelled nitrogen deposition and increases in SOM.

6. **Changes to the tree and shrub species**

a. Most tree and shrub species remained stable in terms of their frequency of occurrence at plot and site levels, although 15 species (eight of these shrubs) declined, whilst five other species (four conifers) increased.

b. There was a net loss of stems from the smallest size classes (particularly less than 10 cm dbh) with some smaller gains in the 30-60 cm classes. Stems greater than 60 cm remained scarce.

c. Individual species showed distinct patterns: for example

   i. oak lost stems in the lowest size classes but gained in the larger ones;

   ii. elm and beech lost stems across the size class range;

   iii. holly increased substantially in the smallest size class;

   iv. hazel lost small stems.

d. Mean basal area of trees and shrubs increased both for individual plots and across most sites.

e. Species richness amongst saplings (25-130cm high) decreased, but small increases in frequency were shown by some shade tolerant species including yew, beech and holly.

f. Seedling (< 25 cm high) frequency declined for most species, but holly showed a notable increase.

g. Open habitats (rides, glades etc) and some wet habitats (ditches, boggy patches) became less common.

h. Grazing signs increased in the lowlands; across GB the biggest increase in recorded grazing signs was for 'Other deer' (i.e. species other than red deer).

7. **Ground flora changes**

a. Overall species richness per plot and per 'site' (set of 16 plots) declined markedly by 36% and 12% respectively. Considerable variation in species richness occurred between sites: increases were more common in the south and east, particularly in woods affected by the 1987 storms.

b. The surveys in 2001, being earlier in the season, were expected to detect more species, particularly in the vernal flora. The changes in species richness, cover and frequency reported here were significant after allowing for this survey date difference.

c. Although species frequency in 2001 was strongly correlated with that in 1971, more species declined in frequency than increased at both site and plot levels. 'Woodland specialists' were more likely than other species to show decreases in frequency.

d. Some widespread species increased in cover, with woodland specialists again disproportionately represented among those increasing.

e. Increases in tree basal area were associated with species richness declines; other variables relating to disturbance (1987 storm damage, grazing, open habitats) were associated with increased richness.

f. There was an overall shift across the data set towards more shaded assemblages of plants, but no change in mean Ellenberg light score. Reductions in the numbers of open habitats recorded per plot and increases in basal area were associated with declines in Ellenberg light scores. Species increasing in cover were more likely to be those associated with semi-shaded (rather than open) conditions.

g. There was no overall shift in species towards more fertile/eutrophic assemblages and no change in mean Ellenberg fertility score. Increasing soil pH and high levels of intensive land surrounding the wood were however associated with increases in Ellenberg fertility scores. Species increasing in cover were more likely to be associated with high (rather than low) nutrient status conditions. Changes in abundance for some species were correlated with increases in modelled nitrogen deposition.

h. There was evidence that the vegetation response to increasing soil pH and increased fertility could be partly uncoupled by increased shading.

i. Stress-tolerator species scores declined and were negatively associated with changes in open habitats. Competitor and Ruderal species scores did not show any overall change, but the Ruderal changes were positively correlated with changes in open habitats and negatively with basal area change.

j. 51 species out of 332 showed a significant relationship (in all but four cases positive) between spring temperature change and change in frequency within woodland plots. Other species changed in cover in relation to increased growing season length, with both increases and decreases being found.

k. Overall cover of the ground flora was positively correlated with increasing pH and negatively correlated with increasing basal area.

Conclusions and implications

8. The broad composition and structure of the whole suite of woods was not dramatically different in 2001 from that in 1971. Some of the results indicate some recovery from past damage – for example the increase in soil pH. Other changes, most particularly the decline in woodland specialist richness, represent deterioration in the quality of the woods.

9. We found effects on species distributions and abundance correlated with climate change over the last 30 years. Given the changes that are already being observed in the phenology of species, it seems likely that effects on woodland species abundance will become even more common in the next 50 years.

10. No simple woodland management response can be made to offset the future impacts of climate change, because we cannot predict with any certainty what the impacts will be in terms of species responses. However, in general larger populations (or meta-populations) are more likely to survive and spread than small ones. This supports the case for an increase in woodland area and for improving connectivity within the

landscape, but also for addressing other causes of species decline that do have a clear management solution.

11. Signs of eutrophication in the ground flora were detected that were correlated with models of diffuse pollution and the management of adjacent land. Increased nitrogen inputs (and also spray drift effects) at the edges of woods from adjacent agriculture can be addressed in part through developing buffer strips next to woodland and by developing dense vegetation at the wood edge: in effect establishing a scrub/grassland 'ecotone'.

12. The significance of diffuse pollution impacts for woodland species is becoming more widely appreciated. Impacts may be reduced by maintaining high shade levels – in effect ensuring that light levels rather than nutrients act as the limiting factor.

13. Given the generally young nature of most of the stands, then without deliberate management intervention broadleaved woods are, on average, likely to become older and darker in the next twenty years. This could benefit some species and communities – those of fallen dead wood and shade-loving conditions - but may lead to continuing decline in much of the ground flora and also other groups associated with open space and young growth.

14. Opening out the wood temporarily may increase the abundance of some species, which is desirable if existing woods are to act as sources for the colonisation of new woodland. In undertaking such management we must be aware of the increasing potential of interactions with and between other drivers (climate change, nitrogen deposition, deer grazing) to influence the outcome.

15. All long-term woodland studies gain in value with time: equally we are conscious that some of our analyses would be more useful if there were not such a long gap between the survey times. The data will be made available for further analyses. Consideration will be given to linking at least some of the sites surveyed into other woodland surveillance programmes.

Appendix 1.List of sites.

Appendix 2. Updated handbook of woodland survey methods

Appendix 3. Quantifying relocaltion error for repeat plots

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Appendix 11. An analysis of change in number of repeat plots allocated to CVS classes.

Appendix 12. Management and ownership in 2001– review of the surveyors reports.

Appendix 1 List of sites

SSI = Site of Special Scientific Interest
AW = ancient woodland

Site Name	Site Num	Easting	Northing	SSSI	AW
Waverley Wood	1	4355	2710	0	0
Pickreed Wood	2	5503	1266	0	0
Greenaleigh Plantation	3	2955	1479	0	0
Reins Wood	4	4567	4850	1	1
Love's Copse	5	4274	1735	0	1
Longleat Woods	6	3790	1432	0	0
Compton Wood	7	3537	1570	0	1
Say's Copse & Smalladine Copse	8	4724	2435	1	1
Hawthorn Dene & North Dene & Thompson's Plantation	9	4435	5458	1	1
Kitesgrove, Juniperhall and Home woods; Big Ashes andStockings Plantations	10	4715	1880	0	0
Old Park Wood	11	5011	3267	0	1
Midger Wood & Back Common	12	3797	1895	1	1
Austy Wood	13	4170	2627	0	1
Bird's Marsh	14	3918	1756	0	0
Beck Hole Scar	15	4823	5022	0	0
Ashampstead Common	16	4582	1750	0	0
Ashberry Wood	17	4569	4851	1	1
Ffridd wood or Cefn-gwastad wood	18	3157	2947	0	1
Lower Wetmoor	19	3742	1877	1	1
Wellhanger Copse	20	4870	1147	0	1
Sapperton South Wood & Pickworth Wood	21	5030	3340	1	1
Park Wood	22	3703	1321	0	1
Betty Daw's Wood	23	3698	2283	0	1
Hill Wood; Enfield & Hillwood Plantations	24	3782	1574	0	1
Papworth Wood	25	5291	2629	0	0
Loocombe Wood	26	3668	1512	0	1
Rivey Wood	27	5565	2478	0	0
Spital Wood	28	4683	3484	0	1
Medmenham wood	29	4810	1845	0	0
Piddles Wood	30	3795	1130	1	1
Balsham Wood	31	5588	2496	0	1
Hoddesdonpark Wood	32	5353	2085	0	0
Docksight Wood	33	5013	3158	0	1
Luns Hill Wood	34	3539	1307	0	0
Whitbarrow wood; High Park, Low Park & High Crag Woods	35	3436	4870	1	1
Pike Gill Wood	36	3610	4668	0	1

Site Name	Site Num	Easting	Northing	SSSI	AW
Smithy Hill & Birks Brow woods	37	3410	4920	0	1
Craighall Gorge or Glen Ericht wood	38	3178	7490	1	1
Foolscar Wood, Haverigg Holme wood	39	3264	4915	0	0
Mill Wood	40	3455	8504	1	1
Coed Y Wenault	41	2649	3531	1	1
Woods of Callender	42	3150	8367	0	1
Seatoller wood; High Stile & Low Stile Woods, Borrowdale Yews	43	3239	5131	1	1
New Laund Hill wood; High Wood	44	3653	4468	0	1
Sliding Braes wood; Fogoesburn Wood	45	4148	5569	0	0
White Cliff Wood	46	4711	5185	0	1
Corrieshalloch Gorge wood	47	2205	8780	1	1
Hensol Wood	48	3052	1802	0	0
Pen-yr-allt Wood	49	1884	2338	0	1
Garroch wood	50	2595	5822	1	1
Cilhengroes wood	51	2188	2215	0	1
Allt Penarth wood	52	2648	2407	0	1
Bubney wood	53	3509	3420	0	0
Newclose Wood	54	3392	5015	0	0
Carmel wood; Bylchau-gwynion wood	55	2594	2162	1	1
Den of Alyth wood	56	3230	7487	1	1
Pinkney Bank Wood	57	4704	5142	0	0
Coed Gelli-draws	58	3058	1885	1	1
Gartfairn Wood	59	2434	6896	1	0
Eaves Wood	60	3468	4762	1	1
Longclose Wood	61	4135	5560	0	0
Winster wood; Neds Low & Wilcock Woods	62	3410	4930	0	1
Riding Mill wood	63	4013	5612	0	0
Rottenbutts Wood	64	3670	4890	0	1
Great Plantation	65	3183	1431	0	0
Cilgadan wood; Nant Morlais wood	66	2403	2114	0	0
Eden Gorge wood	67	3527	5425	0	0
Blane Wood	68	2507	6851	1	0
Newton House wood; Great & Scarry Woods	69	4885	5040	0	0
Over Dale wood	70	4847	5140	0	0
Morse's Grove	71	3685	2137	0	1
Hall Brow Wood	72	3348	4885	0	0
Great Knott	73	3334	4918	0	1
Glen Beasdale wood	74	1708	7847	1	1
Cevnant Dulyn wood; Caer-llin Ford wood	75	2757	3683	1	1
Coille Coire Chuilc	76	2327	7281	1	1
Dounduff wood	77	2975	8486	0	0
Allt-yr-Hebog	78	2685	2440	0	1
Warren Wood	79	5245	1294	0	1

Site Name	Site Num	Easting	Northing	SSSI	AW
Hoad's Wood	80	5643	1187	0	1
Wern-fawr Wood	81	2588	2239	0	0
Blakeneyhill Wood	82	3658	2087	0	1
Ford & Aird wood, Tynron wood	83	2825	5924	1	0
Wellington Wood	84	3613	4546	0	0
Allt-ddu & Dol-y-garnedd wood	85	2715	2973	1	1
Dinas wood	86	2783	2467	1	1
Coedcochion wood	87	2916	3694	0	1
Leith Hill Place Wood; Farmhouse, Slittens & Hooks Copses	88	5137	1427	1	1
Allt Blaen-eigiau	89	2384	2256	0	1
Houndtor Wood; Wanford Wood & Deal Copse	90	2770	804	0	0
Chiddingly Wood	91	5347	1320	1	1
Gelli-hir Wood	92	2563	1927	0	1
Llangibby Park wood	93	3360	1972	0	1
Bradenham Wood; The Coppice	94	4835	1975	0	0
Priestfield Wood	95	4153	5568	0	1
Garreg-goch-isaf wood	96	2540	2185	0	1
Afon Sylgen wood	97	2315	2332	0	0
Mulben wood; Glen Orchill wood	98	3335	8516	0	1
Dulwich wood	99	5340	1725	0	1
Nettlebedcommon Wood	100	4700	1875	0	1
Oakers Wood	101	3808	916	0	1
Lower Nut Hurst wood	102	4105	2970	1	1
Normanton Down gorse	103	4121	1414	0	0

Appendix 2 Updated field handbook of woodland survey methods

Contract No: FST 20-32-023 Woodland Indicators: analysis of field survey

National Woodland Survey 2002
Field Handbook

Amended by K Kirby, S M Smart and H I J Black. Adapted from original text by M W Shaw and R G H Bunce for the 1971 baseline broadleaved woodland survey of GB.

Contents

1. Instructions on methods of survey and recording

1.1 General

1.1.1 You will be supplied with the necessary site and plot location maps, recording sheets and soil sampling bags and boxes before leaving Merlewood. A check list of all equipment is given in Annex V. CEH can lend girth tapes for DBH measurement and sighting poles for slope or tree height measurement if necessary. In any event all survey teams should used the same methods.

1.1.2 Woods will be located using a list of grid references and names for each woodland site, an A4 extract from the relevant 1:50,000 OS map (plus, wherever possible, a copy of the original 2½" map) showing the location of each site and an enlarged copy of the site sketch map showing the locations of each of the 16 plot locations that need to be re-recorded (from either the 1:50, 000 or 2 ½" map – please check carefully as this will affect locating plots). Having located the site the first important thing is obtaining **PERMISSION** to enter and survey the site in question.

1.2 Access and permission to survey sites

It will be the responsibility of the surveyors to obtain permission to survey the woods. The contractors will provide such information as they hold but for some woods there will be no known owner and this will need to be established on the ground. Once you have established ownership, **record** names and addresses with the survey results on the back of the Site Description sheet. You **MUST** obtain permission to access the land.

Experience from Pilot Woodland Re-survey and the Countryside Survey 2000 fieldwork showed that, in the majority of cases, land-owners could be identified and permissions secured in half a day –even with multiple owners. There were very few cases where land-owners refused permission to survey their land. Most are fascinated by the fact that records existed from 1971 and that these records could be accurately updated.

In order to ease negotiations you will be provided with a letter of introduction explaining the background to the survey. You can also assure any landowner that they will receive a complete copy of the results (1971 and 2002) for their parcel of land. This is also why it is crucial to note down addresses and contact numbers for each site.

1.3 Location of the sampling points

A map will be provided that is marked with the 16 random sampling points (numbered 1-16). Locating these points on the ground is an extremely critical part of the survey procedure upon which much else depends. There are two important factors in locating the points:

i) Accuracy
ii) Absence of subjective bias (ie not exercising choice)

In practice, high accuracy is not possible without resorting to time-consuming methods. However a reasonable degree of accuracy is required if plot and map derived datasets are to be compatible, since certain information about the plots (altitude, slope position, measures of exposure etc.) will be taken from the map. Three maps will be provided: (i) 1:50 for location, (ii) a photocopy of the original 2½" with plot locations and (ii) expanded version of the same.

PLEASE NOTE that the contours on the 2½" map are in 25 foot intervals and the original 1971 instructions to surveyors were that 1/32nd of an inch = 22 yards. If you have a metric map, or wish to work in metres, you will have to convert all distances and slopes accordingly.

There are no permanent markers for each plot as absolute reference points to determine the accuracy of relocation. A degree of re-location error is expected given the lack of permanent markers but our experience in the pilot survey shows that the following re-location procedure performs substantially better than analysis of repeat records from a newly randomised set of locations.

More important is the avoidance of bias. Such considerations as, "this bit is not very typical", or, "we had a bit like this last time, we will walk on another 10 paces, it looks better there", must be avoided at all costs. Taking short or long paces in order to avoid a blackthorn thicket or nettle bed is an equally serious crime as is the location of plots in situations judged to be in any sense 'homogenous'.

PLEASE NOTE THAT THE USE OF GPS TO LOCATE PLOTS IS DISCOURAGED. THIS MAY BRING YOU CLOSER TO THE 1971 **MAPPED** PLOT LOCATION BUT MAY NOT NECESSARILY BRING YOU CLOSER TO WHERE THE PLOT WAS ACTUALLY RECORDED. BECAUSE GPS WAS NOT USED IN 1971 IT'S USE IN 2003 COULD INTRODUCE BIAS.

1.4 Relocation approach:

The approach will be to pace out along a compass bearing having derived a distance and angle from the plot location map.

Each enlarged map has one complete side of a 1 km square marked on it. This will allow you to scale between distance on the map and distance on the ground e.g. 1 mm = 10 m on a 1:10,000 map. **Please note,** plot location maps have been enlarged to different extents to increase the clarity of the plot locations so you will need to work out a map-to-ground correspondence separately for each plot location map.

Bear in mind that the sites may have altered significantly over 30 years. Collect soil samples and record the vegetation even if the plot is no longer woodland. Only do not record if it is built-over. We know that at least one site has been bisected by a motorway since 1971. Dramatic changes in land-use may have affected other sites as well. Do not attempt to record plots that now fall into land you have no permission to survey but DO make a note of the change in use. In particular, do not record plots on used railway embankments or motorway verges. Be sensible and stay alive!

1.5 Order of recording the data

One site description and habitat form must be completed for each site and three sets of data (each with its own recording form) and one soil sample must be collected from each plot.

We recommend you use clutch pencils to fill in all recording forms. They do not need sharpening and since all forms will be printed onto waterproof paper, pencil will be preferable to pen if it is raining. An example of each recoding form is given in Annex IV. The vegetation plot for ground flora should be recorded first so that it is surveyed in a relatively undisturbed state. The remaining recording can then be carried out in the most manageable order.

Recording forms for each dataset

(a) **Vegetation plot**. Ground Flora - presence and absence in five successively increasing quadrat sizes up to the full 14.14 x 14.14 m, with % cover/abundance estimates for the largest of these. Major common bryophytes should be recorded but a full list is not expected (see below).
(b) **Site description and habitats** - mostly presence and absence of attributes.
(c) **Trees, saplings and shrubs** - trees, DBH (cm) and species from all four quarters of a 14.14 x 14.14 m plot (200 m^2), the same data for saplings and shrubs from a pair of diagonally opposite quarters 1 and 3 of the plot.
(d) **Plot description and habitat data** - mostly presence and absence of attributes, from the same 14.14 x 14.14 m plot.

Samples

(i) A soil sample dug from each plot to be obtained at the same time as the plot survey.

The methods of setting out the plots and the collecting and recording of the data are now dealt with in detail.

2. Recording of plot data

There are four recording forms for the following categories. The Annex provides further details on individual categories and classifications.

2.1 Vegetation plot: ground flora

The first operation when the plot centre has been located, is to lay out the plot. The four corner posts delineate the largest 14.14 x 14.14 m (200 m^2) plot. The plot should be located so that the diagonal strings, and hence corners of the plot, are orientated along cardinal compass points. Spaced along each of the distance strings are four coloured markers that give the half-diagonal distances of the four smaller plots (see Figure 2). Starting with the smallest 2 x 2 m plot, the area within is carefully searched recording the presence of all ground flora species - all vascular plants (monocots, dicots, and ferns) - **including tree or shrub seedlings <25 cm in height**. A record of the presence of species in this innermost quadrat are made by inserting a **1** in the column headed Q on the vegetation plot recording sheet and in the row corresponding to the species concerned (see Annex II). If the species is not listed then pencil in the entry in the blank rows under ‘Other species’ at the bottom of the sheet. Plants which cannot be immediately identified, or for which a subsequent check, in flora or herbarium, is required, should be placed in a labelled paper bag.

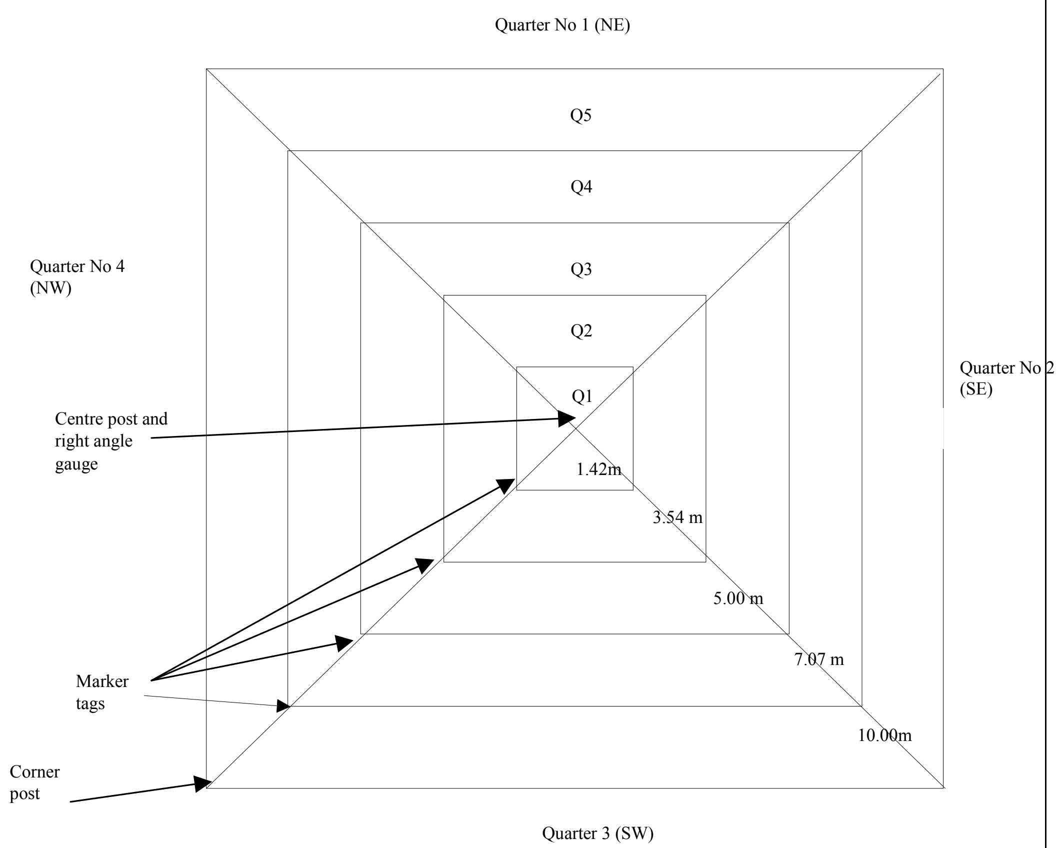
Having recorded all species in a given quadrat size, the new area enclosed by the next successive set of markers is searched for **additional species only**. This procedure is repeated until the full 14.14 x 14.14 m (200 m^2) has been recorded. The most convenient method of search for the successive sizes of quadrat is for the two operators to spiral outwards moving in opposite directions so that both cover the whole area. Record successive quadrats by inserting the quadrat number (2 to 5) in the Q column; as for quadrat 1.

Because of identification difficulties, only the common major bryophytes growing on the soil should be recorded **(not on tree bases, logs, rocks or other specialised habitats).** A list of these is given in Annex I.

Having completed the record of presence of the vascular plants in all five quadrat sizes, an estimate of cover abundance for the full plot (14.14 x 14.14 m) should be made and inserted next to each species in any one of the two columns headed % (see Annex II). This should include all vascular plants plus tree/shrub seedlings recorded as present, plus the six additional categories (litter, wood, rock, bare ground, water and bryophytes). **Estimates should be given to the nearest 5% only. Species present in appreciable quantity (either in area occupied or number of individuals, if widely scattered), but with less than 5% cover, should be recorded as 1. Those present as only single or few specimens with little cover should be recorded as +.** The total cover should add up to ca. 100% (making due allowance for the +'s and 1's), **or more if the ground flora is markedly layered**. Note that tree and shrub canopy cover is not included as the canopy composition and age-class distribution is recorded instead.

Figure 2

LAYOUT OF VEGETATION PLOT



Distance string position from centre - 1/2 diagonal

Q1 = 4 m^2 quadrat (2 m x 2 m) = 1.42 m diagonal

Q2 = 25 m^2 (5.00 x 5.00 m) = 3.54 m

Q3 = 50 m^2 (7.07 x 7.07 m) = 5.00 m

Q4 = 100 m^2 (10.00 x 10.00 m) = 7.07 m

Q5 = 200 m^2 (14.14 x 14.14 m) = 10.00 m

Not to scale

2.2 Trees, saplings and shrubs

These are recorded in the 14.14 x 14.14 m plot, the laying out of which has already been described in (a) above. Decisions as to whether individuals are in the plot, or not, are based on rooted base being 50% or more within the plot.

(i) Trees are defined as stems of >5 cm DBH of any species which is normally capable of attaining a tree like habit. Exceptions include **Hazel, Blackthorn, *Viburnum* spp., Juniper** and other shrubs, which rarely produce stems >5 cm diameter anyway. The species and DBH (cm) of all stems in the whole plot over 5 cm diameter is measured (recording by quarters of the plot). Trees with multiple stems have each stem measured and recorded separately **but these are bracketed together on the recording sheet (see Annex III)**. Dead trees (standing of course) or dead stems on multi-stemmed trees, are designated by a capital "D" in the top right-hand corner of the cell in which its diameter is recorded.

(ii) Saplings - tree species, with the same definition as (i), but with a height >130 cm (ie over breast height) but <5 cm DBH are recorded only in the diagonally opposite quarters 1 and 3. **Quarter 1 is always the NE quadrant. Quarter 3 is always the SW quadrant (see Figure 2)**. The same measurements as for trees, species and DBH (cm), are recorded for these with the same conventions for multi-stemmed and dead trees or stems.

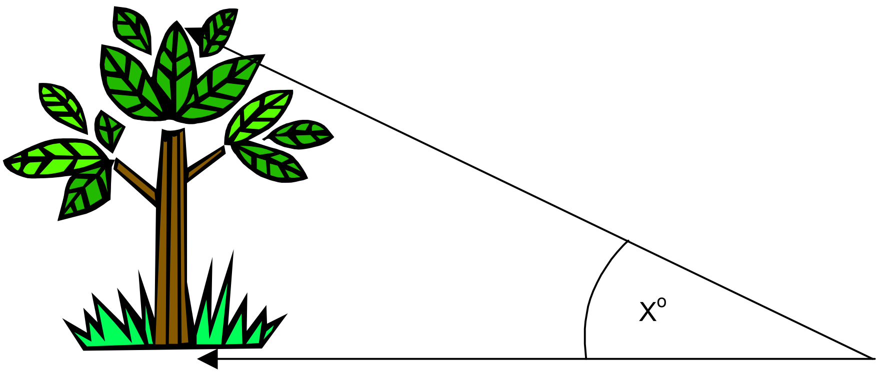
(iii) Shrubs - as defined above according to species. Like the saplings these are only recorded in the diagonally opposite quarters 1 and 3; same data, same conventions.

The final job is to measure the height of the largest tree in the plot (the tree with the largest DBH - regardless of species). It is recommended that you use an Abney hand level, clinometer or hygrometer. If provided with a hygrometer – please use this in preference. Failing this you MUST calibrate your preferred method against the hygrometer and detail the calibtation in the record sheets. Whichever method is used **always ensure that your horizontal distance is taken along the same contour: the slope should be zero between the observer and the base of tree. If this proves impossible then you must record the ground slope so that a correction can be made later.** In the eventuality of the largest tree being in some way atypical (i.e. top broken off) the next largest should be substituted. An example of a completed recording form is given in Annex III.

(1) Height Measurement with a clinometer

Insert the horizontal distance and angle to the top of the tree next to the relevant individual on the DBH data sheet (see Annex III). **Note you will have to insert the horizontal distance between observer and tree plus the angle to treetop. The actual height will then be calculated in the spreadsheets you will use for data entry after the survey.**

Use a clinometer to measure the angle between ground and tree top to give X°.



Horizontal distance on level ground (H)

Tree height = (Tan (X°) x H) + height from ground to eye level

(2) Height Measurement with a hypsometer
If these are available then instructions will be provided following training on the field course

Plot description and habitats

These are recorded on the basis of presence within the 14.14 x 14.14 m plot by striking out the appropriate attributes on the form. The object of this form is to obtain frequency data about important attributes that can reasonably be expected to occur a measurable number of times within a single site. A detailed account of methods and definitions of the attributes is given in Annex IV (the second number in brackets referring to the plot form attributes). **In the case of attributes that have an appreciable defined area, e.g. ponds, glades, etc., only part of the full area needs to be in the plot for it to be recorded as present.** For example if only part of a glade 50 m across occurred actually within the plot it would be recorded as present and attribute 76 struck off. The comments column can be used to record any information that is not included elsewhere and is considered relevant or useful in interpretation.

2.3 Soil sampling

The objective is to obtain a composite soil sample from each plot. Soil samples are to be taken from the centre of each plot or as near as possible (not more than 1 m distant).

Each sample bag must have a self-adhesive label stuck on indicating site and plot (labels provided – ideally done when the bag is dry before starting fieldwork). Wherever possible, bags should also be marked using a permanent marker in the field after the soil sample has been collected – on the bag itself, showing site and plot. Unknown soil samples results in the loss of data – hence double labeling to reduce such error.

Soil samples are to be taken from the top 15 cm of the soil using a trowel. Before taking the sample, check for fresh plant litter (green) on the surface of the soil. Carefully remove this to expose the layer of decomposing plant material below. If in doubt – include in the sample for later removal at CEH. If the area is rocky – remove the largest rocks to expose the soil surface. If there is more rock that soil – move to another area (within 1 m distance).

If difficulties in obtaining sufficient sample are encountered, then supplement from nearest possible point in the plot, (again within 1 m distance) – but ensuring to sample the top 15 cm of soil again. Should this occur, a note to this effect should be appended to the data form. The hole should be filled in and roughly disguised before leaving the plot - this is important.

Record any problems/changes in soil sampling on the plot form.

The sample should be a representative sample of the entire 0 to 15 cm of soil and fill ca. ¾ of the bag, wherever possible. Bags are all self-sealing, so when filled, seal to keep air-tight and prevent loss of soil.

All soil sample bags should be kept in the plastic boxes corresponding to each site (marked using the self-adhesive labels) and stored in a cool place until returned to CEH Merlewood.

2.4 Completion of the plot

Having filled in all data recording forms and collected all necessary samples, the recording of the plots is now complete. At this point it is advisable to:

(i) check that all forms have been fully entered – make a quick check to see that major items have not been omitted, and that the **site, plot number and date of survey have been correctly entered at the top of each form.**
(ii) Check all the samples into your rucksack.
(iii) Check all the equipment into your rucksack.
(iv) Check the soil sampling area has been filled in.
(v) Take one last quick look round the plot to see that nothing important has been omitted and no equipment left behind.

The data you are collecting is being collected "forever". Make sure that it is comprehensive and correct to the best of your ability even at the expense of taking a little extra time.

One additional set of data has to be collected for the site as a whole (i.e. comprising the plots and the ground in-between), namely site description and habitats for the whole site - separate but similar form to that for the plot.

3. Site description and habitats

3.1 Recording forms

A detailed description of how this data should be collected and recorded on the form and definitions for all attributes is given in Annex IV (attribute numbers not in brackets). Coverage is of the whole site, both within and between plots. In order to record section L (Marginal Land Use) and M (Boundary Type) it will almost certainly be necessary to walk round all or part of the boundary. Useful information can also be obtained from the site map. Please make full use of **comments section** to note any features may help in the interpretation of change. Also make sure you record any information gleaned from conversation with the land-owner, although such anecdotal information will not be consistently recorded it can help when interpreting change. Since surveyors are required to draft brief pen sketches of each site, it will be in your interest to complete the plot and site descriptor sheets in the field.

3.2 Completion of the site

When the whole site has been completed (4 sets of data and 2 sets of samples for 16 plots, plus the site description sheet) all the sheets should be stapled together in plots, checked for completeness and put back into the cardboard site folder ready for data entry.

4. Soil dispatch to Merlewood

When all 16 soil samples from each plot are in the plastic box, you are now ready to dispatch to CEH Merlewood. An address label is supplied to be taped to each box when ready for dispatch.

Options for returning samples are: delivery by hand if you are in the area; courier; recorded delivery next day post; collection by CEH (when this is local or near a CEH station). Options for sample return will be finalised in discussion with surveyors at the field course. Each survey team should, ideally ensure that samples are sent so that they arrive at CEH Merlewood within the week they are sampled. Please remember that CEH Merlewood is closed over the weekend so courier/post will not be delivered to CEH Merlewood on a Saturday or Sunday. It is much better to keep the samples until the following week in a cool place than send them on a Friday when they could end up sitting somewhere hot for two days.

Annex Ia List of top 25 most common bryophytes recorded from pilot woodland sites

BRC code	BRC names	Count of Bryo Code
8201214	*Polytrichum sp.*	254
820599	*Thuidium tamariscinum*	173
820507	*Pseudoscleropodium purum*	152
8101308	*Lophocolea sp.*	132
8201147	*Fissidens sp.*	123
820395	*Plagiomnium undulatum*	111
820382	*Mnium hornum*	109
820351	*Hypnum cupressiforme sens.lat.*	105
820463	*Pleurozium schreberi*	97
820206	*Dicranum scoparium*	80
820346	*Hylocomium splendens*	64
820532	*Rhytidiadelphus loreus*	64
820533	*Rhytidiadelphus squarrosus*	62
820534	*Rhytidiadelphus triquetrus*	52
8201243	*Sphagnum sp.*	38
820203	*Dicranum majus*	32
8201110	*Campylopus sp.*	32
820592	*Thamnobryum alopecurum*	26
820374	*Leucobryum glaucum*	25
8204	*Calliergon cuspidatum*	17
810867	*Pellia epiphylla*	16
820402	*Neckera crispa*	12
810827	*Marchantia polymorpha*	9
820335	*Hookeria lucens*	8
82042	*Aulacomnium palustre*	8

Annex Ib List of common bryophytes in Great Britain

BRC code	BRC names
82040	*Atrichum undulatum*
82042	*Aulacomnium palustre*
82081	*Brachythecium rutabulum*
8201106	*Bryum spp.*
8204	*Calliergon cuspidatum*
8201110	*Campylopus spp.*
810714	*Cephalozia bicuspidate*
820157	*Cirriphyllum piliferum*
820184	*Dicranella heteromalla*
820203	*Dicranum majus*
820206	*Dicranum scoparium*
820249	*Eurhynchium praelongum*
820255	*Eurhynchium striatum*
8201147	*Fissidens spp.*
820335	*Hookeria lucens*
820346	*Hylocomium splendens*
820351	*Hypnum cupressiforme sens.lat.*

BRC code	BRC names
820357	*Isopterygium elegans*
820363	*Isothecium myurum*
810807	*Lepidozia reptans*
820374	*Leucobryum glaucum*
810814	*Lophocolea heterophylla*
8101308	*Lophocolea spp.*
810827	*Marchantia polymorpha*
820382	*Mnium hornum*
820402	*Neckera crispa*
810867	*Pellia epiphylla*
200001105	*Plagiochila spp.*
820383	*Plagiomnium rostratum*
820395	*Plagiomnium undulatum*
820463	*Pleurozium schreberi*
820475	*Pohlia nutans*
8201214	*Polytrichum spp.*
820507	*Pseudoscleropodium purum*
820389	*Rhizomnium punctatum*
820245	*Rhynchostegium confertum*
820532	*Rhytidiadelphus loreus*
820533	*Rhytidiadelphus squarrosus*
820534	*Rhytidiadelphus triquetrus*
8201243	*Sphagnum spp.*
820589	*Tetraphis pellucida*
820592	*Thamnobryum alopecurum*
820599	*Thuidium tamariscinum*
8201052	*Ulota crispa sens.lat.*
820158	*Climacium dendroides*
8201121	*Cratoneuron spp.*
8201138	*Drepanocladus spp.*
820276	*Fontinalis antipyretica*
820512	*Ptillium crista-castrensis*

Annex II Vegetation plot (woodlands re-survey 2000)

Site No.		Plot No.		Recorder		Date	

	Q	%	%		Q	%	%		Q	%	%		Q	%	%
Bare ground				**FERNS etc**				183 Gali sax				413 Sonc asp			
213 Barley				41 Athy fil				190 Gera mol				414 Sònc ole			
454 Wheat				53 Blec spi				193 Gera urb				415 Sorb auc			
GRASSES				137 Dryo dil				195 Geum urb				420 Stac syl			
10 Agro can				138 Dryo fil				197 Glec hed				421 Stel als			
12 Agro cap				147 Equi arv				204 Hede hel				423 Stel hol			
11 Agro sto				348 Pter aqu				206 Hera sph				424 Stel med			
20 Alop gen				**FORBS/WOODY Sp**				207 Hier pil				427 Succ pra			
21 Alop pra				2 Acer pse				208 Hier sp.				845 Thym pra			
28 Anth odo				4 Achi mil				220 Hype pul				441 Tori jap			
37 Arrh ela				5 Achi pta				223 Stet				443 Tric cae			
562 Aven fat				18 Alli pet				238 Lami alb				446 Trif dub			
55 Brac syl				26 Ange syl				239 Lami pur				448 Trif pra			
58 Brom mol				29 Anth syl				240 Laps com				841 Trip mar			
61 Brom ste				587 Arum mac				243 Lath pra				463 Vacc myr			
123 Cyno cri				47 Bell per				255 Loni per				467 Vero arv			
124 Dact glo				50 Betu sp.				256 Lotu cor				469 Vero cha			
404 Dan dec				64 Call vul				273 Matr mat				471 Vero off			
129 Desc ces				68 Camp rot				277 Merc per				472 Vero ser			
130 Desc fle				69 Caps bur				286 Myri gal				477 Vici sep			
8 Elymus rep				70 Card h/f				288 Nart oss				482 Viol pal			
165 Fest ovi				71 Card pra				296 Oxal ace				849 Viol r/r			
166 Fest rub				92 Cent nig				302 Pedi syl				490 Vero per			
209 Holc lan				96 Cera fon				307 Pice sit				**MOSSES/LICHENS**			
210 Holc mol				97 Cham ang				311 Ping vul				850 Brac sp.			
253 Loli mul				98 Chen sp				315 Plan lan				512 Clad imp			
254 Loli per				101 Chry opp				316 Plan maj				106 Clad pyx			
283 Moli cae				103 Cirs arv				324 Poly avi				513 Clad unc			
287 Nard str				104 Cirs pal				328 Poly per				519 Dicr het			
304 Phle pra				105 Cirs vul				833 Poly vu/se				131 Dicr sco			
319 Poa ann				113 Cono maj				336 Pote ans				161 Eurh sp.			
321 Poa pra				114 Conv arv				339 Pote rep				216 Hylo spl			
847 Poa tr/ne				117 Cory ave				342 Prim vul				222 Hypn cup			
SEDGES/RUSHES				118 Crat mon				343 Prun vul				530 Loph sp.			
74 Care bin				121 Crep sp.				346 Prun spi				280 Mniu hor			
76 Care dem				590 Dact sp.				350 Quer sp.				282 Mniu und			
78 Care ech				132 Digi pur				351 Ranu acr				535 Pell sp.			
81 Care nig				136 Dros rot				354 Ranu fic				314 Plag und			
85 Care pan				140 Empe nig				355 Ranu fla				318 Pleu sch			
86 Care pil				141 Endy non				370 Rosa sp.				331 Poly com			
152 Erio ang				143 Epil hir				375 Rum a'sa				843 Poly jun			
153 Erio vag				747 Epil mon				376 Rum a'la				279 Pseu pur			
228 Junc a/a				144 Epil pal				837 Rume con				543 Rhan lan			
230 Junc bul				150 Eric cin				378 Rume cri				364 Rhyt lor			
231 Junc con				151 Eric tet				380 Rume obt				365 Rhyt squ			
232 Junc eff				160 Euph sp.				381 Sagi sp.				558 Spha g/f			
235 Junc squ				168 Fili ulm				386 Samb nig				559 Spha g/t			
260 Luzu c/m				170 Frax exc				401 Sene jac				561 Spha r/t			
443 Tric cae				177 Gali apa				402 Sene vul				439 Thui tam			
				182 Gali pal				405 Sile dio							

Other Species	Q	%	%		Q	%	%		Q	%	%

Annex III Tree, sapling and shrub data

Site No. *200* **Plot No.** *1* **Recorder:** *MWS* **Date** *24/06/71*

Q No	Species													Ht (m)
1														
T	Oak	37	34											16
R														
E	Birch	9	7	12										
E														
S														
S	Birch	2	5	2	2									
A														
P														
S														
S	Hazel	2	5	4	3	1	1	2	4	2	1			
H														
R														
B														
2														
T	Oak	16^{D}	24											
R														
E														
E														
S														
3														
T	Oak	15	16^{D}	15										
R														
E														
E														
S														
S	Birch	4	1											
A	Rowan	4	3	4										
P														
S														
S	Hazel	2	5	2	1	1	2	3	2^{D}	3^{D}	1	1	3^{D}	
H														
R														
B														
4														
T	Oak	34												
R														
E														
E														
S														

Annex IV Instructions for completing the plot and site description and habitat forms

General

One copy of the Site Description and Habitat Form is completed for each site. The Plot Description and Habitat Form is a somewhat reduced version of the Site Form and one is completed for each plot (ie 16 per site). For simplicity in the subsequent handling of the data, the code numbers for the attributes are different on the two forms, the attributes being numbered sequentially on each form without gaps, except for unallocated codes. Since the methods of recording and definitions of attributes remain the same on the two forms it is possible to treat them together by giving both code number series - site code first unbracketed, and plot code second in brackets ( ).

Checking that all the appropriate attributes for a given plot have been recorded is part of the routine procedure dealt with in the main text. A further check should, however, be made that there are no logical inconsistencies between the plot and site forms; attributes which are present on the plot form **must** be present on the site form (but not necessarily vice versa). If any significant area of the site has not been covered in connection with locating or recording the plots (or for other purposes) it should be briefly visited to check that no attributes have been missed. Particular care should be taken with the site form as the recording of a given attribute is an all or nothing proposition and is therefore critical.

The attribute code numbers are dealt with in order below:

(SE = self-explanatory; and UA = unallocated).

1	(1)	Site Number - SE
2	(2)	Plot number - SE, on site form fill in as 1 -16
3	(3)	Recorder - recorder's initials
4	(4)	Date - day, month, year. Inclusive dates on site form.
	(5)	Slope - (plot only) in _ or %. Depends on the instrument provided - Blume Leiss = _, Haga = %. (See main text for methods).
	(6)	Aspect - _ magnetic, SE (See main text for methods).

A. **Trees – management**

5	Planted hardwoods - must be clear evidence that the trees have been planted, eg visible lines, uniform age and/or, in the case of mixtures, regular alternation of species. Gets more difficult to detect planted origin with age.
6	Planted conifers - these can usually be assumed to be planted except in the case of European larch and Scots pine, unless there is strong evidence to the contrary, eg irregular distribution and age. May be natural regeneration of some species.
7	Pollards - trees that have had their main branch systems cut off at some time at a height above breast height (4'3" or 130 cm) but have now resprouted. An ancient method of marking boundaries or obtaining firewood and/or browse for stock.
8 (7)	Coppice stools - trees that have been cut off below breast height and have resprouted. Most multi-stemmed trees are the result of coppicing but not all.

Usually the point of cutting can be seen and there are usually >2 stems. Hazel stools should not be recorded as coppice stools unless there are unmistakable cut stems to be seen; a multi-stemmed growth form is normal for this species. Many woods all over Britain, but particularly in the south, were formerly managed on a coppicing system. Most coppice origin woods have not been cut for 20, 50 or even more years and have grown on so that their former use is less evident (but see attribute 10 (9)).

9 (8) Singled coppice - where, in what was formerly coppice, with a preponderance of multi-stemmed trees, selected stools have had the number of shoots reduced to one by cutting the others off. This can be detected by the swollen base of the tree with scars where the other main shoots were removed or by the presence of residual twiggy growth. Becomes less detectable with time.

10 (9) Recently cut coppice - where there is evidence that coppicing is still, or has been until very recently, in progress. Recent coppice can be detected from cut shoot stubs on the stools and/or the presence of coppice produce (see also 20) in the wood. Recent - <c 5 years.

11 Mature conifers - trees >40 years old or >20 m height.

12 (10) Stumps hardwood new - hardwood stumps can usually be distinguished from conifers by the presence of ring-porous wood and/or medullary rays. Often the remnants of bark can be used to identify the hardwood species, eg oak, ash, birch. New stumps can be distinguished from old 13 (11) by the absence of advance rot, luxuriant growths or bryophytes and by the fact that the ring growth is still discernible without cutting or scraping the stump.

13 (11) Stumps hardwood old - the inverse of the characters used to identify new stumps in 12 (10) above. Stumps of species like birch rot away completely in a very short time, whilst those of more resistant species like oak persist for many (>50) years, so the old/new scale is necessarily arbitrary.

14 (12) Stumps conifer new - conifer stumps can be distinguished from hardwoods by the absence of ring-porous wood or medullary rays. Identifiable bark is often useful, as also is resin exudation, and the smell of resin if reasonably fresh. Apart from Sequoias (not very likely) **NO** conifers produce any coppice shoots from stumps cut near the ground. So if there are any signs of coppice shoots live or dead it is sure to be hardwood. the same rules for new/old hardwood stumps also apply to conifers. Yew coppices quite frequently but is easy to identify.

15 (13) Stumps conifer old - fully explained above, SE.

16 Stumps overgrown - in the more open woodlands, the older stumps in an advance state of decay will often be completely overgrown by such species as bramble, honeysuckle or bryophytes.

17 Brashing/pruning - where the lower branches of the trees have been artificially removed by cutting to improve access and/or timber quality.

18 Brash heaps - can result from brashing or pruning, or from the cutting of scrub species, or as the lop and top (the thinner branches) of felled trees. Essentially, therefore, a heap of thin branches which have been left to rot.

19 Cord wood - odds and ends of felled trees, almost invariably hardwood, which have been cut to log size (as for putting on the fire) and have been piled into regular stacks (usually about 4'-6' high and 2'-3' wide and any length).

20 Coppice sticks - the product from cutting coppice which has been tidily stacked for subsequent use. Can vary from large sizes such as hop poles down to pea sticks.

21 Stack timber - the larger parts of the stems of felled trees which have been cut into regular lengths (3' up to 30' or 40') and stacked. Anything from pulp bolts up to the largest sizes in saw timber.

22 Felled trees - trees that have been felled but have not been processed any further than having had the branches cut off.

23 Chips/sawdust - SE

24 Fire sites - SE, often used to get rid of brash 18.

25 Paint/blaze marks - used to mark trees for some special purpose; often for felling, retaining or thinning out the surrounding trees in favour of the best trees. Paint marks may consist of dots, rings or even numbers. Blaze marks consist of the bark being cut off in a strip at about breast height. The latter almost invariably means the tree is marked for felling. Also include scribe marks.

26 Extraction routes - places where logs have obviously been dragged or strips of trees removed for the same purpose.

27 Vehicle tracks - the use of vehicles on **unmade ground** off the main roads or tracks (see also attributes 114-118 (79-82)).

28 (14) UA

B. **Trees – regeneration**

29-48 (15-34) (as per species listed) - **regeneration is any tree species >25cm height and <5cm DBH and must be of seedling origin.** The only exception (ie non-tree) is hazel which must of course be >25 cm in height but must also be of obvious, recent, seedling origin (**do not** record coppice shoots - upper limit of 5 cm hardly applies here). Coppice shoots are not to be recorded as regeneration and care should be taken to check this point as far as possible. Younger seedlings, <25 cm height, will be recorded by plots as a part of the ground flora. Regeneration over breast height will similarly be recorded in more detail with the saplings.

C. **Trees - dead (= habitats)**

49 Live/Dead - trees which, although still alive, have substantial dead parts on them, >50%.

50 Standing dead <10 cm diameter - SE.

51 Standing dead >10 cm diameter - SE.

52 (35) Fallen broken - trees dead, or recently alive, which have fallen and are lying on or near the ground due to the main trunk breaking. Includes trees that have been felled and abandoned. Must be <10 cm diameter at widest point - does not include very small trees.

53 (36) Fallen uprooted - as for 52 but uprooted with a mass of soil and roots pulled out of the ground leaving a hole. Must be >10 cm diameter again.

54 (37) Log very rotten - a very old version of 52 (35) or 53 (36), the sort you can kick into with your boot (with no broken toes). Must be >10 cm diameter again.

55 (38) Fallen branch >10 cm diameter - SE.

56 (39) Hollow trees - as indicated by large holes in base or higher up, SE.

57 (40) Rot hole - smaller holes <25 cm diameter where branches have fallen off or the tree has been damaged in some way. In general not large or deep enough to indicate the tree is hollow.

58 (41) Stump <10 cm diameter - hardwood or conifer of any age and state of decay.

59 (42) Stump >10 cm diameter - as for 58 (41) apart from size.

60 UA.

D. **Trees - epiphytes and lianes**

61 (43) Bryophytes base - <50 cm height SE.

62 (44) Bryophytes trunk - >50 cm height, trunk referring to primary structural members(s) of tree.

63 (45) Bryophytes branch - no height or diameter limitations, branch referring to secondary (and lesser) structural members of tree.

64 (46) Lichen trunk - as 62 (44) above. Refers to foliose lichens only (**not** the less conspicuous granular types). SE.

65 (47) Lichen branch - as 63 (45) above. SE.

66 (48) Fern - ferns growing anywhere on the tree.

67 Mistletoe - SE

68 Clematis - must ascend at least into the lower crown of trees to be counted.

69 Ivy - as for 68 SE.

71 Macrofungi - growing anywhere on tree from base to crown. Includes both mushroom and bracket-shaped types.

72 UA.

E. **Habitats - rock**

73 (51) Stones <5 cm - as with all attributes in this group, must be on the surface of the ground, otherwise SE.

74 (52) Rocks 5-50 cm - SE.

75 (53) Boulders >50 cm - SE.

76 (54) Scree - the essential characteristics of a scree is its actual or potential mobility, thus distinguishing it from a rock pile (attribute 82 (62)). In order to exhibit this mobility a scree consists of a mass of rock fragments resting at or near the maximum angle or repose. The instability of a scree is conferred either by additions from above or active erosion at the base (possibly at high altitudes by the severe climatic regime). The minimum size for recording screes is 25 m^2. Man-made screes produced by various earth-moving operations also count (see also 133 (87) and 134 (88)).

77 (55) Rock outcrop <5 m (height) - should be, as far as it is possible to tell, part of the solid geology. Height refers to vertical height (includes low angle outcrops such as limestone pavement).

78 (56) Cliff >5 m - a larger version of 77 (55).

79 (57) Rock ledges - horizontal surfaces of any size on rock outcrops or cliffs (77 (55) and 78 (56)). No width limits apply. Will usually be made very obvious by the presence of vegetation on the rock faces.

80 (58) Bryophyte covered rock - logically must record one or more of attributes 74 (52), 75 (53), 77 (55), and 78 (56) as well. Otherwise SE.

81 (59) Gully - where two rock faces or cliffs face one another. Must be at least 3 m in height and length and not more than 1.5 x their height apart. Logically must also record one or both of attributes 77 (55) and 78 (56) as well.

82 (60) Rock pile - as name suggests a pile of rocks, not less than 1 m in height and 2 m in diameter (see also 76 (54)). Logically must also record one or both attributes 74 (52) and 75 (53) as well.
83 (61) Exposed gravel or sand - must be at least 1 m^2 in extent in one piece.
84 (62) Exposed mineral soil - must be at least 1 m^2 in extent in one piece.

F. **Habitats - aquatic**

85 (63) Small pool <1 m^2 - must not be running water, otherwise SE.
86 (64) Pond 1-20 m^2 - as for 85 (63) SE.
87 (65) Pond/lake >20 m^2 - as for 85 (63) SE.
88 Stream slow <1 m - speed less than 1 mph (very slow walking or 1 m/2 secs).
89 Stream fast <1 m - speed over 1 mph.
90 River slow 1-5 m speed as 88, SE.
91 River fast 1-5 m - speed as 89, SE.
92 River slow >5 m - speed as 88, SE.
(66) Stream/river slow (plot only) - as above but no size limits.
(67) Stream/river fast (plot only) - as below but no size limits.
93 River fast >5 m - speed as 89, SE.
94 Bottom rock - SE.
95 Bottom gravel - SE.
96 Bottom sand - SE.
97 Bottom mud - if water turbid, may have to poke with a stick (if turbid most likely mud anyway).
98 Bottom peat - SE.
99 (68) Aquatic vegetation - must be true water plants, not terrestrial plants submerged by an abnormally high water level.
100 (69) Spring - water emerging from ground, SE.
101 (70) Marsh/bog - water exuded under feet.
102 (71) Ditch/drain dry - may be wet at other times of year, SE.
103 (72) Ditch/drain wet - SE.
104 (73 & 74) - UA.

G. **Habitats - open**

105 Glade 5-12 m grass - in order to qualify must be an area of 5-12 m in two dimensions at right angles not covered by tree canopy (ie. Trees >130 cm) and with grass as the main vegetation type. A gap 8 x 4 m would not count but one 11 x 5 m would.
106 Glade >12 m grass - same rules as 105 above, SE.
107 Glade 5-12 m mixed - as for 1-5 but vegetation mixed, eg. Grass, herbs, brambles or even woody species <130 cm.
108 Glade >12 m mixed - as 107 above, SE.
109 Glade 5-12 m boggy - as for 105 but ground exuding water under foot. Vegetation can be any of the boggy types, eg. Rushes, *Sphagnum*, even grasses such as *Molinia*. Is distinguished from attributes 105-108 by wetness.
110 Glade >12 m boggy - as for 109, SE.
(75) Glade 5-12 m (plot only) - as above but any vegetation type.
(76) Glade >12 m (plot only) - as above but any vegetation type.

111 (77) Rocky knoll <12 m (width) - consists of an area raised above the surrounding ground consisting largely of rocks with relatively little covering of soil.

112 (78) Rocky knoll >12 m - as 111 (77), SE.

113 Field - a field is a definite management division, an area of ground being currently or having been in the past managed as a field. Normally there will be well marked boundaries with the wood - wall or fence, but these may be in poor repair. In order to count as being in the wood it must be at least partly within the survey boundary and enclosed on at least three sides by the wood.

114 (79) Path 1-5 m - not normally used by wheeled vehicles. Vegetated apart from a narrow trodden area.

115 (80) Ride >5 m - same as for 114 (79) but largely vegetated.

116 (81) Track non-prepared - quite extensively used by wheeled vehicles and therefore deeply rutted, vegetation being significantly affected by this use (>25% destroyed). Has not been the subject of large scale earth-moving operations nor has any metal (stones) been added to the surface.

117 (82) Track metalled - as for 116 (81) but earth-moving and/or addition of stone to surface used in construction.

118 Road tarmac - must be within the site boundary SE.

119 & 120 UA.

H. **Habitats - human**

121 House occupied - SE.

122 House unoccupied - SE.

123 Farm occupied - a farm is a complex of buildings for both human habitation and agricultural use (e.g. Farmhouse, barn, cowshed, pigsty, etc.). Do not fill in 121 as well unless there is a quite separate occupied house. Similarly 125.

124 Farm unoccupied - as for 123. Same rules apply to 122 and 125.

125 Agricultural building - must be separate from farm SE.

126 Other building - SE.

127 Ruined building - SE.

128 Sheep pen/enclosure - SE.

129 (83) Wall dry - dry stone walling, no use of mortar or earth packing.

130 (84) Wall mortared - wall held together with lime mortar, cement or earth. Also includes brick walls.

131 (85) Wall ruined - formerly 129 or 130, but fallen down. If the walls in a wood are part fallen and part standing must be at least 50 m fallen to count.

132 (86) Embankment - must be man-made either by the removal or addition of earth.

133 (87) Soil excavation - rather similar to 132, but more contemporary in nature, with exposed soil surfaces either because excavation is still in progress or subsequent erosion of the surfaces has not yet ceased (see also 84 (62) and possibly 83 (61)).

134 (88) Quarry/mine - historical or contemporary, SE.

135 (89) Rubbish domestic - SE.

136 (90) Rubbish other - SE.

I. **Habitats - vegetation**

137 Alder grove - must be at least 400 m^2 in one piece to count.

138 Hazel grove - as for 137, SE.

139 Willow grove - as for 137, SE.
140 Conifer grove - must have typical “grove” characteristics, ie. Dense branches near the ground, plenty of cover. Will therefore usually be restricted to young conifers. Otherwise as for 137, SE. See also 11.
141 (91) Blackthorn thicket - must be at least 100 m^2 in one piece.
142 (92) Hawthorn thicket - as for 141 (91) SE.
143 (93) Rhododendron thicket - as for 141 (91) SE.
144 (94) Bramble clump - must be at least 25 m^2 in one piece to count.
145 (95) Nettle clump - as for 144 (94) SE.
146 (96) Rose clump - as for 144 (94) SE.
147 (97) Willow-herb clump - as for 144 (94) SE.
148 (98) Umbellifer clump - as for 144 (94) SE.
149 (99) Bracken dense - must be at least 100 m^2 in one piece to count.
150 (100) Moss bank - must be at least 5 m^2 in one piece to count.
151 (101) Fern bank - as for 150 (100) SE.
152 (102) Grassy bank - must be at least 25 m^2 in one piece to count.
153 (103) Leaf drift - must be at least 10 m^2 in one piece to count and >5 cm in depth.
154 Isolated scrub - must be at least 100 m^2 in one piece to count, and at least 30 m from the nearest woodland.
155 Isolated trees - must not be more than 3 trees together and at least 30 m from the nearest woodland to count.
156 (104) Herbaceous vegetation >1 m - species other than those already recorded in 144-149 (94-99) inclusive. Same minimum size.
157 (105) Macrofungi soil - SE.
158 (106) Macrofungi wood - on dead wood (see also 71 (50) on standing live or dead trees).
159 & 160 UA.

J. Animals

Evidence from a number of different sources can be used to record the presence of these animals; sight, signs or sound. In the plots it will usually depend mainly on signs. A few suggestion are given below.

161 (107) Sheep - dropping, hoof marks, wool on brambles, tree bark and fences, bleating.
162 (108) Cattle - droppings, hoof marks.
163 (109) Horse/pony - care is required here because only horses living and/or feeding in the wood at some time should be recorded. Horses ridden through the wood should not be recorded. Droppings, hoof marks (may be unshod).
164 (110) Pig - droppings, hoof marks, digging, noises.
165 Goat - no suggestions (not very likely anyway).
166 (111) Red deer - droppings, fraying >1 m, hoof marks, scrapes.
167 (112) Other deer - droppings, fraying <1 m, hoof marks, scrapes.
168 (113) Rabbit - droppings (usually concentrated on small hummocks), holes and incipient holes, fur.
169 Hare - not easy, apart from sight, larger than rabbit, black tips to ears, runs differently.

170 (114)	Badger - setts (large holes with remains of bedding materials outside, no smell), footprints, hairs on fence, latrines (groups of holes with dropping in them), feeding excavations and scrapings.
172 (116)	Mole - mole hills.
173	Red squirrel - apart from dreys, not really distinguishable from those of grey squirrel, must rely on sight.
174	Grey squirrel - as for 173, SE.
(117)	Squirrel (plot only) - red or grey together, SE.
175 (118)	Anthill - refers to larger species, with hill >25 cm.
176 (119)	Corpse/bones - SE but can also be used to detect the presence of the deceased, e.g. Rabbit bones record rabbit, etc.
(120)	Spent cartridges - SE.

K. **Birds**

177	Rook - heavy beak, baggy trousers, usually in flocks.
178	Crow - like rook apart from above characteristics, usually seen singly or in pairs.
179	Jackdaw - smaller than rook or crow, greyish skull cap.
180	Magpie - easy.
181	Jay - easy, characteristic call as well.
182	Raven - larger than crow or rook, characteristic call.
183	Pigeon - easy, can also use grey feathers, egg shells, and nests to detect.
184	Owl - easy, call and pellets.
185	Buzzard - heavy birds, broad wings, soaring, characteristic mewing call.
186	Kestrel - more delicate, frequently hovering.
187	Other birds of prey - if in doubt about identity, record this.
188	Blackbird - easy, also alarm call.
189	Thrush - easy.
190	Heron - easy
191	Wildfowl - easy.
192	Robin - easy.
193	Wren - easy, also alarm call.
194	Finches - includes house sparrow, chaffinch, green finch, etc. Heavy finch-like beaks.
195	Tits - includes blue, great, coal, marsh, willow and long-tailed tits.
196	Woodpecker - green and others, nests, also drumming on trees.
197	Pheasant - easy, also call of cock pheasant.
198	Other game - SE.
199	Spent cartridges - SE.
200	UA.

L. **Marginal land use (<400 m distant)**

For some of these, eg Road, railway, river, etc. it will be possible to obtain correct records from the map. The map can also be used to pinpoint parts of the marginal land for which it will be necessary to check the use on the ground. It will be necessary to walk much of the boundary anyway to fill in section M. A good deal of navigation to determine the plot positions can make use of the boundary, thus economising in walking time.

201 Woodland hardwood - >75& hardwood < 25% conifers.
202 Woodland mixed - hardwood 25 -75%, conifer 25-75%.
203 Woodland conifer - >75% conifer <25% hardwood.
204 Scrub-woody species overall height <5m. (Woodland 201-203 >5m).
205 Orchard - SE.
206 Arable - SE.
207 Permanent pasture - SE.
208 Rough grazing - may merge a bit with 207 and 209, but not critical.
209 Heath/moorland - SE.
210 Marsh/fen/bog - SE.
211 River - SE.
212 Lake - SE.
213 Road - SE.
214 Railway - SE.
215 Housing - more than five houses in a reasonable group.
216 Industrial - SE.
217 Quarry/mine - SE.
218 Tipping - rubbish dumps or industrial waste.
219 Waste - land which is under no immediately obvious usage.
220 UA.

M. **Boundary type**

221-236 All fairly self-explanatory. Must be at least 10 m in length in one piece of any type for it to be recorded. Attributes 234 and 235, hedge thin and thick, distinguished as <2 m and >2 m respectively. Note distinction between 228 bank and 229 ditch separately and 230 bank and ditch together. A bank must be >1 m high. Merging direct – no obvious boundary; grading into open area between woods and adjacent area.

N. **Subjective overall impression of site**

236-241 Quite straightforward, simply one's subjective impression of the site.
242 Approximately time taken to survey - SE.

Comments

Anything (but anything) that was noted about any aspect of the site and which was not formally recorded on the form may be included here. Obviously it will not be possible to use this information in a formal, analytical sense, but it may constitute an extremely valuable aid to interpretation or in designing the collection of information for future surveys.

Plot description and habitats

1 Site No. ***200***	2 Plot No. *1*	3 Recorder *MWS*	4 Date *24/06/71*
5 Slope 12° or %	6 Aspect 120° Mag.		

A TREES - MANAGEMENT

~~7 Cop. Stool~~	8 Singled cop.	9 Rec. cut. cop.	~~10 Stump hard.new~~
11 Stump hard.old	12 Stump con.new	13 Stump con.old	14

B TREES - REGENERATION

15 Alder	16 Ash	17 Aspen	18 Beech
~~19 Birch~~	20 Hawthorn	~~21 Hazel~~	22 Holly
23 Hornbeam	24 Lime	~~25 Oak~~	~~26 Rowan~~
27 Rhododendron	28 Sweet chestnut	29 Sycamore	20 Wych elm
31 Other hrwd.	32 Scots pine	33 Yew	34 Other con.

C TREES - DEAD (- HABITATS)

35 Fallen brkn	~~36 Fallen uprtd~~.	~~37 Leg.v.rotten~~	38 Fall. bnh.>10cm
39 Hollow tree	40 Rot hole	41 Stump<10cm	~~42 Stump >10cm~~

D TREES - EPIPHYTES AND LIANES

~~43 Bryo.base~~	~~44 Bryo.trunk~~	~~45 Bryo.branch~~	~~46 Lichen trunk~~
~~47 Lichen branch~~	48 Ferm	49 Ivy	~~50 Macrofungi~~

E HABITATS - ROCK

~~51 Stone.<5cm~~	~~52 Rocks 5-50cm~~	~~52 Boulders >50cm~~	54 Scree
~~55 Rock outcp.>5m~~	56 Cliff >5m	57 Rock ledges	~~58 Bryo.covd.rock~~
59 Gully	60 Rock piles	61 Exp.grav/sand	62 Exp.min.soil

F HABITATS - AQUATIC

63 Sml.pool <1m^2	64 Pond 1-20 m^2	65 Pon/lake>20 m^2	66 Strm/riv.slow
67 Strm/riv. fast	68 Aquatic veg.	69 Spring	70 Marsh/bog
71 Dtch/drain dry	72 Dtch/drain wet	73	74

G HABITATS - OPEN

~~75 Gld.5-12m~~	76 Gld.>12m	77 Rky.knoll<12m	78 Rky.knoll>12m
79 Path <5m	80 Ride >5m	~~81 Track non prop~~	82 Track metalled

H HABITATS - HUMAN

~~83 Wall dry~~	84 Wall mortared	85 Wall ruined	86 Embankment
87 Soil excav.	88 Quarry/mine	89 Rubbish dom.	90 Rubbish other

I HABITATS - VEGETATION

91 Blkthorn.thkt.	92 Hawthron thkt.	93 Rhodo.thkt.	94 Bramble clump
95 Nettle clump	96 Rose clump	97 W.herb clump	98 Umbel.clump
~~99 Bracken dense~~	100 Moss bank	101 Ferm bank	102 Grass bank
103 Leaf drift	104 Herb veg.>1m	105 Macfungi.soil	106 Macfungi.wood

J ANIMALS (mainly signs)

~~107 Sheep~~	108 Cattle	109 Horse/pony	110 Pig
111 Red deer	~~112 Other deer~~	113 Rabbit	114 Badger
115 Fox	~~116 Mole~~	~~117 Squirrel~~	118 Anthill
119 Copse/bones	120 Spent ctrdgs.	121	122

COMMENTS

Site description and habitats

1 Site No. *200* | 2 Plot No. *1-16* | 3 Recorder *MWS* | 4 Date *24/06/71*

A TREES - MANAGEMENT

~~5 Plnted.hard~~	~~6 Plnted.con~~.	7 Pollards	~~8 Cop. stool~~
~~9 Singled cop~~.	10 Rec.cut cop.	~~11 Mature con~~.	~~12 Stump hard.new~~
~~13 Stump hard.old~~	14 Stump con.new	~~15 Stump con.old~~	~~16 Stump ovgwn~~.
17 Brash/pruning	~~18 Brash heaps~~	19 Cord wood	20 Cop.sticks
21 Stack timber	22 Felled trees	~~23 Chips/sawdust~~	24 Fire sites
25 Pnt/blaze mks.	26 Extrn. routes	~~27 Vehicle tracks~~	28

B TREES - REGENERATION

29 Alder	30 Ash	31 Aspen	32 Beech
~~33 Birch~~	34 Hawthorn	~~35 Hazel~~	~~36 Holly~~
37 Hornbeam	38 Lime	~~39 Oak~~	~~40 Rowan~~
41 Rhododendron	42 Sweet Chestnut	43 Sycamore	44 Wych Elm
~~45 Other bard~~	46 Scots pine	47 Yew	~~48 Other con~~.

C TREES - DEAD (- HABITATS)

~~49 Live/dead~~	~~50 Stnd.dead <10cm~~	~~51 Stnd.dead>10cm~~	~~52 Fallen brkn~~
~~53 Fallen uprtd.~~	~~54 Log.v rotten~~	~~55 Fall bnb.>10cm~~	56 Hollow trees
57 Rot holes	~~58 Stump <10cm~~	~~59 Stump >10cm~~	60

D TREES - EPIPHYTES AND LIANES

~~61 Bryo.base~~	~~62 Bryo.trunk~~	~~63 Bryo.branch~~	~~64 Lichen trunk~~
~~65 Lichen branch~~	~~66 Fern~~	67 Mistletoe	68 Clematis
~~69 Ivy~~	~~70 Honeysuckle~~	~~71 Macrofungi~~	72

E HABITATS - ROCK

~~73 Stones~~	~~74 Rocks 5-50cm~~	~~75 Boulders >50cm~~	76 Scree
~~77 Rock outcp.<5m~~	78 Cliff >5m	~~79 Rock ledge~~	80 Bryo.covd.rock
81 Gully	~~82 Rock piles~~	83 Exp.grav/sand	~~84 Exp.min.soil~~

F HABITATS - AQUATIC

85 Sml.pool <$1m^2$	86 Pond 1-$20m^2$	87 Pond/lake>$20m^2$	~~88 Strm.slow <1m~~
~~89 Strm.fast <1m~~	90 Riv.slow 1-5m	91 Riv.fast 1-5m	92 Riv.slow >5m
93 Riv.fast>5m	~~94 Bottom rock~~	~~95 Bottom gravel~~	~~96 Bottom sand~~
97 Bottom mud	98 Bottom peat	99 Aquatic veg.	100 Spring
~~101 Marsh/bog~~	102 Dtch/drain dry	103 Dtch/drain wet	104

G HABITATS - OPEN

~~105 Gld.5-12m grs~~	~~106 Gld.>12m grs~~	~~107 Gld.3-12m mxd~~.	~~108 Gld.>12, mxd~~.
~~109 Gld.5-12m bgy~~	~~110 Gld.>12m bgy~~	111 Rky.knoll <12m	112 Rky.knoll >12m
113 Field	~~114 Path 1-5m~~	115 Ride >5m	~~116 Track non-prep~~.
~~117 Track metalled~~	118 Road tarmac	119	120

H HABITATS - HUMAN

121 House occ.	122 House unocc.	123 Farm occ.	124 Farm unocc.
~~125 Agri.bldg~~.	126 Other bldg.	127 Ruined bldg.	~~128 Sheep pen/enc~~.
~~129 Wall dry~~	130 Wall mortared	~~131 Wall ruined~~	132 Embankment
133 Soil excav.	134 Quarry/mine	~~135 Rubbish dom~~.	136 Rubbish other

I HABITATS - VEGETATION

137 Alder grove	~~138 Hazel grove~~	139 Willow grove	140 Con.grove
141 Blkthorn.thkt	142 Hawthorn thkt.	143 Rhodo.thkt.	144 Bramble clump
145 Nettle clump	146 Rose clump	147 W.herb clump	148 Umbel.clump
~~149 Bracken dense~~	~~150 Moss bank~~	~~151 Fern bank~~	152 Grass bank
153 Leaf drift	154 Isolated scrub	~~155 Isolated trees~~	~~156 Herb veg.>1m~~
~~157 Macrofungi soil~~	~~158 Macrofungi wood~~	159	160

J ANIMALS (Sight. sign or sound)

~~161 Sheep~~	162 Cattle	163 Horse/pony	164 Pig
165 Goat	166 Red deer	~~167 Other deer~~	168 Rabbit
169 Hare	~~170 Badger~~	171 Fox	~~172 Mole~~
173 Red squirrel	~~174 Grey squirrel~~	175 Anthill	~~176 Corpse/bones~~

K BIRDS (Sight, sign or sound)

~~177 Rook~~	~~178 Crow~~	~~179 Jackdaw~~	~~180 Magpie~~
~~181 Jay~~	182 Raven	~~183 Pigeon~~	184 Owl
185 Buzzard	186 Kestrel	187 Other BOP	~~188 Blackbird~~
~~189Thrush~~	190 Heron	191 Wildfowl	192 Robin
~~193 Wren~~	~~194 Finches~~	~~195 Tits~~	~~196 Woodpecker~~
197 Pheasant	198 Other game	199 Spent ctrdge.	200

L MARGINAL LAND USE (<400 m distant)

~~201 Woodland hrwd~~.	202 Woodland mixd.	~~203 Woodland con~~.	~~204 Scrub~~
205 Orchard	206 Arable	~~207 Permnt.pasture~~	~~208 Rough grazing~~
~~209 Heath/moorland~~	~~210 Marsh/fen/bog~~	211 River	212 Lake
~~213 Road~~	214 Railway	215 Housing	216 Industrial
217 Quarry/mine	218 Tipping	219 Waste	220

M BOUNDARY TYPE

~~221 Fence good~~	~~222 Fence holes~~	223 Fence derelict	~~224 Wall good~~
~~225 Wall gaps~~	~~226 Wall derelict~~	227 Post and rail	~~228 Bank~~
229 Ditch	230 Bank and ditch	231 Water	~~232 Road~~
233 Railway	234 Hedge thin	235 Hedge thick	~~236 Merging direct~~

N SUBJECTIVE OVERALL IMPRESSION OF SITE

~~237 Cracking~~	238 Pleasant	239 OK	240 Nasty
241 Nightmare	242 Approx.time taken to survey = hours		

COMMENTS

Annex V List of field equipment

This is a list of equipment needed to carry out the tasks outlined in the field handbook. CEH and English Nature will be providing some of this – as detailed. Individual Personal Protective Equipment and Health & Safety requirements are the responsibility of individuals and their employers.

Site location and permissions

1:50,000 extract with individual sites marked (CEH)
Copies of original 2½” maps with individual sites, where available (CEH)
Copies (where relevant) of sketch map showing plot locations (1 to 16); 1:50,000 and/or 2 ½” – remember to check which you have to get correct scale for distances/contours (CEH)
Copy of letter to landowner explaining background to the project and seeking permission (English Nature); word file to be sent to surveyors for editing for each site as necessary

Plot location and recording

1 x machete (experience during the pilot suggests this item will be very useful for accessing plot locations)
1 set of plot marking equipment (comprising centre pole, 4 x corner poles + distance strings) (CEH)
1 x sighting pole (CEH)
1 x magnetic compass
1 x clinometer (English Nature/OFI, please treat with great care as you will have to replace if lost!)
1 x DBH girth tape (CEH)
1 x 30 m tape

Per site

16 x Vegetation (ground flora) recording forms (CEH)
16 x Tree, sapling and shrub recording forms(CEH)
16 x Plot description sheets per site (CEH)
1 x Site description sheet per site (CEH)

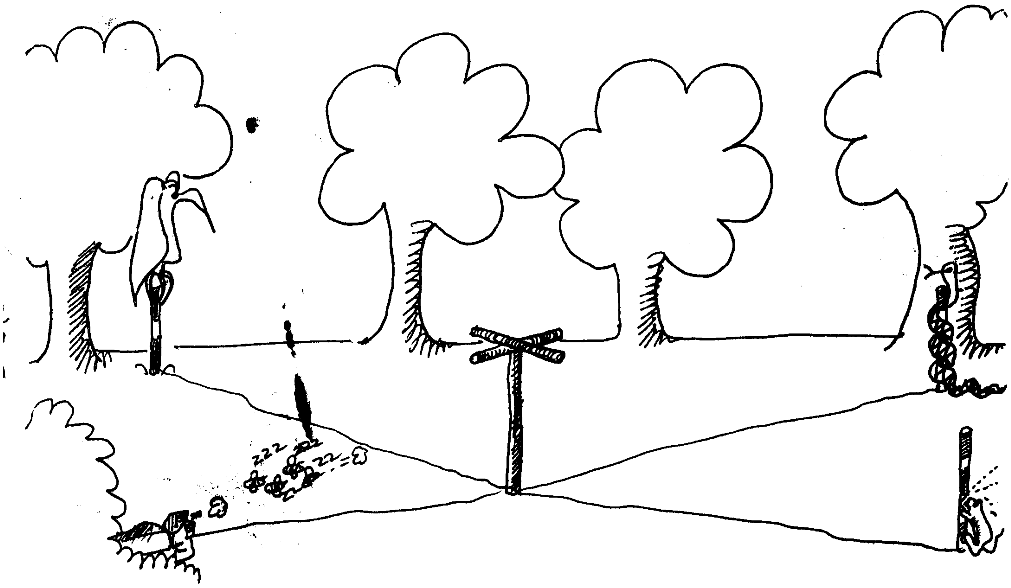
Soil sampling equipment

1 x ‘Japanese Bog Digger’ (ask Bob!) – or a small draw hoe or V-shaped hoe
1 x trowel
1 x ruler
16 x self-sealing bags per site (CEH)
16 x pre-printed adhesive labels for each soil sample bag (CEH)
1 x permanent marker pen (use in addition to the adhesive label)

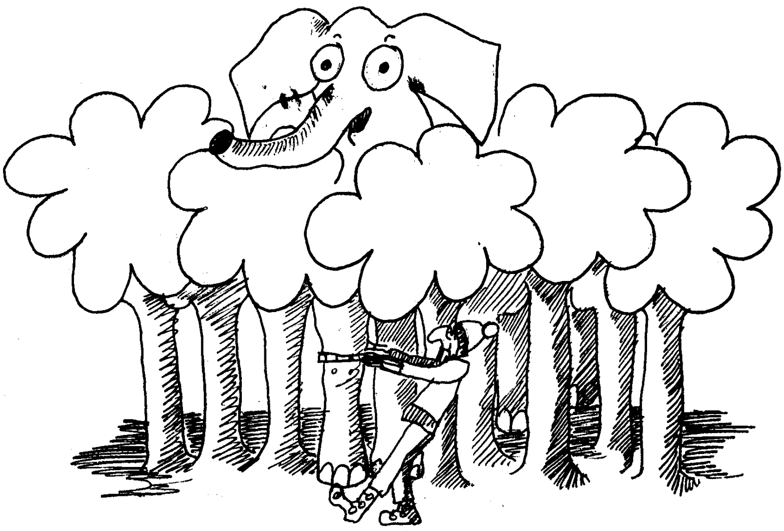
General equipment

Clutch pencils - plus spares - plus leads
Rubber
Plastic boxes with lids (CEH)
Field keys
Hand lens
Weather writers
Cardboard boxes for return of soil samples (courier to be arranged with English Nature).

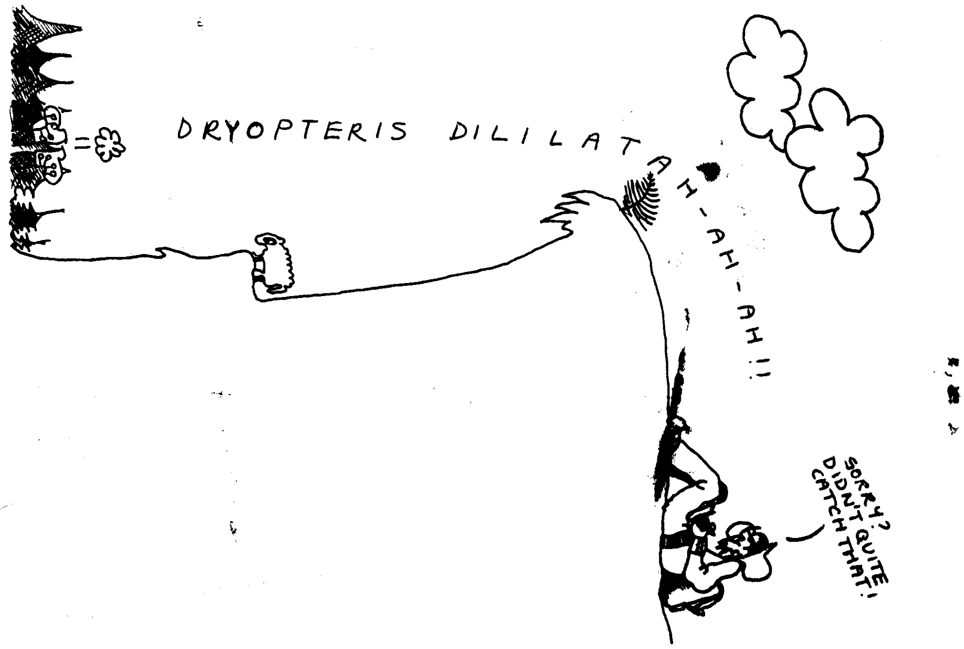
Setting out a plot



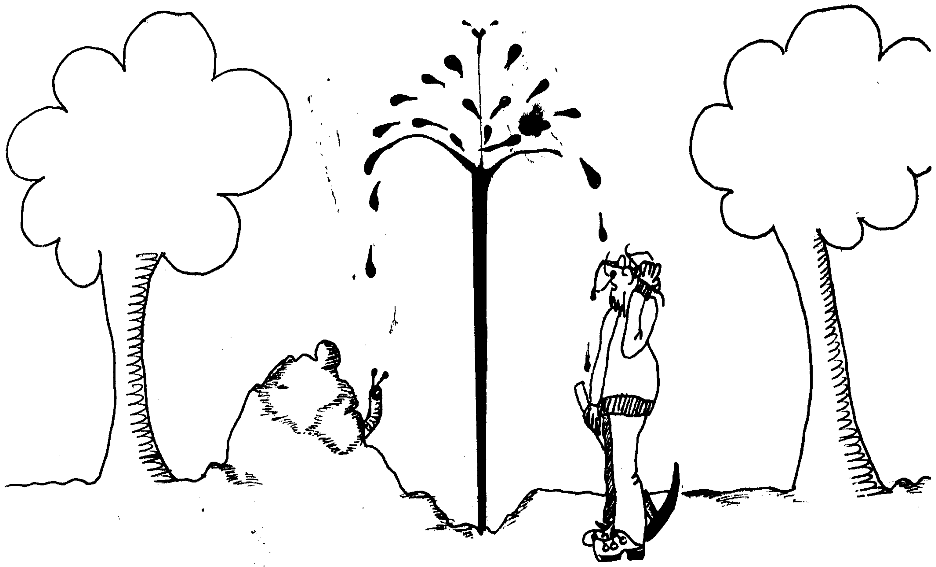
Measuring tree d.b.h.'s



Recording ground flora



Taking a soil sample



Appendix 3: Quantifying relocation error for repeat plots recorded during the pilot re-survey for 14 of the 'Bunce' broadleaved woodland sites (Smart and others 2001)

Introduction

Statistical analyses of temporal vegetation change are more powerful when based on records from plots located in the same place rather than randomised to new locations at each survey. This follows from the general principle that locations near to each other tend to be more similar. Even if vegetation change occurs, species compositional data recorded from the same point at times1 and 2, will tend to be more similar than data recorded from two random points at times 1 and 2.

The principle of autocorrelation between near points can be used to address the problem of quantifying the error involved in attempting to relocate the same vegetation monitoring plots. In the case of the 2000 pilot survey, the field botanist relied only on a marked point on a map as the sole aid to relocating the 1971 plot location. Consequently considerable relocation error could potentially arise. The hope is that having made an effort to move near to the mapped point, the plot records from 2000 will, on average, be more similar to the respective 1971 plot record than if a completely new, random set of locations were chosen. In attempting to measure the amount of relocation error, one cannot of course exploit a 'true' set of temporal pairs known to have been recorded in exactly the same position. What can be done is to compare the average species compositional similarity between the ostensibly true temporal pairs with the average similarity for a random pairing of the 1971 data with the 2000 data. If, on average, attempts to relocate the true 1971 position had been successful then the similarity between the true pairs should be greater than the random pairs.

Methods

In summary, the method involves comparing the position of the mean and median similarity coefficients (Jaccard coefficient for presence/absence data – Kuo, 1997) between the 16 true temporal pairs on each site, against a distribution of 1000 mean and median similarity values generated from random combinations of the similarity coefficients between 1971 plots and 2000 plots other than the true pairing. Since the original 1971 points were randomly located through each woodland site, then the new 2000 data are also distributed at random with respect to all other plot locations except the location with which they were intended to be paired. Hence, the true temporal pairs can be validly compared with a random selection of unpaired plots.

The structure of the dataset is shown below (Fig A3.1). 16 plots are located in each woodland site. Each plot was recorded in 1971 and again in 2000 in supposedly the same location. This gives a half-matrix of 496 coefficients per site i.e. one similarity coefficient for every possible pairing of the 32 records. However, the only coefficients of interest for the test are those between temporal pairs, including the true pairs and unpaired locations. This gives a total of 256 coefficients from which to construct a distribution of means and medians. This distribution was generated by drawing a random sample of 16 similarity coefficients (without replication of pairs in each sample) from the total pool of 256 and computing a mean and a median. 1000 such random draws were carried out hence, 1000 sample statistics computed. 1000 is chosen because this allows for a maximum significance level of p=0.001. This would happen if the mean or median similarity coefficient for the 16 true pairs was larger or smaller than the means or medians for every one of the 1000 randomised means or medians. We hope of course that the coefficient for the true temporal pairs will be significantly larger than the coefficients for the random plot pairs.

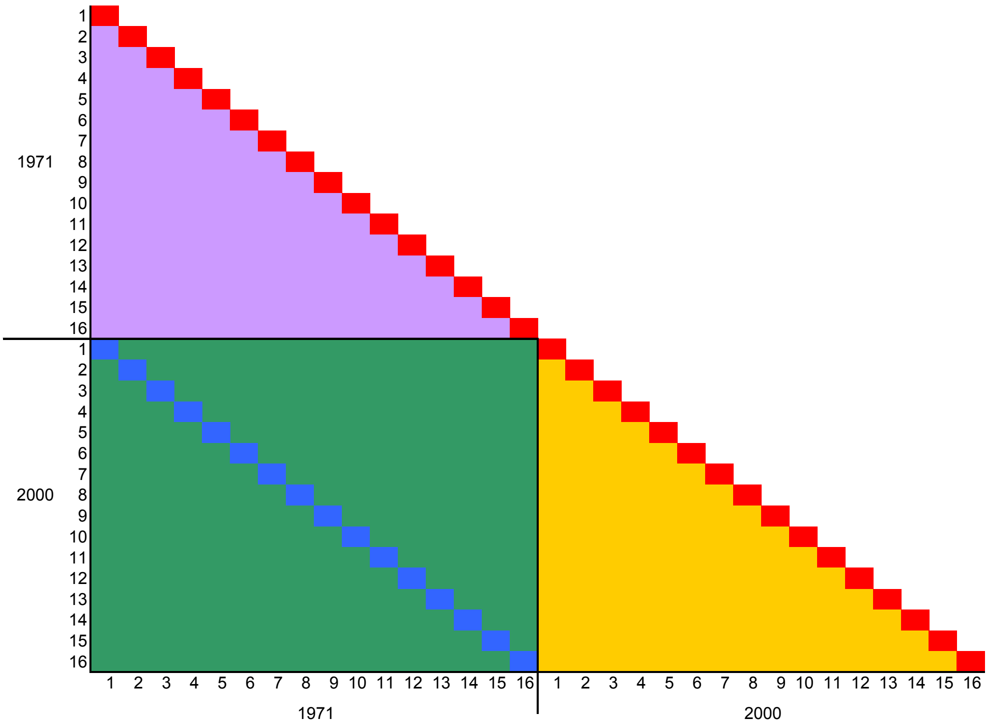


Figure A3.1 Half-matrix of similarity coefficients between all possible pairs of plot data recorded for a woodland survey site in 1971 (16 records) and 2000 (16 records). The blue diagonal shows the 'true' temporal pairs representing the 1971 record and the 2000 record that was intended to have been recorded in the same place. The green shading indicates all the remaining possible pairings between 1971 and 2000 plots recorded in different locations. The reference distribution of similarity coefficients is based on 1000 random draws of 16 coefficients from this dataset of 256 pairs. The mauve and yellow shading indicates spatial pairs based on plots recorded in the same year.

Results

On nine out of the fourteen pilot sites, relocation of the 1971 sites in 2000 resulted in higher species compositional similarity than random pairings of plot data for each site (Table A3.1). The relative gain in similarity due to accurate plot relocation can be visualised as the difference between the similarity for the true temporal pairs versus the random pairs (Fig A3.2). As expected from the significance test results, all the NS sites are situated close to the $x=y$ line reflecting the small difference between the true pair versus random pair similarity coefficients. The graph also conveys the clear positive correlation between the random and true pair medians across all 14 sites. This indicates that even if 1971 and 2000 plots were randomly paired up on each site, within-site patterns of temporal similarity would be preserved. The largest deviations from the diagonal indicate sites that showed the largest gain in temporal similarity due to accurate relocation. The major beneficiary in this respect was Callender. However, this is partly an artefact of the site having comprised two distinct sections on either side of a main road, each of which differed greatly in species composition. The consequence of this is that the true pairs have an unfair advantage when their similarity is compared to the range full of random pairings. This is because even if relocation was poor they are not likely to have been placed on the wrong side of the road, whereas the random pairing of plots made no distinction between the two halves of the site. In this respect, coarse-scale heterogeneity should probably be taken into account by randomising within each site sub-unit. This will be explored when the full re-survey data are analysed.

High similarities, between both true and random temporal pairs, suggest less change and, as one might expect, higher median similarity coefficients for the true 1971 -2000 pairs were significantly negatively correlated to the magnitude of species compositional change measured by movement of plots along DCA axes 1 and 2 between the two surveys (Spearman rank -0.747, p=0.002, n=14). Hill Wood showed the lowest similarity between 1971 and 2000 repeat plots. This was an obvious consequence of having half of the woodland site replaced by improved grassland in 2000 (see pilot survey report).

Table A3.1 Results of randomisation tests of the difference between mean and median similarity coefficients for supposedly 'true' pairs of woodland plots versus random pairings of 1971 and 2000 plots. The table is ordered by median similarity between 1971 and 2000 plots based on the true pairs for each site.

	Random pairs		**True pairs**		
Site	**Mean similarity**	**Median similarity**	**Mean similarity**	**Median similarity**	**Sig level**
Spital	0.36	0.36	0.40	0.40	0.03
Callender	0.23	0.20	0.37	0.38	0.001
Hall Brow	0.33	0.33	0.34	0.38	0.03
Great Knott	0.31	0.32	0.35	0.37	0.03
Cil-Hen-Ros	0.36	0.36	0.38	0.36	Ns
Balsham	0.27	0.26	0.31	0.32	0.03
Mill Wood	0.23	0.23	0.32	0.32	0.001
Priestfield	0.28	0.28	0.30	0.30	Ns
Glan Morlies	0.21	0.21	0.31	0.29	0.001
Oakers	0.18	0.18	0.28	0.28	0.001
Eaves Wood	0.24	0.23	0.25	0.24	Ns
Wellhanger copse	0.22	0.21	0.24	0.22	Ns
Birdsmarsh	0.19	0.16	0.22	0.20	0.09
Hill Wood	0.14	0.07	0.12	0.08	Ns

The implications of non-significant results

Lack of significant difference between the similarity of the true and randomised pairs of plots could result from the fact that any particular pairing of plots was likely to be quite similar within very homogenous sites. If this is the case then we would expect such sites to have relatively high mean or median similarities between-plots and within each year. If much change had occurred then of course similarity coefficients for the true pairs and randomised pairs are both likely to be low even if spatial replicates within each year are similar.

If within-year mean similarities are low for random pairs of plots then this indicates heterogeneity across the site. If such sites also showed no significant difference in similarity between true and random temporal pairs then this must imply high relocation error since a non-significant result did not just result from the fact that any pairing of plots was likely to be quite similar because of homogeneity across the site. Clearly highly heterogeneous sites may coincide with difficult and variable terrain that poses the greatest difficulty in relocation and the highest possibility of small differences in relocation translating into large floristic differences between temporal pairs. This may well have applied to the three NS sites that saw either major felling (Priestfield and Wellhanger Copse) or were very patchy in the composition and structure of their canopies and field layers (Eaves Wood – complex mosaic of open limestone pavement and closed woodland). However, if plot relocation has been effective on very varied sites then these are precisely the situations where maximum reduction in spatial error should be reflected by relatively large differences between true temporal pairs and randomly paired plots. These should be the sites with the largest difference in similarity coefficients between true and random pairs.

Further work

Testing these various additional hypotheses about the relationships between within-site similarity and relocation error will form part of the full resurvey analyses.

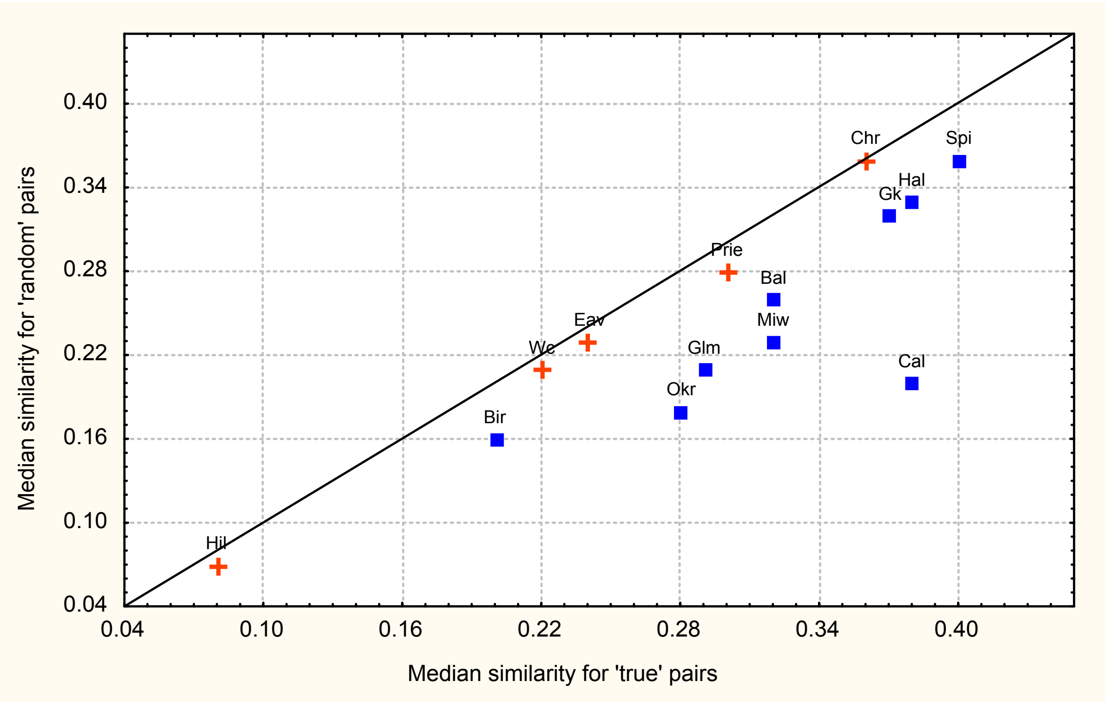


Figure A3.2 Median similarity coefficients for supposedly ‘true’ pairs of 1971 and 2000 woodland plots versus the median for random pairings based on 1000 draws of 16 plots on each of the 14 pilot sites. Bal=Balsham, Spi=Spital, Cal=Callender, Hal=Hall Brow, Gk=Great Knott, Chr=Cil-Hen=Ros, Prie=Priestfield, Glm=Glan Morlies, Okr=Oakers, Eav=Eaves Wood, We=Wellhanger Copse, Bir=Birdsmarsh, Hil=Hill Wood.

Quantifying relocation error for all sites in the 2001 survey

At p<=0.05, 59 out of 103 sites had mean similarity coefficients between the true co-located temporal pairs that were significantly higher than 1000 means based on random draws of unmatched temporal pairs. Note that 5 such significant results at p=0.05 would be expected purely by chance out of 100 tests.

Therefore, attempts to find the 1971 plot location appeared to result in better performance on average across the majority of sites (Table A3.2 and Fig A3.3).

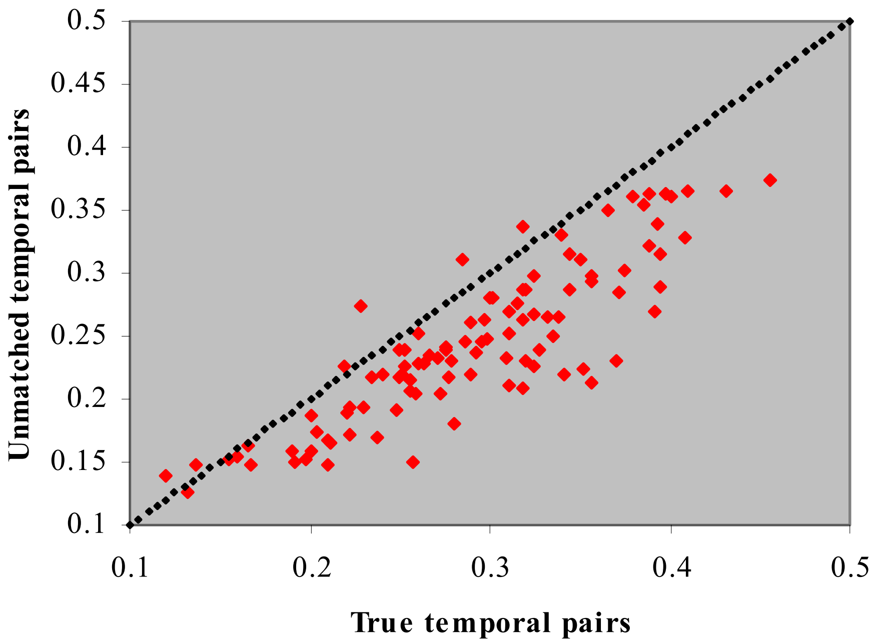


Figure A3.3. Mean similarity coefficients between ostensibly true temporal pairs of plots intended to have been recorded in the same locations in 1971 and 2002 versus mean coefficients for spatially unmatched temporal pairs. Each point represents one woodland site. Data taken from Table 1 and Apendix 1a.

Table A4.3. Mean similarity coefficients and randomisation p values for woodland sites. Results for the 14 pilot sites are given in Appendix 1a.

Site Code	a. Mean similarity (true temporal pairs)	b. Mean similarity (unmatched temporal pairs)	Randomised *p* (see Appendix 1a)
1	0.219	0.226	0.639
2	0.259	0.205	0.022
3	0.309	0.232	0.004
4	0.287	0.245	0.080
5	0.200	0.159	0.080
6	0.375	0.302	0.001
7	0.290	0.220	0.017
8	0.388	0.362	0.105
9	0.298	0.247	0.003
10	0.356	0.214	0.001
11	0.276	0.242	0.033
12	0.318	0.288	0.092
15	0.167	0.147	0.090
16	0.394	0.315	0.003
17	0.352	0.224	0.001
18	0.277	0.218	0.024
19	0.357	0.294	0.002

Site Code	a. Mean similarity (true temporal pairs)	b. Mean similarity (unmatched temporal pairs)	Randomised *p* (see Appendix 1a)
21	0.261	0.253	0.329
22	0.316	0.277	0.049
23	0.302	0.281	0.085
25	0.432	0.365	0.001
26	0.324	0.267	0.009
27	0.264	0.228	0.047
29	0.204	0.174	0.110
30	0.332	0.265	0.013
32	0.276	0.239	0.117
33	0.327	0.239	0.117
34	0.325	0.298	0.102
35	0.255	0.207	0.042
36	0.222	0.193	0.100
37	0.159	0.155	0.400
38	0.155	0.153	0.491
39	0.192	0.150	0.034
41	0.260	0.228	0.049
43	0.230	0.194	0.043
44	0.132	0.126	0.424
45	0.325	0.226	0.001
46	0.190	0.158	0.054
47	0.341	0.220	0.001
48	0.271	0.232	0.023
49	0.392	0.269	0.001
50	0.311	0.252	0.038
52	0.319	0.262	0.005
53	0.335	0.249	0.001
54	0.252	0.226	0.158
55	0.136	0.148	0.682
56	0.371	0.285	0.001
57	0.237	0.169	0.020
58	0.250	0.217	0.050
59	0.251	0.220	0.168
61	0.255	0.216	0.021
62	0.212	0.165	0.027
63	0.293	0.238	0.049
64	0.210	0.167	0.076
65	0.385	0.355	0.150
67	0.258	0.151	0.001
68	0.393	0.339	0.001
69	0.279	0.231	0.005
70	0.235	0.217	0.195
71	0.398	0.364	0.058
74	0.410	0.365	0.034
75	0.398	0.364	0.058
76	0.345	0.315	0.133
77	0.357	0.298	0.031
78	0.198	0.153	0.078
79	0.297	0.264	0.092
80	0.290	0.260	0.151
81	0.248	0.191	0.004
82	0.285	0.310	0.743

Site Code	a. Mean similarity (true temporal pairs)	b. Mean similarity (unmatched temporal pairs)	Randomised *p* (see Appendix 1a)
83	0.166	0.164	0.468
84	0.389	0.322	0.005
85	0.295	0.245	0.027
86	0.366	0.350	0.301
87	0.266	0.235	0.092
88	0.338	0.265	0.004
89	0.408	0.328	0.005
90	0.455	0.373	0.003
91	0.210	0.148	0.011
92	0.344	0.287	0.039
93	0.200	0.188	0.309
94	0.222	0.172	0.015
96	0.229	0.273	0.099
97	0.252	0.239	0.258
98	0.320	0.287	0.141
99	0.395	0.289	0.003
100	0.273	0.205	0.004
102	0.319	0.209	0.019
103	0.318	0.336	0.766

Further reading:

CLARKE, K.R. 1993. Non-parametric multivariate analyses of change in community structure. *Australian Journal of Ecology*, 18, 117-143.

KUO, A. 1997. *The DISTANCE macro: Preliminary documentation*, 2nd ed. Multivariate & Numerical R&D Application Division: SAS Institute Inc.

PHILLIPI, T.E., and others. 1998. Detecting trends in species composition. *Ecol App.* 8, 300-308.

Appendix 4. The impact of catastrophic disturbance: change on sites in the track of the October 1987 storm

The October 1987 storm led to an estimated 15 million trees being blown down in south east England. Although only the fifth most severe storm to hit the UK since records began, the severity of damage was heightened because trees were still in leaf and soils were often sodden consistent with the fourth wettest October in England on record (Whitbread 1991; Hopkins 1994). Woodlands in the path of the storm were also thought more vulnerable because of tall growth in often unmanaged woods and a lack of resilience to frequent high winds that would be typical of more northern woodlands (Spencer 1994;).

Ten of the 1971 woodland survey sites fell inside the zone of highest wind velocity and therefore provided a unique opportunity to quantify disturbance effects still evident in 2002 and to contrast these with changes elsewhere in GB. The boundaries of the strom track were based on the description on the Met Office web-site (www.met-office.gov.uk/education/historic/1987.html). This delimits the region subjected to winds only thought likely once every 200 years (Burt and Mansfield 1988). In reality there was a continuum of average windspeeds moving north west from the main storm track (Whitbread 1991) but a discrete boundary was used for simplicity of analysis (Figure A4.1).

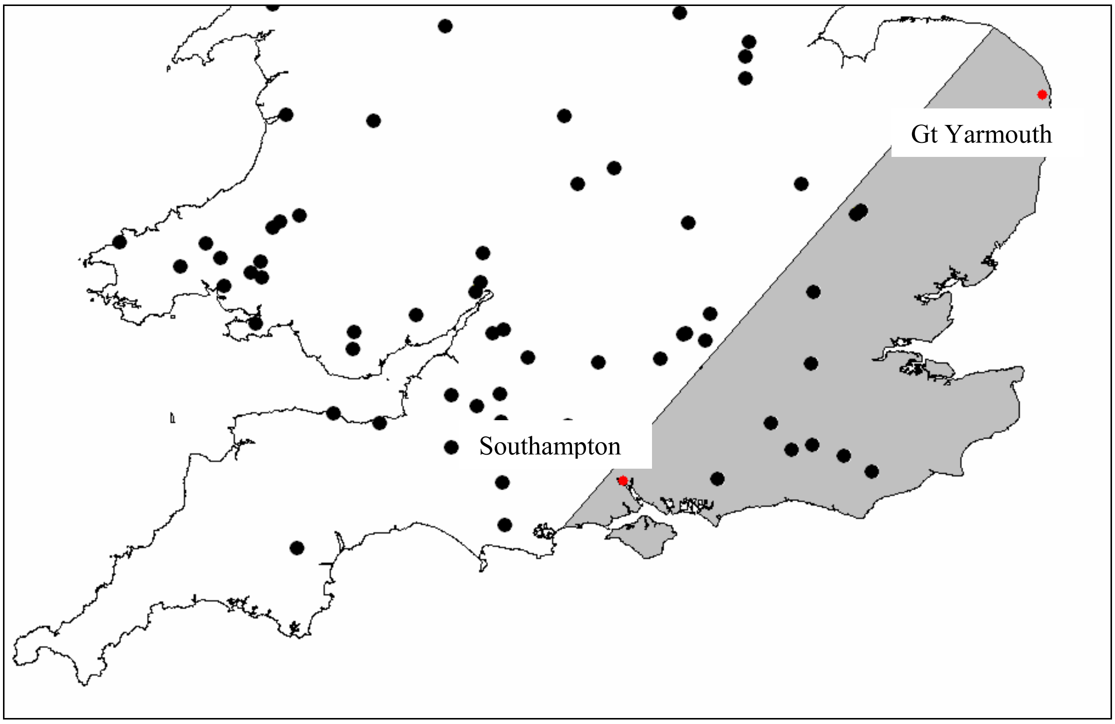


Figure A4.1 The area of Britain subjected to the highest wind speeds during the October 1987 storm. Ten of the 1971 woodland sites lie inside this area.

Summary of ecological changes

The major differences between storm sites and GB changes were a non-significant decrease in woody basal area rather than a significant increase, a non-significant increase in richness of woody regenerating stems and a non-significant increase in species richness, in contrast to the large average decline seen across other GB sites (Table A4.1 and Figure A4.2). Changes in other variables were consistent with the GB direction of change with lack of significance probably partly resulting from lower statistical power.

Table A4.1 Changes in ecological variables 1971-'02. GB versus ten woodland sites within the track of the October 1987 storm.

	Stratum	**Mean change**	**se**	**Df**	**T**	**p**
Woody basal area	GB	0.24	0.052	104	4.51	**<0.0001**
	Oct 87 storm sites	-0.06	0.345	7.68	-0.17	0.8705
Woody species richness (regen) (plot)	GB	-0.13	0.022	102	-6.02	<0.0001
	Oct 87 storm sites	-0.13	0.071	9	-1.78	0.1095
Woody species richness (regen) (site)	GB	-0.04	0.006	101	-6.39	<0.0001
	Oct 87 storm sites	0.01	0.024	7.71	0.43	0.6822
Open habitats (plot)	GB	-0.03	0.007	101	-4.21	<0.0001
	Oct '87 storm sites	-0.04	0.019	9.08	-2.27	**0.0494**
Open habitats (site)	GB	-0.13	0.029	102	-4.54	<0.0001
	Oct 87 storm sites	-0.19	0.064	9	-3.02	**0.0145**
Ellenberg fertility	GB	-0.04	0.023	100	-1.67	0.0976
	Oct 87 storm sites	-0.05	0.047	153	-0.99	0.323
Competitive traits	GB	0.03	0.019	99.3	1.55	0.1249
	Oct 87 storm sites	-0.03	0.083	7.48	-0.32	0.7595
Stress-tolerant traits	GB	-0.08	0.021	100	-3.60	0.0005
	Oct '87 storm sites	-0.06	0.055	8.9	-1.16	0.2773
Light	GB	-0.01	0.023	102	-0.51	0.6107
	Oct '87 storm sites	-0.04	0.067	9.19	-0.57	0.5803
Ruderal score	GB	0.02	0.028	98.9	0.56	0.5734
	Oct 87 storm sites	0.04	0.090	7.75	0.45	0.6684
Species richness	GB	-8.14	0.828	99.8	-9.83	<0.0001
	Oct 87 storm sites	0.52	1.615	8	0.32	0.7486

The contrasting changes in basal area and species richness are particularly significant and reflect the widespread canopy destruction across many of the storm track sites. However, while all ten sites were ostensibly exposed to the highest wind speeds the extent of disturbance reported by surveyors varied from none to widespread. Management responses were similarly varied. Summaries of surveyor's notes for each of the ten sites are given below:

- Site 2 (Pickreed Wood) – Although extensively disturbed, most fallen trees were still alive and much debris was left resulting in a ground layer still rather shaded and species poor by 2002.
- Site 20 (Well Hanger Copse) – All large Beech had apparently disappeared despite north-facing slopes affording apparent protection from the storm and leaving parts of the woodland intact. However, the majority of the site had been affected to some extent and Laurel had greatly expanded being described in 2002 as posing "..a real threat to the woodland flora.".
- Site 27 (Rivey Wood) – Storm damage reported but not sufficiently extensive to have opened up what remained a neglected woodland with a shaded and species poor woodland field layer in 2002.
- Site 31 (Balsham) – No mention of storm damage at all. The canopy showed an ageing profile and the ground flora a reduction in mean species richness. Hence change appeared to reflect the GB average with no deflection by the 1987 storm.
- Site 32 (Hoddesdon Park Wood) – No storm damage was reported even though mean ground flora species richness had increased. The reason may have been the reported reinstatement of coppicing by the Woodland Trust rather than the storm.
- Site 79 (Warren Wood) – Disturbance by storm appeared to be extensive. The site was also described as as a tidy wood following major clearance of brash and fallen timber after the storm. However, disturbance was linked by surveyors to the overwhelming dominance of Bracken through the whole site by 2002.
- Site 80 (Hoads Wood) – No mention of being storm damaged.
- Site 88 (Leith Hill Place Wood) – Patchy storm damage, the implication being that canopy gaps occupied a minor proportion of the site area. These were now packed with downy birch stems.
- Site 91 (Chiddingly Wood) – Storm disturbance was reported but no details on extent or effects given.

In addition to these ten sites, two beech dominated woodlands very close to the storm track boundary were severely affected (site 94 – Bradenham Wood and site 29 – Medmenham Wood). Both were situated on south facing slopes in the Chilterns and in both sites mean ground flora species richness had increased (Appendix ?).

Patterns of change on storm-affected sites

Results pointed to the particular vulnerability of beech to windthrow. Preferential impacts on this species have been previously reported for the October 1987 and January 1990 storms where over-mature and thinly rooted individuals were at most risk (Whitbread and Montgomery 1994; Marrow 1994). Given the strong competitive effect of this species, some have drawn attention to its particular sensitivity to disturbance as a check on ascendancy in otherwise favourable lowland broadleaved woodlands (Peterken and Jones 1987).

The observed increases in ground flora species richness (Figure A4.2) across the storm track series seem clearly consistent with established relationships between succession and species-richness in woodlands (Whitbread 1994, Peterken 1981; Blair-Brown 1994). However, on some sites, canopy disturbance was associated with competitive release of understorey dominants such as bracken, bramble, laurel and rhododendron. Their apparent increase in cover and probable suppression of the ground flora was locally reported by surveyors and is consistent with other monitoring studies on storm affected sites (eg Parker, 1994).

As far as could be gleaned from survey reports, the extent of storm damage was very variable; some sites appeared to have escaped completely while on impacted sites, disturbance ranged from swathes of damage covering a significant proportion of a site to minor damage only (Whitbread 1991).

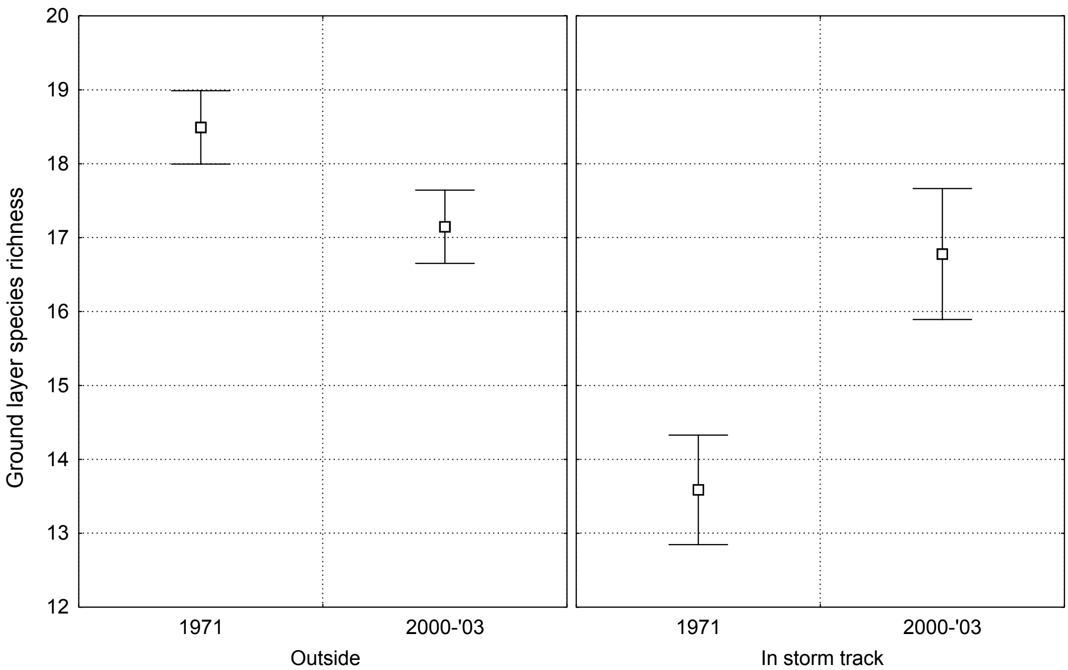


Figure A4.2. Changes in ground layer species richness in central and southern England outside the October ’87 storm track versus those inside the storm track. Mean +/-SE. The ten storm track sites started in 1971 with unusually low mean ground flora species richness compared to the wider GB sample. To test the possibility that this reflected acidic soils, soil pH was compared between groups but no significant difference detected.

Appendix 5 Tests of change in individual herbaceous species abundance by site and plot frequency.

Probability based on the binomial formula. Hence results indicate the extent to which counts in each survey year differ from a 50:50 split between years.

Plant species	Site count '71	Site count resurvey	Binomial -p	Direction	Plot count '71	Plot count resurvey	Binomial - p	Direction	Srad	Rrad	EbergN	EbergL
Achillea millefolium	18	10	0.0925	no change	40	22	0.0150	down	2	3	4	7
Agrostis canina sens.lat.	46	32	0.0703	no change	228	124	0.0000	down	3	3	3	7
Ajuga reptans	78	58	0.0515	no change	333	180	0.0000	down	3	3	5	5
Alchemilla glabra	6	0	0.0156	down	17	0	0.0000	down			4	7
Angelica sylvestris	58	32	0.0040	down	221	86	0.0000	down	1	2	5	7
Anthoxanthum odoratum	54	52	0.4613	no change	345	228	0.0000	down	3	3	3	7
Arctium agg.	38	23	0.0361	down	93	50	0.0002	down			8	6
Arrhenatherum elatius	49	36	0.0964	no change	139	86	0.0002	down	2	2	7	7
Athyrium filix-femina	73	61	0.1710	no change	477	314	0.0000	down	2	1	6	5
Bellis perennis	21	12	0.0814	no change	37	22	0.0337	down	2	4	4	8
Blechnum spicant	58	50	0.2504	no change	317	237	0.0004	down	5	1	3	5
Bromopsis ramosa	29	17	0.0519	no change	88	31	0.0000	down	3	3	7	4
Calluna vulgaris	32	23	0.1403	no change	127	92	0.0107	down	3	1	2	7
Campanula glomerata	8	0	0.0039	down	17	0	0.0000	down			3	8
Campanula rotundifolia	20	8	0.0178	down	52	12	0.0000	down	5	1	2	7
Campanula trachelium	6	0	0.0156	down	23	0	0.0000	down			6	4
Cardamine hirsuta/flexuosa	61	45	0.0724	no change	218	124	0.0000	down			5	6
Carex nigra	11	11	0.5841	no change	36	19	0.0150	down	4	1	2	7
Carex ovalis	7	2	0.0898	no change	14	2	0.0021	down	4	2	4	7
Carex sylvatica	70	64	0.3330	no change	308	217	0.0000	down	5	1	5	4

Plant species	Site count '71	Site count resurvey	Binomial -p	Direction	Plot count '71	Plot count resurvey	Binomial - p	Direction	Srad	Rrad	EbergN	EbergL
Carex viridula subsp.oedocarpa	8	3	0.1133	no change	15	3	0.0038	down	5	1	2	8
Centaurea nigra	20	8	0.0178	down	47	13	0.0000	down	3	3	5	7
Chamerion angustifolium	56	41	0.0774	no change	207	83	0.0000	down	1	1	5	6
Circaea lutetiana	86	81	0.3785	no change	609	491	0.0002	down	1	3	6	4
Cirsium palustre	69	41	0.0049	down	243	129	0.0000	down	1	3	4	7
Clematis vitalba	7	8	0.5000	no change	38	21	0.0182	down			5	6
Conopodium majus	30	22	0.1659	no change	84	46	0.0005	down	3	3	5	6
Convallaria majalis	5	1	0.1094	no change	12	2	0.0065	down			5	5
Cornus sanguinea	26	12	0.0168	down	77	20	0.0000	down			6	7
Crepis paludosa	14	3	0.0064	down	30	6	0.0000	down			4	6
Cruciata laevipes	8	1	0.0195	down	15	2	0.0012	down	3	3	5	6
Dactylis glomerata	78	64	0.1376	no change	272	172	0.0000	down	2	2	6	7
Dactylorhiza sp.	26	11	0.0100	down	64	18	0.0000	down			2	8
Danthonia decumbens	8	7	0.5000	no change	27	13	0.0192	down	5	1	2	7
Deschampsia cespitosa	84	78	0.3473	no change	528	423	0.0004	down	2	5	4	6
Deschampsia flexuosa	58	45	0.1185	no change	443	245	0.0000	down	4	1	3	6
Digitalis purpurea	57	58	0.5000	no change	270	231	0.0447	down	2	3	5	6
Dryopteris dilatata/carthusiana	96	94	0.4711	no change	856	713	0.0002	down			4	4
Dryopteris filix-mas	99	90	0.2804	no change	859	544	0.0000	down	3	2	5	5
Empetrum nigrum	4	1	0.1875	no change	10	1	0.0059	down			1	7
Epilobium montanum	88	51	0.0011	down	373	141	0.0000	down	3	3	6	6
Epipactis helleborine	20	3	0.0002	down	50	4	0.0000	down	5	1	4	4
Equisetum arvense	19	1	0.0000	down	41	3	0.0000	down	1	3	6	7
Eriophorum angustifolium	5	4	0.5000	no change	15	5	0.0207	down	4	1	1	8

Plant species	Site count '71	Site count resurvey	Binomial -p	Direction	Plot count '71	Plot count resurvey	Binomial - p	Direction	Srad	Rrad	EbergN	EbergL
Euphorbia agg.	7	0	0.0078	down	19	0	0.0000	down				
Festuca gigantea	46	28	0.0237	down	176	59	0.0000	down	3	3	7	5
Festuca ovina agg.	33	23	0.1144	no change	136	78	0.0000	down	5	1	2	7
Festuca rubra agg.	31	27	0.3470	no change	81	57	0.0249	down	3	3	5	8
Filipendula ulmaria	53	45	0.2398	no change	237	137	0.0000	down	2	1	5	7
Fragaria vesca	73	39	0.0008	down	264	120	0.0000	down	3	3	4	6
Galeopsis tetrahit agg.	28	15	0.0330	down	69	39	0.0025	down	1	4	6	7
Galium mollugo	5	2	0.2266	no change	17	3	0.0013	down			4	7
Galium odoratum	31	23	0.1704	no change	102	57	0.0002	down	3	2	6	3
Galium palustre	47	39	0.2253	no change	142	109	0.0216	down	2	3	4	7
Galium saxatile	49	36	0.0964	no change	354	174	0.0000	down	5	1	3	6
Geranium sylvaticum	6	1	0.0625	no change	17	3	0.0013	down			5	6
Geum rivale	16	5	0.0133	down	41	9	0.0000	down	4	2	4	6
Geum urbanum	84	75	0.2630	no change	488	336	0.0000	down	4	2	7	4
Glyceria fluitans	14	9	0.2024	no change	37	21	0.0240	down	1	3	6	7
Hedera helix	79	75	0.4045	no change	595	509	0.0052	down	3	1	6	4
Heracleum sphondylium	43	29	0.0625	no change	128	70	0.0000	down	1	3	7	7
Hieracium 'indeterminate'	27	10	0.0038	down	71	18	0.0000	down				
Holcus lanatus	84	71	0.1676	no change	417	301	0.0000	down	3	3	5	7
Holcus mollis	80	70	0.2313	no change	502	349	0.0000	down	2	2	3	6
Hypericum androsaemum	15	6	0.0392	down	28	10	0.0025	down	4	2	5	5
Hypericum humifusum	9	1	0.0107	down	15	1	0.0003	down	4	2	3	7
Hypericum perforatum	24	5	0.0003	down	47	7	0.0000	down	2	3	5	7
Hypericum pulchrum	46	42	0.3747	no change	131	82	0.0005	down	5	1	3	6
Impatiens noli-tangere	10	0	0.0010	down	12	0	0.0002	down			6	4
Iris foetidissima	4	1	0.1875	no change	25	1	0.0000	down			5	5

Plant species	Site count '71	Site count resurvey	Binomial -p	Direction	Plot count '71	Plot count resurvey	Binomial - p	Direction	Srad	Rrad	EbergN	EbergL
Juncus articulatus/acutiflora	27	19	0.1510	no change	48	31	0.0356	down			3	7
Juncus bulbosus	20	12	0.1077	no change	34	19	0.0267	down	3	3	2	7
Juniperus communis	3	3	0.6563	no change	20	8	0.0178	down			3	8
Lathyrus linifolius	13	10	0.3388	no change	42	19	0.0022	down	4	2	3	6
Leucanthemum vulgare	7	0	0.0078	down	10	0	0.0010	down	2	2	4	8
Ligustrum vulgare	22	11	0.0401	down	92	41	0.0000	down	3	1	5	6
Listera ovata	14	9	0.2024	no change	50	16	0.0000	down	4	2	5	6
Lonicera periclymenum	89	84	0.3806	no change	679	509	0.0000	down			5	5
Lotus corniculatus	21	11	0.0551	no change	45	14	0.0000	down	4	2	2	7
Lotus pedunculatus	23	10	0.0175	down	44	21	0.0030	down	2	2	4	7
Luzula pilosa	65	38	0.0050	down	327	121	0.0000	down	5	1	3	5
Lychnis flos-cuculi	12	5	0.0717	no change	30	14	0.0113	down	3	3	4	7
Lysimachia nemorum	71	52	0.0521	no change	333	167	0.0000	down	3	3	5	5
Melampyrum pratense	23	9	0.0100	down	59	25	0.0001	down	3	3	3	5
Mentha aquatica	18	11	0.1325	no change	38	19	0.0082	down	1	2	5	7
Mercurialis perennis	75	64	0.1982	no change	534	426	0.0003	down	3	1	7	3
Moehringia trinervia	31	15	0.0129	down	80	34	0.0000	down	3	3	6	4
Mycelis muralis	13	2	0.0037	down	22	4	0.0003	down	3	3	5	4
Oxalis acetosella	87	76	0.2168	no change	782	575	0.0000	down	4	2	4	4
Paris quadrifolia	2	2	0.6875	no change	11	3	0.0287	down			6	3
Pedicularis palustris	6	0	0.0156	down	13	0	0.0001	down			2	8
Pedicularis sylvatica	6	2	0.1445	no change	13	2	0.0037	down	3	3	2	8
Persicaria hydropiper	16	6	0.0262	down	44	9	0.0000	down	1	5	6	7
Pilosella officinarum	10	5	0.1509	no change	17	7	0.0320	down			2	8
Pimpinella saxifraga	3	0	0.1250	no change	11	0	0.0005	down	4	2	3	7

Plant species	Site count '71	Site count resurvey	Binomial -p	Direction	Plot count '71	Plot count resurvey	Binomial - p	Direction	Srad	Rrad	EbergN	EbergL
Plantago lanceolata	29	21	0.1611	no change	76	50	0.0128	down	3	3	4	7
Plantago major	35	26	0.1528	no change	62	39	0.0140	down	2	4	7	7
Poa annua	49	26	0.0053	down	111	46	0.0000	down	1	5	7	7
Poa nemoralis/trivialis	82	63	0.0673	no change	492	377	0.0001	down			6	7
Polygala oxyptera	11	9	0.4119	no change	40	24	0.0300	down	5	1	3	8
Polygala serpyllifolia	11	0	0.0005	down	40	0	0.0000	down	5	1	2	8
Polypodium vulgare sens.lat.	33	12	0.0012	down	86	34	0.0000	down	5	1	3	6
Polystichum aculeatum	21	12	0.0814	no change	46	29	0.0320	down			5	5
Potentilla erecta	48	37	0.1390	no change	272	163	0.0000	down	4	2	2	7
Potentilla sterilis	63	29	0.0003	down	236	87	0.0000	down	5	1	5	5
Primula elatior	4	1	0.1875	no change	14	5	0.0318	down			6	4
Primula vulgaris	63	53	0.2017	no change	272	154	0.0000	down	4	2	4	5
Prunella vulgaris	54	42	0.1307	no change	184	100	0.0000	down	3	3	4	7
Pteridium aquilinum	89	82	0.3232	no change	737	572	0.0000	down	1	1	3	6
Ranunculus acris	47	20	0.0007	down	106	46	0.0000	down	3	3	4	7
Ranunculus flammula	18	10	0.0925	no change	35	13	0.0010	down	2	3	3	7
Ribes nigrum	24	3	0.0000	down	56	4	0.0000	down			6	5
Ribes rubrum	24	15	0.0998	no change	56	37	0.0307	down			6	5
Ribes uva-crispa	19	7	0.0145	down	25	9	0.0045	down	3	1	6	5
Rosa seedling/sp	72	40	0.0016	down	301	116	0.0000	down			6	6
Rubus fruticosus agg.	101	100	0.5000	no change	1247	1076	0.0002	down			6	6
Rubus idaeus	58	34	0.0080	down	256	94	0.0000	down			5	6
Rubus saxatilis	6	1	0.0625	no change	11	1	0.0032	down			4	7
Rumex acetosella	22	9	0.0147	down	39	18	0.0038	down	3	3	3	7
Rumex conglomeratus	43	9	0.0000	down	156	14	0.0000	down	1	3	7	8

Plant species	Site count '71	Site count resurvey	Binomial -p	Direction	Plot count '71	Plot count resurvey	Binomial - p	Direction	Srad	Rrad	EbergN	EbergL
Sagina sp.	12	2	0.0065	down	24	4	0.0001	down				
Sanicula europaea	43	20	0.0026	down	161	41	0.0000	down	5	1	5	4
Senecio aquaticus	15	2	0.0012	down	33	10	0.0003	down	1	4	5	7
Silene dioica	59	40	0.0350	down	276	157	0.0000	down	3	3	7	5
Solanum dulcamara	25	24	0.5000	no change	62	36	0.0056	down	2	2	7	7
Solidago virgaurea	33	9	0.0001	down	132	21	0.0000	down	4	2	3	5
Sonchus oleraceus	9	3	0.0730	no change	16	6	0.0262	down	1	4	7	7
Stachys officinalis	15	8	0.1050	no change	44	11	0.0000	down	5	1	3	7
Stachys sylvatica	64	55	0.2317	no change	204	163	0.0183	down	1	2	8	6
Stellaria holostea	61	42	0.0378	down	232	149	0.0000	down	3	3	6	5
Stellaria uliginosa	23	12	0.0448	down	42	19	0.0022	down	2	3	5	7
Succisa pratensis	24	11	0.0205	down	81	35	0.0000	down	5	1	2	7
Tamus communis	39	23	0.0279	down	141	76	0.0000	down	1	2	6	6
Taraxacum agg.	50	35	0.0642	no change	115	76	0.0029	down	2	4	5	7
Trientalis europaea	5	4	0.5000	no change	29	8	0.0004	down			3	5
Trifolium pratense	20	15	0.2498	no change	41	21	0.0076	down	3	3	5	7
Tussilago farfara	11	2	0.0112	down	12	2	0.0065	down	1	3	6	7
Vaccinium myrtillus	47	34	0.0910	no change	221	148	0.0001	down	3	1	2	6
Valeriana officinalis	34	25	0.1488	no change	94	66	0.0162	down	3	3	5	6
Veronica chamaedrys	61	44	0.0590	no change	259	178	0.0001	down	3	3	5	6
Veronica montana	68	58	0.2114	no change	287	214	0.0006	down	4	2	6	4
Veronica officinalis	30	21	0.1312	no change	88	54	0.0027	down	4	2	4	6
Vicia sepium	29	13	0.0098	down	58	17	0.0000	down	2	2	6	6
Viola hirta	13	3	0.0106	down	26	4	0.0000	down	5	1	2	7
Viola odorata	13	3	0.0106	down	26	7	0.0007	down	3	3	7	5
Viola palustris	22	17	0.2612	no change	55	34	0.0167	down	4	2	2	7

Plant species	Site count '71	Site count resurvey	Binomial -p	Direction	Plot count '71	Plot count resurvey	Binomial - p	Direction	Srad	Rrad	EbergN	EbergL
Viola riviniana/reichenbiana	95	86	0.2761	no change	718	437	0.0000	down			4	5
Adoxa moschatellina	3	5	0.3633	no change	9	8	0.5000	no change			5	4
Agrostis capillaris	80	73	0.3139	no change	470	420	0.0502	no change	3	3	4	6
Agrostis gigantea	8	10	0.4073	no change	9	16	0.1148	no change	1	3	7	7
Agrostis stolonifera	65	55	0.2057	no change	199	179	0.1642	no change	1	3	6	7
Allium ursinum	21	21	0.5612	no change	80	92	0.2008	no change	3	3	7	4
Alopecurus pratensis	3	3	0.6563	no change	6	5	0.5000	no change	2	2	7	7
Anemone nemorosa	43	41	0.4566	no change	148	174	0.0817	no change	3	3	4	5
Anthriscus sylvestris	17	16	0.5000	no change	39	45	0.2928	no change	1	3	7	6
Arum maculatum	35	46	0.1332	no change	154	178	0.1034	no change	3	3	7	4
Asplenium trichomanes	9	4	0.1334	no change	15	7	0.0669	no change	5	1	2	5
Brachypodium sylvaticum	65	62	0.4296	no change	343	305	0.0730	no change	4	1	5	6
Callitriche seedling/sp	7	3	0.1719	no change	14	7	0.0946	no change			6	7
Caltha palustris	7	13	0.1316	no change	18	26	0.1456	no change	4	2	4	7
Campanula latifolia	8	2	0.0547	no change	17	9	0.0843	no change			6	4
Carex binervis	11	11	0.5841	no change	28	20	0.1562	no change	5	1	2	7
Carex echinata	15	10	0.2122	no change	40	34	0.2807	no change	5	1	2	8
Carex flacca	7	6	0.5000	no change	18	14	0.2983	no change	5	1	2	7
Carex pallescens	3	8	0.1133	no change	11	11	0.5841	no change	5	1	4	6
Carex panicea	10	11	0.5000	no change	20	21	0.5000	no change	5	1	2	8
Carex paniculata	4	4	0.6367	no change	8	6	0.3953	no change			6	6
Carex pulicaris	3	3	0.6563	no change	8	6	0.3953	no change			2	8
Carex vesicaria	2	1	0.5000	no change	9	8	0.5000	no change			4	8
Centaurium erythraea	5	3	0.3633	no change	8	3	0.1133	no change	3	3	3	8
Cerastium fontanum	40	35	0.3222	no change	108	91	0.1283	no change	2	4	4	7

Plant species	Site count '71	Site count resurvey	Binomial -p	Direction	Plot count '71	Plot count resurvey	Binomial - p	Direction	Srad	Rrad	EbergN	EbergL
Ceratocapnos claviculata	9	4	0.1334	no change	16	9	0.1148	no change	3	3	5	5
Chrysosplenium oppositifolium	41	47	0.2971	no change	178	181	0.4580	no change	3	3	5	5
Crataegus laevigata	3	7	0.1719	no change	10	18	0.0925	no change			5	5
Crepis capillaris	5	2	0.2266	no change	7	3	0.1719	no change	2	4	4	7
Cynosurus cristatus	20	19	0.5000	no change	53	58	0.3522	no change	3	3	4	7
Cytisus scoparius	12	10	0.4159	no change	23	15	0.1279	no change	3	1	4	8
Drosera rotundifolia	5	5	0.6230	no change	14	7	0.0946	no change			1	8
Elymus caninus	9	9	0.5927	no change	14	15	0.5000	no change	3	3	8	7
Elytrigia repens	6	12	0.1189	no change	8	16	0.0758	no change	1	2	7	7
Epilobium hirsutum	12	17	0.2291	no change	26	34	0.1831	no change	1	1	7	7
Epilobium palustre	15	9	0.1537	no change	29	18	0.0719	no change	4	2	3	7
Epilobium parviflorum	3	3	0.6563	no change	5	7	0.3872	no change	3	3	5	7
Equisetum fluviatile	2	1	0.5000	no change	5	5	0.6230	no change	3	1	4	8
Equisetum sylvaticum	11	11	0.5841	no change	39	33	0.2780	no change			5	5
Erica cinerea	14	12	0.4225	no change	54	45	0.2108	no change	4	1	2	7
Erica tetralix	6	5	0.5000	no change	22	24	0.4415	no change	4	1	1	8
Eriophorum vaginatum	5	4	0.5000	no change	6	9	0.3036	no change	3	1	1	8
Euonymus europaeus	14	13	0.5000	no change	43	32	0.1240	no change	3	1	5	5
Eupatorium cannabinum	8	5	0.2905	no change	13	13	0.5775	no change	2	2	7	7
Euphorbia amygdaloides	14	12	0.4225	no change	43	43	0.5429	no change			6	4
Festuca vivipara	4	3	0.5000	no change	19	10	0.0680	no change			2	8
Galium aparine	71	69	0.4663	no change	329	332	0.4690	no change	1	3	8	6
Geranium dissectum	3	3	0.6563	no change	4	7	0.2744	no change	2	4	6	7
Geranium robertianum	81	80	0.5000	no change	395	371	0.2030	no change	2	4	6	5
Glechoma hederacea	57	49	0.2484	no change	214	204	0.3299	no change	3	3	7	6

Plant species	Site count '71	Site count resurvey	Binomial -p	Direction	Plot count '71	Plot count resurvey	Binomial - p	Direction	Srad	Rrad	EbergN	EbergL
Gymnocarpium dryopteris	10	11	0.5000	no change	21	16	0.2557	no change			4	4
Hordelymus europaeus	5	2	0.2266	no change	8	4	0.1938	no change			7	6
Hypericum hirsutum	8	9	0.5000	no change	15	22	0.1620	no change	3	3	5	6
Hypericum tetrapterum	4	3	0.5000	no change	11	9	0.4119	no change	3	3	4	7
Impatiens glandulifera	4	6	0.3770	no change	6	11	0.1662	no change	1	3	7	6
Juncus conglomeratus	21	15	0.2025	no change	31	34	0.4022	no change	2	1	3	7
Juncus effusus	72	62	0.2185	no change	256	247	0.3607	no change	2	1	4	7
Juncus squarrosus	5	5	0.6230	no change	13	14	0.5000	no change	4	1	2	7
Lamiastrum galeobdolon	30	34	0.3540	no change	198	176	0.1388	no change	4	1	6	4
Lathyrus pratensis	11	9	0.4119	no change	24	15	0.0998	no change	3	3	5	7
Luzula campestris/multiflora	29	31	0.4487	no change	124	112	0.2370	no change			3	7
Luzula sylvatica	26	21	0.2800	no change	106	84	0.0637	no change	3	1	4	5
Lycopus europaeus	5	4	0.5000	no change	7	5	0.3872	no change	1	3	6	7
Lysimachia nummularia	2	5	0.2266	no change	4	10	0.0898	no change	3	3	5	5
Matricaria discoidea	3	4	0.5000	no change	3	7	0.1719	no change	1	5	7	7
Melica uniflora	26	25	0.5000	no change	78	68	0.2282	no change	4	1	5	4
Molinia caerulea	24	18	0.2204	no change	88	68	0.0640	no change	3	1	2	7
Myosotis scorpioides	4	2	0.3438	no change	12	7	0.1796	no change	1	3	6	7
Nardus stricta	12	8	0.2517	no change	34	26	0.1831	no change	5	1	2	7
Narthecium ossifragum	6	5	0.5000	no change	23	21	0.4402	no change			1	8
Odontites vernus	3	6	0.2539	no change	4	9	0.1334	no change	1	5	5	7
Oenanthe crocata	7	6	0.5000	no change	11	12	0.5000	no change	2	3	7	7
Orchis mascula	4	4	0.6367	no change	4	7	0.2744	no change	4	2	4	6
Oreopteris limbosperma	19	17	0.4340	no change	65	57	0.2632	no change			3	6
Persicaria maculosa	6	6	0.6128	no change	9	6	0.3036	no change	1	5	7	7

Plant species	Site count '71	Site count resurvey	Binomial -p	Direction	Plot count '71	Plot count resurvey	Binomial - p	Direction	Srad	Rrad	EbergN	EbergL
Phalaris arundinacea	6	6	0.6128	no change	19	16	0.3679	no change	1	1	7	7
Phegopteris connectilis	9	11	0.4119	no change	26	29	0.3939	no change			4	4
Phleum pratense sens.lat.	12	13	0.5000	no change	23	15	0.1279	no change			6	8
Polygonatum multiflorum	1	3	0.3125	no change	11	8	0.3238	no change			6	4
Polygonum aviculare agg.	5	4	0.5000	no change	6	4	0.3770	no change	1	5	7	7
Potentilla anserina	7	5	0.3872	no change	11	6	0.1662	no change	2	3	6	8
Potentilla reptans	11	6	0.1662	no change	16	8	0.0758	no change	2	3	5	7
Ranunculus repens	78	73	0.3725	no change	310	284	0.1525	no change	1	3	7	6
Rumex acetosa	38	32	0.2752	no change	102	85	0.1210	no change	3	3	4	7
Rumex obtusifolius	28	40	0.0909	no change	70	80	0.2313	no change	1	3	9	7
Scrophularia auriculata	3	4	0.5000	no change	7	4	0.2744	no change	1	3	7	7
Scrophularia nodosa	42	42	0.5434	no change	92	85	0.3261	no change	1	3	6	5
Scutellaria galericulata	5	4	0.5000	no change	14	13	0.5000	no change	2	3	5	7
Senecio jacobaea	20	33	0.0492	up	40	56	0.0627	no change	1	4	4	7
Sonchus asper	4	4	0.6367	no change	4	6	0.3770	no change	1	4	6	7
Stachys palustris	4	4	0.6367	no change	7	8	0.5000	no change	1	3	7	7
Stellaria graminea	12	9	0.3318	no change	15	18	0.3642	no change	3	3	4	7
Stellaria media	49	44	0.3393	no change	96	93	0.4422	no change	1	5	7	7
Teucrium scorodonia	1	1	0.7500	no change	7	6	0.5000	no change	4	2	3	6
Thymus polytrichus	5	4	0.5000	no change	9	6	0.3036	no change	5	1	2	8
Torilis japonica	11	6	0.1662	no change	15	16	0.5000	no change	3	3	7	7
Trichophorum cespitosum	5	4	0.5000	no change	14	17	0.3601	no change			1	8
Trifolium repens	34	30	0.3540	no change	73	65	0.2757	no change	2	3	6	7
Triticum aestivum	4	2	0.3438	no change	5	6	0.5000	no change			7	8
Ulex sp.	15	11	0.2786	no change	23	16	0.1684	no change	3	1	2	7
Umbilicus rupestris	5	4	0.5000	no change	10	10	0.5881	no change	5	1	4	6

Plant species	Site count '71	Site count resurvey	Binomial -p	Direction	Plot count '71	Plot count resurvey	Binomial - p	Direction	Srad	Rrad	EbergN	EbergL
Urtica dioica	85	83	0.4693	no change	478	468	0.3849	no change	1	1	8	6
Vaccinium vitis-idaea	3	2	0.5000	no change	13	7	0.1316	no change	4	1	2	6
Veronica beccabunga	11	5	0.1051	no change	17	9	0.0843	no change	1	3	6	7
Veronica scutellata	3	1	0.3125	no change	8	3	0.1133	no change	2	3	3	8
Aira praecox	4	8	0.1938	no change	7	26	0.0007	up	3	3	2	8
Alliaria petiolata	4	14	0.0154	up	7	20	0.0096	up	1	3	8	5
Anisantha sterilis	0	5	0.0313	up	0	16	0.0000	up	1	4	7	7
Atriplex patula	2	4	0.3438	no change	2	9	0.0327	up	1	5	7	7
Carex pendula	23	21	0.4402	no change	66	92	0.0232	up	4	1	6	5
Carex pilulifera	6	13	0.0835	no change	11	33	0.0006	up	5	1	2	7
Carex remota	36	36	0.5469	no change	92	123	0.0203	up	3	3	6	4
Cirsium arvense	27	43	0.0361	up	50	101	0.0000	up	1	1	6	8
Cirsium vulgare	21	33	0.0668	no change	33	71	0.0001	up	1	3	6	7
Hyacinthoides non-scripta	82	80	0.4687	no change	470	552	0.0056	up	3	3	6	5
Iris pseudacorus	6	8	0.3953	no change	22	40	0.0150	up	2	1	6	7
Juncus bufonius sens.lat.	4	11	0.0592	no change	4	15	0.0096	up	2	4	4	7
Juncus inflexus	2	8	0.0547	no change	2	12	0.0065	up	3	1	5	7
Lolium perenne	16	25	0.1055	no change	35	68	0.0007	up	2	3	6	8
Melampyrum cristatum	0	4	0.0625	no change	0	11	0.0005	up			2	6
Milium effusum	18	21	0.3746	no change	78	102	0.0431	up	4	2	5	4
Myosotis arvensis	0	10	0.0010	up	0	26	0.0000	up	2	4	6	7
Myosotis secunda	0	3	0.1250	no change	0	12	0.0002	up	1	3	4	6
Narcissus pseudonarcissus	0	1	0.5000	no change	0	13	0.0001	up			5	7
Phyllitis scolopendrium	17	22	0.2612	no change	40	61	0.0230	up	5	1	5	4
Poa pratensis sens.lat.	15	18	0.3642	no change	30	47	0.0338	up	3	3	6	7
Polystichum setiferum	3	11	0.0287	up	4	23	0.0002	up			6	4

Plant species	Site count '71	Site count resurvey	Binomial -p	Direction	Plot count '71	Plot count resurvey	Binomial - p	Direction	Srad	Rrad	EbergN	EbergL
Ranunculus ficaria	0	14	0.0001	up	0	68	0.0000	up	2	4	6	6
Rosa arvensis	0	6	0.0156	up	0	18	0.0000	up			5	6
Rosa canina agg.	0	9	0.0020	up	0	19	0.0000	up			6	6
Rubus caesius	0	7	0.0078	up	0	16	0.0000	up	3	1	6	7
Rumex crispus	0	11	0.0005	up	0	21	0.0000	up	1	4	6	8
Senecio vulgaris	2	10	0.0193	up	2	17	0.0004	up	1	5	7	7
Stellaria nemorum	1	6	0.0625	no change	3	18	0.0007	up			7	4
Veronica serpyllifolia	9	21	0.0214	up	17	37	0.0045	up	2	4	5	7

Appendix 6 ‘Steele’Recording Card

1/3	Vice County		4/6	Wood Code No.	

TREES AND SHRUBS

Score through the species and tick appropriate columns.
Qualify as necessary by R = Rare; A = Abundant; LA = Locally abundant.

	SPECIES	Canopy	Understory	Shrub	Coppice	Reg. Seedling	Reg. Sapling		SPECIES	Canopy	Understory	Shrub	Coppice	Reg. Seedling	Reg. Sapling
		1/4	5	6	7	8	9			1/4	5	6	7	8	9
7	Acer cam Field Maple							43	Querc cer Turkey Oak						
8	pse Sycamore							44	pet Sessile Oak						
9	Aescu hip Horse Chestnut							45	rob Pedunculate Oak						
10	Alnus glu Alder							46	Hybrid Oaks						
11	Betul pub Birch							47	Rhamn cat Buckthorn						
12	ver Silver Birch							48	Rhodo pon Rhododendron						
13	Carpi bet Hornbeam							49	Ribes nig Blackcurrant						
14	Casta sat Sweet Chestnut							50	syl						
15	Clema vit Travellers Joy							51	uva Gooseberry						
16	Cornu san Dogwood							52	Rosa spp Roses						
17	Coryl ave Hazel							53	Salix alb White Willow						
18	Crata mon Hawthorn							54	cap Goat Willow						
19	oxy Midland Hawthorn							55	Atrocin/cin Sallow						
20	Daphn lau Spurge Laurel							56	fra Crack Willow						
21	Euony eur Spindle							57	pen Bay Willow						
22	Fagus syl Beech							58	spp						
23	Frang aln Alder Buckthorn							59	Sambu nig Elder						
24	Fraxi exc Ash							60	Sarot sco Broom						
25	Heder hel Ivy							61	Sorbu ari (agg.) Whitebeam						
26	Ilex aqu Holly							62	auc Rowan						
27	Junip com Juniper							63	tor Wild Service						
28	Larix Larches							64	spp						
29	Ligus vul Privet							65	Taxus bac Yew						
30	Lonic per Honeysuckle							66	Tilia cor Small Leaved Lime						
31	Mahon aqu Oregon Grape							67	vul Common Lime						
32	Malus syl Crab Apple							68	Ulex eur Gorse						
33	Picea Spruces							69	gal Dwarf Furze						
34	Pinus syl Scots Pine							70	Ulmus car Smooth Elm						
35	spp							71	gla Wych Elm						
36	Popul tre Aspen							72	pro English Elm						
37	spp							73	Vibur lan Wayfaring Tree						
38	Prunu avi Wild Cherry							74	opu Guelder Rose						
39	pad Bird Cherry							75	Viscu alb Mistletoe						
40	spi Blackthorn														
41	lau Cherry Laurel							76	Other Broad-Leaved Species						
42	spp							77	Other Coniferous Species						
		1/4	5	6	7	8	9			1/4	5	6	7	8	9

78/79	Average Height of Trees	ft.	80	Average Tree Canopy Closure	%

NOTES

1/3	Vice County		4/6	Wood Code No.	

GROUND FLORA WITHIN WOODLAND

Score through the species present and qualify as necessary by
R = Rare: A = Abundant and LA = Locally Abundant

7 Desch fle Wavy Hairgrass		38 Blech spi Hard Fern		58 Carex ech Star Sedge	
8 Digit pur Foxglove		39 Callu vul Ling		59 Carex nig Common Sedge	
9 Erica cin Bell Heather		40 Orchi eri Heath Spotted Orchid		60 Carex ros Beaked Sedge	
10 Galiu her Heath Bedstraw		41 Vacci myr Bilberry		61 Dryop spi Narrow Buckler Fern	
11 Holcu mol Creeping-Soft-Grass				62 Erica tet Cross-Leaved Heath	
12 Luzul pil Hairy Woodrush				63 Juncu eff Soft Rush	
13 Melam pra Common Cow-Wheat				64 Molin cae Purple Moor Grass	
14 Poten ere Common Tormentil				65 Polyt comm Common Hair Moss	
15 Succi pra Devil's Bit Scabious				66 Sphagnum spp Bog Mosses	
16 Anemo nem Wood Anemone		42 Athyr fil Lady Fern		67 Chrys opp Opposite-Leaved Golden Saxifrage	
17 Endym non Bluebell		43 Desch cae Tufted Hairgrass		68 Cirsi pal Marsh Thistle	
18 Lonic per Honeysuckle		44 Holcu lan Yorkshire Fog		69 Galiu pal Marsh Bedstraw	
19 Oxali ace Wood Sorrel		45 Phyll sco Hart's Tongue		70 Poten pal Marsh Cinquefoil	
20 Pteri aqu Bracken				71 Ranun Flammula Lesser Spearwort	
21 Rubus fru (agg.) Bramble				72 Ranun Repens Creeping Buttercup	
22 Teucr scorod Wood Sage				73 Viola pal Marsh Violet	
23 Veron off Common Speedwell					
24 Viola spp Violets					
25 Brach syl Slender False Brome		46 Ajuga rep Bugle		74 Carex panicula Panicled Sedge	
26 Circa lut Enchanter's Nightshade		47 Alliu urs Ramsons		75 Carex rem Remote Sedge	
27 Conva maj Lily-of-the-Valley		48 Arum mac Lords and Ladies		76 Crepi pal Marsh Hawksbeard	
28 Eupho amy Wood Spurge		49 Asper odo Sweet Woodruff		77 Equis tel Great Horsetail	
29 Fraga ves Wild Stawberry		50 Calam epi Bushgrass		78 Eupat can Hemp Agrimony	
30 Galeo lut Yellow Archangel		51 Carex pen Pendulous Sedge		79 Iris pse Yellow Flag	
31 Geran rob Herb Robert		52 Carex syl Wood Sedge		80 Thely pal Marsh Fern	
32 Glech hed Ground Ivy		53 Filip ulm Meadow Sweet			
33 Mercu per Dog's Mercury		54 Geum riv Water Avens			
34 Poten ste Barren Strawberry		55 Liste ova Twayblade			
35 Primu vul Primrose		56 Ranun fic Lesser Celandine			
36 Sanic eur Sanicle		57 Valer off Valerian			
37 Veron cha Germander Speedwell					

NOTES

NOTES

WOODLAND SURVEY MARCH 1967 S 004

1/3	Vice County		4/6	Wood Code Number		7/36	Name of Wood	
37/39	Nature Conservancy Region		40/42	1 Inch O.S. Sheet Number		43/50	Grid Reference	
51/53	Acreage		54	Length / Breadth Ratio				

Owner/Tenant/ Agent

Sketch Map of Area Surveyed

Surveyor		
55/57	Date	

Number the Grid Lines

		1	2	3	4	5	6	7	8	9
58	Status	National Nature Reserve	Forest Nature Reserve	S.S.S.I	Local Nature Reserve	County Trust Reserve	Informal Reserve Agreement	Other Nature Reserve		
59		Other Statutory Area	Forestry Commission	Other Govt. Areas	National Trust	Common Land	Private			
60	Outstanding Interest	Seed Plants	Ferns	Bryophytes	Fungi	General Flora	General Ecology	Archae-ology	Geology	
61		Mammals	Birds	Reptiles	Amphibia	Lepid-optera	Cole-optera	Other Inverts.	General Fauna	
62	Woodland Type	Broad-Leaved Woodland	Conifer Woodland	Mixed Woodland	Coppice	Coppice with Standards	Scrub			
63		Regular	Irregular	Plantation	Parkland					
64	Management: Objectives	Timber	Game	Grazing	Shelter	Amenity	Nature Conser-vation	Education	Research	Other
65	Management: Recent Activity Last 50 years	Clear Felling	Thinning	Coppicing	Planting	Under-Planting	Grazing	Intense Recreation Use	None	
66	Management: Past Activity	Felling	Coppicing	Pollarding	Grazing	Ridge and Furrow	None	Planting		
67	Margin	Abrupt	Diffuse	Contin. Scrub	Fence or Hedge	Wall	Water			
68	Adjacent Land Use	Broad Leaved Woodland	Coniferous Woodland	Mixed Woodland	Scrub	Arable	Rough Pasture	Improved Pasture	Heath or Moorland	
69		River	Lake or Reservoir	Marsh or Fen	Sea	Road	Rail	Housing or Industry	Quarry etc.	
70	Additional Habitats within Wood	Tree Stumps	Canal or River	Dyke or Ditch	Stream	Pond	Lake	Marshy/ Boggy Areas	Banks	
71		Buildings	Paths <10 ft. Wide	Rides >10 ft. Wide	Glades	Fields	Rock Outcrops	Boulders	Scree	
72	Mammals present in Woodland	Sheep	Cattle	Horses	Pigs					
73		Deer	Rabbits	Hares	Grey Squirrels	Red Squirrels	Badgers	Foxes	Moles	
74	Soil	Chalk	Other Lime-Stones	Peat	Alluvium	Gravel	Sand	Loam	Clay	
		-1	2	3	4	5	6	7	8	9

Appendix 7 Soil processing and analyses protocols.

1. Soil was sampled (approximately 2 kg to depth of 15 cm) from each plot, placed in plastic bags and returned to CEH Merlewood.
2. On arrival at CEH Merlewood, soil samples were placed in a cold room at ca. $4^{o}C$ until processing (typically up to 48 hrs).
3. Sample site and plot number were recorded on log sheets.
4. Where possible, soil samples sieved individually using a 2 mm stainless steel mesh – cleaned after each use, removing all stones and vegetation.
5. If sieving was not possible, the soil was broken up into lumps/crumbs to obtain a relatively homogeneous sample for pH analyses and to aid drying.
6. Fresh soil pH was measured using a standard protocol.
7. Soil samples air-dried in trays in an oven at $25^{o}C$ for ca. 7 days.
8. Air-dry soil pH measured again using standard protocol.
9. Sample taken for loss-on-ignition analyses at $550^{o}C$ using standard protocols of the Environmental Chemistry Section, CEH Merlewood (Appendix).
10. Samples placed in labelled air-tight polypropylene containers for long-term storage.

Soil pH - Method

1. Calibrate the pH meter using buffer solutions of pH 4 and pH 7.
2. Add $10cm^3$ of the sample to a 100ml beaker.
3. Add ~ 10ml of spectrum water (ultra pure) obtained from the Environmental Chemistry reservoir. Mix vigorously with a glass rod / spatula to a paste, then top up to the 50ml mark.
4. Leave for 20 minutes.
5. Insert pH electrode, stir and press read button on pH meter.
6. Leave for a further minute.
7. Take pH reading and record result.
8. Rinse and dry electrode after each sample has been read.

Determination of air-dry moistures and loss-on-ignition (Soil Organic Matter)

1. Dry small crucible in small oven at $105^{o}C$.
2. Cool in dessicator
3. Weigh crucible and approx. 1g air-dry sieved sample (= W_1 g)
4. Dry 3 hours at $105^{o}C$
5. Cool and weigh as before (= W_2 g)
6. Place in muffle (ashing) at $550^{o}C$ for 2 hours (allow ½ hour to reach $550^{o}C$)
7. Cool in dessicator and re-weigh (= W_3 g)
8. Run duplicate determinations and two standards.

Calculation

Let $(W_2 - W_1)$ oven dried = $(W_3 - W_1)$ muffle dried

Then % dry matter = $\dfrac{(W_3 - W_1)}{(W_2 - W_1)} \times 100$

APPENDIX 8 Site level tests of change in indicator variables.

Key to Variables

N_pa:	Mean Ellenberg fertility score in each plot (unweighted)
R_pa:	Mean Ellenberg pH score in each plot (unweighted)
L_pa:	Mean Ellenberg light score in each plot (unweighted)
SOM:	Soil Organic Matter
P_op:	Count of open habitats at plot level
P_man:	Count of plot level signs of recent management
P_reg:	Species richness of regenerating tree and shrub stems in plts
N_cov:	Cover-weighted Ellenberg fertility
R_cov:	Cover-weighted Ellenberg pH
L_cov:	Cover-weighted Ellenberg light
B area:	Basal area of trees and shrubs
Spp_rich:	Ground flora species richness (excludes bryophytes and lichens)
C:	Grime's competitor score
S:	Grime's stress-tolerator
R:	Ruderal score
Gram_cov:	Graminoid cover
Dom_cov:	Summed cover of Bracken + Bramble + *Rhododendron* spp.
Bryo_cov:	Bryophyte cover

SITE	N_pa	Sig	R_pa	sig	L_pa	sig	soil pH	sig	SOM	sig	P_op	sig	P_man	sig	P_reg	sig	N_cov	sig
1	-0.20	**	-0.14	*	-0.20	*	-0.09	ns	11.75	***	0.01	ns	0.04	ns	0.01	ns	-1.02	**
2	-0.08	Ns	-0.14	ns	0.00	ns	0.76	*	0.65	ns	-0.10	*	-0.04	ns	0.00	ns	-0.56	ns
3	-0.08	Ns	0.00	ns	-0.15	ns	0.27	ns	-5.67	*	-0.14	**	0.04	ns	-0.06	*	0.45	ns
4	0.02	ns	-0.01	ns	0.04	ns	0.63	ns	-0.52	ns	-0.06	ns	-0.02	ns	-0.03	ns	0.15	ns
5	0.15	ns	0.24	ns	0.15	ns	0.20	ns	2.16	ns	-0.05	ns	-0.10	ns	0.02	ns	0.16	ns
6	-0.01	ns	0.00	ns	0.02	ns	0.81	*	0.39	ns	-0.02	ns	0.21	*	-0.08	***	-0.34	ns
7	0.09	ns	0.06	ns	0.11	ns	0.46	*	0.48	ns	0.06	ns	0.00		-0.11	***	-0.11	ns

SITE	N_pa	Sig	R_pa	sig	L_pa	sig	soil pH	sig	SOM	sig	P_op	sig	P_man	sig	P_reg	sig	N_cov	sig
8	0.04	ns	0.05	ns	0.08	ns	0.31	ns	2.04	ns	-0.05	ns	0.00		-0.02	ns	-0.03	ns
9	0.05	ns	0.10	ns	-0.05	ns	-0.23	ns	0.05	ns	-0.03	**	0.00	ns	-0.03	ns	0.03	ns
10	0.10	ns	0.11	*	-0.44	*	1.46	***	-1.49	ns	-0.04	ns	0.00		0.03	ns	0.77	***
11	0.04	**	0.03	ns	0.05	**	-0.26	*	1.43	*	-0.09	*	0.13	ns	0.01	ns	0.08	ns
12	0.01	ns	0.13	*	-0.23	*	0.59	***	1.62	ns	-0.04	ns	-0.06	ns	-0.08	**	0.17	ns
13	0.00	ns	0.03	ns	0.30	ns	1.01	**	5.30	*	-0.05	ns	-0.02	ns	-0.06	*	-0.05	ns
14	0.11	ns	0.13	ns	-0.02	ns	0.15	ns	9.46	ns	0.03	ns	0.00		-0.07	*	0.06	ns
15	-0.67	**	-0.48	*	0.01	ns	1.25	***	-0.42	ns	0.04	ns	-0.09	*	0.00	ns	-0.46	ns
16	0.01	ns	0.00	ns	-0.03	ns	0.53	ns	4.33	ns	-0.09	ns	-0.04	ns	-0.02	ns	0.08	ns
17	0.01	ns	-0.13	ns	0.12	ns	-0.14	ns	-2.86	ns	0.01	ns	0.02	ns	-0.01	ns	0.08	ns
18	-0.04	ns	-0.07	ns	0.31	*	0.44	*	2.89	*	0.01	ns	0.00	ns	-0.08	**	-0.14	ns
19	0.12	**	0.05	ns	-0.11	ns	0.77	***	3.45	ns	0.05	ns	0.00		-0.10	***	0.16	ns
20	0.09	ns	0.01	ns	-0.11	ns	0.81	**	0.12	ns	0.00	ns	0.04	ns	-0.08	**	-0.08	ns
21	0.28	**	0.16	*	-0.05	ns	0.32	ns	-0.31	ns	0.01	ns	-0.06	ns	0.00	ns	0.44	**
22	0.00	ns	-0.04	ns	0.02	ns	0.17	ns	-1.39	ns	0.08	*	-0.02	ns	-0.07	*	-0.21	ns
23	0.11	*	0.07	**	-0.02	ns	0.56	**	-0.96	ns	0.03	ns	-0.08	ns	-0.13	***	0.00	ns
24	0.10	ns	0.05	ns	-0.01	ns	0.28	ns	7.53	***	0.03	ns	-0.04	ns	-0.13	***	0.18	ns
25	0.08	ns	0.13	ns	-0.05	ns	1.18	***	1.15	ns	0.00	ns	-0.08	ns	-0.08	***	0.05	ns
26	0.01	ns	0.02	ns	-0.01	ns	0.03	ns	1.92	ns	0.07	*	0.00	ns	-0.06	*	0.22	*
27	0.04	ns	-0.29	ns	0.40	**	0.22	ns	-5.62	***	-0.01	ns	0.06	ns	-0.01	ns	-0.33	*
28	0.00	ns	-0.05	ns	0.13	ns	0.26	ns	2.63	ns	0.01	ns	-0.02	ns	-0.03	ns	0.20	ns
29	0.01	ns	0.02	ns	-0.02	ns	1.32	*	4.89	ns	-0.07	ns	0.00	ns	0.08	**	0.52	**
30	-0.02	ns	-0.03	ns	-0.02	ns	0.57	***	8.95	**	0.02	ns	0.13	**	0.00	ns	1.27	***
31	-0.01	ns	0.01	ns	-0.01	ns	0.15	ns	-1.07	ns	0.02	ns	0.00	ns	0.00	ns	0.18	ns
32	-0.15	ns	-0.27	ns	-0.47	**	0.37	***	5.64	**	-0.01	ns	0.27	*	0.05	***	-1.42	*
33	-0.03	ns	-0.23	ns	0.24	ns	0.88	**	1.62	ns	-0.01	ns	0.02	ns	-0.09	***	-0.15	ns
34	0.14	*	0.24	**	-0.49	***	1.10	***	-1.00	ns	0.05	ns	0.10	*	-0.09	***	0.20	*
35	-0.13	ns	-0.17	ns	0.02	ns	-0.09	ns	-4.26	ns	-0.02	ns	0.04	ns	-0.09	*	-0.27	ns
36	0.37	*	0.48	*	0.30	*	0.28	ns	1.36	ns	-0.04	ns	-0.13	ns	-0.08	***	1.54	***
37	-0.49	ns	-0.53	ns	-0.22	ns	0.22	ns	-1.71	ns	0.03	ns	0.04	ns	0.02	ns	-1.04	**
38	-0.02	ns	-0.12	ns	-0.20	ns	0.17	ns	-6.85	*	0.00	ns	-0.16	*	-0.13	***	0.17	ns

SITE	N_pa	Sig	R_pa	sig	L_pa	sig	soil pH	sig	SOM	sig	P_op	sig	P_man	sig	P_reg	sig	N_cov	sig
39	-0.77	*	-0.26	ns	0.48	***	1.14	***	-18.34	*	-0.06	ns	-0.21	*	-0.01	ns	0.19	ns
40	0.13	ns	0.01	ns	-0.06	ns	0.13	ns	3.13	ns	-0.12	**	-0.10	ns	0.00	ns	0.63	*
41	-0.20	ns	-0.16	ns	-0.10	ns	-0.10	ns	-1.64	ns	-0.06	ns	0.00		0.02	*	0.43	*
42	0.15	ns	0.20	ns	-0.04	ns	1.03	***	-2.05	ns	-0.04	ns	0.00		-0.06	**	0.04	ns
43	-0.14	ns	-0.10	ns	0.14	ns	0.53	***	-13.74	ns	0.07	ns	0.02	ns	-0.03	ns	-0.34	ns
44	-0.46	*	0.02	ns	0.80	**	0.96	**	-3.95	ns	-0.01	ns	-0.13	*	-0.08	***	-0.23	ns
45	0.32	ns	0.25	ns	0.08	ns	0.24	ns	4.35	ns	0.00	ns	-0.13	**	0.08	**	0.81	**
46	0.07	ns	-0.03	ns	0.27	ns	0.17	ns	1.18	ns	-0.01	ns	0.00		-0.02	ns	0.12	ns
47	-0.28	ns	-0.33	ns	0.00	ns	0.37	ns	-0.23	ns	-0.13	**	0.00	ns	-0.05	*	-0.14	ns
48	0.03	ns	0.03	ns	-0.14	ns	0.10	ns	6.52	*	0.02	ns	0.00		-0.13	***	0.00	ns
49	0.04	ns	0.04	ns	0.11	ns	-0.14	ns	-3.68	ns	-0.04	ns	-0.04	ns	0.01	ns	0.27	ns
50	0.00	ns	0.07	ns	0.08	ns	0.40	*	-11.33	**	0.04	ns	0.10	*	-0.02	ns	0.32	ns
51	0.02	ns	0.03	*	0.00	ns	-0.15	ns	4.76	**	-0.04	ns	0.00		-0.01	ns	-0.01	ns
52	0.10	ns	0.05	ns	-0.01	ns	-0.12	ns	3.37	ns	-0.15	***	-0.06	ns	0.02	ns	1.04	*
53	0.08	ns	0.02	ns	-0.19	*	0.80	*	3.72	ns	-0.09	**	-0.02	ns	-0.06	**	0.53	*
54	-0.54	**	-0.55	*	-0.36	*	-0.17	ns	-6.07	ns	-0.02	ns	0.00	ns	-0.09	***	-1.36	***
55	0.27	**	0.10	ns	-0.58	*	-0.18	ns	9.48	ns	-0.30	***	0.00		-0.04	*	0.25	ns
56	0.08	ns	0.02	ns	-0.17	ns	0.23	ns	-3.55	*	-0.01	ns	0.00		-0.06	*	0.68	*
57	0.10	ns	0.04	ns	-0.10	ns	0.49	*	-1.19	*	-0.07	ns	-0.04	ns	-0.06	**	0.14	ns
58	0.04	ns	0.03	ns	-0.05	ns	0.03	ns	0.84	ns	-0.06	*	0.00		0.00	ns	0.21	ns
59	0.09	ns	0.18	ns	0.08	ns	0.11	ns	2.36	ns	-0.07	ns	0.00		-0.05	**	0.54	ns
60	0.05	ns	0.09	ns	0.04	ns	0.10	ns	-4.25	ns	0.06	ns	0.19	*	-0.21	***	-0.39	ns
61	0.11	ns	0.06	ns	0.06	ns	-0.06	ns	4.27	*	-0.02	ns	-0.19	***	-0.04	ns	0.21	ns
62	-0.35	ns	-0.25	ns	0.23	ns	0.25	ns	0.90	ns	-0.01	ns	0.00		-0.07	**	0.24	ns
63	0.12	ns	0.15	*	-0.04	ns	0.55	*	-1.01	ns	0.01	ns	-0.07	ns	-0.02	ns	0.29	ns
64	-0.51	*	-0.49	ns	-0.02	ns	0.32	ns	-7.69	ns	-0.02	ns	0.00	ns	-0.09	**	-0.22	ns
65	0.04	*	-0.05	**	0.02	ns	0.27	*	-3.08	*	0.04	ns	0.00		-0.11	***	0.01	ns
66	0.08	ns	-0.03	ns	-0.14	ns	-0.26	ns	1.10	ns	0.02	ns	-0.06	ns	0.03	ns	0.20	ns
67	-0.09	ns	-0.15	ns	-0.08	ns	0.36	ns	-8.12	ns	-0.09	ns	0.00		-0.06	ns	0.53	ns
68	-0.05	ns	-0.05	*	-0.15	*	0.49	*	-0.41	ns	0.00	ns	0.02	ns	-0.11	**	-0.33	ns
69	0.02	ns	0.01	ns	-0.02	ns	0.58	ns	-2.03	ns	-0.03	ns	-0.02	ns	-0.04	ns	0.14	ns

SITE	N_pa	Sig	R_pa	sig	L_pa	sig	soil pH	sig	SOM	sig	P_op	sig	P_man	sig	P_reg	sig	N_cov	sig
70	0.04	ns	-0.02	ns	0.15	***	0.28	ns	-0.05	ns	0.04	ns	-0.06	ns	-0.04	**	-0.20	ns
71	0.05	ns	0.00	ns	0.10	ns	0.27	ns	3.38	*	0.00	ns	-0.02	ns	-0.10	***	0.05	ns
72	-0.39	*	-0.32	*	-0.24	*	0.19	ns	-4.47	ns	0.05	ns	0.00		-0.01	ns	-0.33	ns
73	-0.27	ns	-0.24	ns	-0.13	ns	0.31	**	11.27	*	-0.05	*	0.06	ns	-0.05	**	0.30	ns
74	0.64	ns	0.51	ns	-0.02	ns	-0.29	ns	-0.92	ns	-0.10	*	-0.02	ns	-0.04	**	0.88	**
75	-0.21	ns	-0.04	ns	-0.17	*	-0.22	ns	1.85	ns	-0.03	**	0.00		0.06	*	-0.09	ns
76	-0.28	**	-0.19	ns	0.21	ns	0.33	ns	-1.08	ns	0.02	ns	0.00		-0.01	ns	-0.25	*
77	-0.11	ns	-0.16	ns	-0.04	ns	-0.04	ns	6.73	ns	-0.11	*	-0.17	*	-0.05	**	-0.12	ns
78	0.00	ns	-0.18	ns	-0.25	**	0.29	*	0.23	ns	-0.17	***	0.00		0.01	ns	0.82	ns
79	-0.10	ns	-0.09	ns	0.00	ns	0.15	ns	1.98	ns	-0.09	*	0.00		0.08	*	-0.48	ns
80	-0.12	ns	-0.14	ns	-0.04	ns	-0.51	ns	-0.88	ns	-0.03	ns	-0.04	ns	0.00	ns	-0.22	**
81	0.16	*	0.04	*	-0.12	ns	-0.09	ns	7.89	*	-0.15	***	0.00		-0.04	ns	0.20	*
82	-0.15	ns	-0.17	ns	-0.07	ns	-0.01	ns	4.23	*	-0.01	ns	0.04	ns	0.00	ns	-0.25	ns
83	-0.08	ns	0.10	ns	0.37	*	0.45	*	-11.84	***	-0.02	ns	0.00		-0.01	ns	0.69	**
84	-0.01	ns	-0.01	ns	-0.02	ns	0.33	ns	-0.26	ns	0.04	ns	0.04	ns	-0.08	**	0.22	ns
85	0.50	ns	0.42	ns	-0.02	ns	0.25	*	-8.98	*	-0.10	*	-0.06	ns	0.01	ns	0.48	ns
86	-0.07	ns	-0.10	ns	-0.01	ns	0.29	**	9.77	**	-0.16	**	0.00		0.07	**	0.54	ns
87	-0.31	ns	-0.25	ns	0.19	ns	0.21	ns	3.65	ns	-0.06	ns	-0.02	ns	0.00	ns	0.27	ns
88	0.03	ns	-0.01	ns	0.00	ns	0.34	*	-2.04	ns	-0.16	***	0.02	ns	-0.03	ns	-0.25	ns
89	-0.24	ns	-0.29	*	-0.09	ns	0.14	ns	5.33	ns	-0.08	*	0.04	ns	-0.01	ns	0.45	ns
90	-0.06	ns	-0.08	ns	-0.02	ns	0.47	*	-4.28	ns	0.00	ns	0.07	ns	-0.06	**	-0.51	**
91	-0.15	ns	-0.11	ns	-0.05	ns	0.56	**	7.11	ns	-0.06	ns	-0.04	ns	-0.02	ns	0.34	ns
92	0.13	***	0.06	**	0.01	ns	0.22	ns	3.06	ns	-0.14	*	-0.06	ns	-0.07	*	0.04	ns
93	-0.03	ns	-0.01	ns	-0.34	*	-0.17	ns	2.08	ns	-0.06	ns	0.02	ns	-0.06	*	-0.04	ns
94	-0.19	*	-0.20	*	-0.56	*	0.79	***	-2.24	ns	-0.03	ns	0.00		0.06	*	-0.40	ns
95	0.12	ns	0.13	ns	0.15	ns	0.26	*	0.22	ns	-0.04	ns	0.02	ns	0.14	***	0.10	ns
96	-0.26	ns	-0.18	ns	-0.23	ns	0.15	ns	0.19	ns	0.00	ns	0.00		-0.08	**	-0.27	ns
97	0.16	ns	0.08	ns	0.21	ns	-0.28	ns	5.19	ns	-0.12	**	-0.02	ns	0.00	ns	0.00	ns
98	0.46	*	0.33	ns	0.16	ns	-0.02	ns	3.41	ns	0.03	ns	0.00		-0.08	***	0.38	ns
99	-0.03	*	-0.02	ns	-0.09	***	1.08	**	3.52	ns	0.01	ns	-0.18	**	0.02	ns	0.02	ns
100	0.12	ns	0.12	ns	-0.26	ns	0.49	***	3.39	ns	-0.22	***	0.04	ns	0.00	ns	0.37	ns

SITE	N_pa	Sig	R_pa	sig	L_pa	sig	soil pH	sig	SOM	sig	P_op	sig	P_man	sig	P_reg	sig	N_cov	sig
101	0.04	ns	-0.05	ns	-0.06	ns	-0.25	ns	-1.67	ns	-0.05	*	-0.04	ns	-0.07	**	0.49	ns
102	0.02	ns	0.24	ns	0.18	ns	0.54	*	4.75	ns	-0.02	ns	0.00		-0.06	**	0.52	ns
103	0.12	ns	0.24	**	-0.10	ns	0.84	***	-0.77	ns	0.07	ns	0.19	**	-0.08	***	0.10	ns

SITE	R_cov	sig	L_cov	sig	B area	sig	Spp_rich	sig	C	sig	S	sig	R	sig	Gram_cov	sig	Dom_cov	sig	Bryo_cov	sig
1	-0.98	*	-0.13	ns	0.76	**	5.75	**	-0.32	**	-0.05	ns	0.16	*	-25.94	*	-26.31	*		
2	-0.60	ns	-0.17	ns	0.16	ns	2.13	ns	0.04	ns	-0.24	*	0.06	ns	1.82	ns	-19.28	ns	14.83	*
3	0.31	ns	-0.14	ns	0.70	**	-4.27	ns	-0.08	ns	0.17	ns	-0.16	ns	7.63	ns	-44.37	***	3.50	***
4	-0.02	ns	0.20	ns	0.19	ns	-17.75	***	0.00	ns	-0.05	ns	-0.08	ns	21.31	*	4.66	ns	15.62	**
5	0.02	ns	0.88	ns	0.37	ns	-2.75	ns	-0.10	ns	-0.72	**	0.67	**	25.17	*	7.13	ns		
6	-0.26	ns	-0.16	ns	-0.26	ns	5.00	ns	0.02	ns	-0.16	ns	0.23	**	17.34	**	-22.09	ns		
7	-0.39	ns	-0.17	ns	0.10	ns	-8.81	***	-0.07	ns	0.02	ns	-0.01	ns	7.80	ns	-2.78	ns	15.92	**
8	-0.11	ns	0.18	*	1.75	ns	5.13	*	0.02	ns	-0.10	ns	-0.06	ns	-4.23	ns	10.96	ns		
9	0.01	ns	0.05	ns	-0.21	ns	-13.56	***	-0.14	*	-0.04	ns	0.12	ns	5.69	ns	2.27	ns	-16.67	ns
10	0.69	***	-2.00	***	-0.18	ns	-3.81	**	-0.19	ns	0.05	ns	0.04	ns	-5.83	ns	-33.06	***		
11	0.07	ns	-0.07	ns	0.06	ns	1.50	ns	-0.14	ns	-0.28	**	0.52	***	7.00	**	18.41	*		
12	0.27	*	-1.02	***	0.31	ns	1.94	ns	-0.03	ns	-0.04	ns	0.04	ns	-1.31	ns	-5.31	ns		
13	-0.35	ns	0.08	ns	0.48	ns	-3.19	ns	-0.33	*	-0.24	ns	0.39	ns	11.20	ns	-59.44	***		
14	-0.16	ns	-0.43	ns	-0.44	ns	-1.56	ns	0.35	ns	-0.01	ns	-0.47	*	-0.75	ns	2.84	ns	1.93	ns
15	-0.53	*	0.06	ns	0.55	ns	-18.33	***	0.28	***	-0.31	*	0.40	**	40.27	***	7.42	ns	18.92	**
16	-0.05	ns	-0.20	ns	0.19	ns	2.19	ns	-0.07	ns	0.03	ns	0.13	ns	5.31	ns	-20.81	**		
17	0.01	ns	0.56	*	0.15	ns	-14.80	***	0.05	ns	0.00	ns	-0.15	*	-0.17	ns	10.30	ns	14.33	***
18	-0.12	ns	0.26	*	1.14	ns	-13.56	***	-0.08	ns	-0.03	ns	0.12	ns	11.47	ns	10.44	*	-0.25	ns
19	-0.01	ns	-0.04	ns	0.64	**	-7.80	**	0.00	ns	-0.03	ns	-0.17	**	-14.50	*	-3.63	ns	-28.00	***
20	-0.14	ns	0.23	ns	-0.69	ns	3.44	ns	0.16	ns	-0.19	*	0.23	ns	-8.37	ns	9.70	ns	-4.67	ns
21	0.14	ns	0.03	ns	0.54	ns	-3.75	ns	0.04	ns	-0.53	***	0.56	***	16.66	**	-0.86	ns		
22	-0.19	ns	0.44	ns	-0.12	ns	-10.75	**	0.00	ns	0.11	ns	-0.07	ns	0.00	ns	14.88	ns	-33.93	**
23	-0.01	ns	0.01	ns	0.35	ns	-0.63	ns	0.16	ns	-0.35	**	0.18	ns	0.17	ns	27.34	**	3.13	ns
24	0.42	*	-0.79	*	0.12	ns	-16.00	**	0.17	ns	0.10	ns	-0.67	**	-17.25	**	-5.06	ns	-58.00	**
25	-0.03	ns	0.06	ns	0.80	**	4.81	**	0.01	ns	-0.22	*	0.18	*	12.88	ns	-9.81	*		

SITE	R_cov	sig	L_cov	sig	B area	sig	Spp_rich	sig	C	sig	S	sig	R	sig	Gram_cov	sig	Dom_cov	sig	Bryo_cov	sig
26	0.28	*	-0.12	ns	0.43	ns	-8.00	**	0.25	**	-0.22	*	-0.06	ns	-0.11	ns	0.43	ns	-8.81	ns
27	-0.44	**	1.49	***	0.55	*	1.88	ns	-0.14	ns	0.04	ns	0.19	ns	8.40	ns	7.90	*		
28	-0.09	ns	0.38	ns	0.18	ns	-1.25	ns	0.10	ns	-0.27	**	0.04	ns	-4.03	ns	8.07	ns	-1.64	ns
29	0.25	ns	-0.31	ns	-0.29	ns	9.64	***	-0.73	***	0.17	ns	0.85	***	3.05	ns	-21.50	ns		
30	1.12	**	0.06	ns	-0.19	ns	0.25	ns	0.18	*	-0.19	ns	0.11	ns	1.63	ns	-2.88	ns	0.91	ns
31	0.23	ns	-0.78	*	0.26	ns	-2.88	ns	0.05	ns	0.01	ns	-0.16	ns	-6.54	ns	14.43	ns	20.93	*
32	-1.59	**	-0.12	ns	0.08	ns	3.94	*	-0.08	ns	-0.05	ns	0.02	ns	0.06	ns	-12.50	ns		
33	-0.22	ns	0.82	*	-0.10	ns	4.56	**	-0.37	**	0.32	**	0.34	**	8.88	ns	-2.83	ns		
34	-0.04	ns	-0.11	ns	0.25	ns	-8.13	**	0.28	**	-0.19	*	-0.18	ns	-2.50	ns	0.38	ns	6.00	***
35	-0.45	ns	0.40	ns	0.26	ns	-9.06	**	-0.10	ns	0.03	ns	0.06	ns	11.63	ns	12.67	*		
36	1.91	***	0.31	ns	0.29	ns	-2.69	ns	0.05	ns	-0.30	**	0.39	**	16.84	*	-19.89	*		
37	-1.01	*	0.14	ns	0.36	ns	-24.13	***	0.05	ns	0.15	ns	-0.54	***	-0.53	ns	19.16	*		
38	-0.05	ns	-0.40	*	1.66	*	-12.73	***	0.24	***	-0.15	**	-0.10	ns	-0.50	ns	10.75	ns	-5.53	ns
39	1.01	*	0.65	***	0.02	ns	-1.69	ns	0.00	ns	-0.27	*	0.58	***	44.53	***	-18.66	*		
40	0.59	*	0.05	ns	0.20	ns	-18.19	***	0.15	**	-0.13	ns	-0.04	ns	-8.16	ns	11.23	*	10.10	ns
41	0.42	*	0.08	ns	0.91	ns	-18.06	***	0.16	**	-0.18	*	0.35	***	13.19	*	1.80	ns	2.81	ns
42	0.02	ns	-0.12	ns	-0.23	ns	-12.06	***	0.24	*	-0.25	ns	0.03	ns	1.59	ns	42.79	***	1.07	ns
43	-0.25	ns	0.16	ns	-0.71	ns	-10.31	**	0.15	*	-0.25	**	0.16	ns	17.97	*	1.70	ns		
44	0.20	ns	0.58	ns	0.19	ns	-8.69	**	-0.10	ns	-0.17	ns	0.48	***	26.00	**	-4.54	**		
45	0.69	*	0.34	ns	0.41	ns	-6.00	*	0.00	ns	-0.13	ns	-0.04	ns	-15.72	ns	19.27	ns	9.29	**
46	-0.13	ns	0.49	*	0.24	ns	-13.46	**	-0.13	ns	-0.07	ns	0.05	ns	-9.04	ns	26.25	***	11.00	ns
47	-0.18	ns	0.08	ns	0.37	ns	-6.50	ns	0.01	ns	0.10	ns	-0.10	ns	20.66	***	-13.60	ns	-7.25	ns
48	0.08	ns	-0.40	ns	0.12	ns	-10.57	*	-0.02	ns	0.13	ns	-0.35	*	-1.82	*	-7.36	ns		
49	0.36	ns	0.02	ns	0.07	ns	-7.69	**	-0.24	*	0.12	ns	0.03	ns	1.65	ns	-14.10	ns	-26.04	*
50	0.46	ns	0.11	ns	-0.09	ns	0.00	ns	-0.01	ns	-0.12	ns	0.12	ns	1.13	ns	-8.31	ns	-25.25	**
51	-0.01	ns	-0.01	ns	0.30	ns	-5.06	**	-0.23	*	0.11	ns	-0.08	ns	-3.60	ns	34.06	***	0.13	ns
52	1.19	*	-0.03	ns	0.63	***	-13.31	***	0.13	ns	-0.08	ns	-0.18	ns	-20.84	**	6.09	ns		
53	0.23	ns	-0.39	**	-0.24	ns	-0.50	ns	-0.12	ns	-0.01	ns	0.20	**	0.16	ns	-8.60	ns	2.83	ns
54	-1.48	***	-0.49	*	-0.82	ns	-5.69	**	0.07	ns	-0.35	*	0.07	ns	6.13	ns	-36.50	**		
55	0.15	ns	-0.52	ns	0.23	ns	-27.47	***	-0.40	***	0.51	**	-0.44	*	-44.50	**	1.10	ns	16.71	ns
56	0.62	*	0.11	ns	0.13	ns	-2.88	ns	0.05	ns	0.11	ns	-0.13	ns	-6.00	ns	1.31	ns	-2.19	ns

SITE	R_cov	sig	L_cov	sig	B area	sig	Spp_rich	sig	C	sig	S	sig	R	sig	Gram_cov	sig	Dom_cov	sig	Bryo_cov	sig
57	-0.04	ns	-0.24	ns	1.09	*	-15.20	***	0.00	ns	0.01	ns	-0.09	ns	-16.93	*	3.19	ns	14.25	**
58	0.21	ns	-0.05	ns	0.75	*	-19.31	***	0.03	ns	-0.04	ns	-0.04	ns	-18.97	ns	4.97	ns	1.47	ns
59	0.27	ns	-0.36	ns	-0.63	ns	-8.57	**	0.18	*	-0.07	ns	0.07	ns	-2.61	ns	0.31	ns	-12.12	ns
60	0.07	ns	-0.04	ns	0.61	ns	-11.44	**	-0.01	ns	0.11	ns	-0.29	*	6.33	*	-1.00	ns	2.14	ns
61	-0.02	ns	0.18	ns	-0.25	ns	-7.63	**	0.14	*	-0.14	ns	0.04	ns	26.03	*	15.25	**	9.67	*
62	0.01	ns	0.67	ns	0.49	*	-5.19	*	0.07	ns	-0.25	ns	0.22	ns	35.03	**	-12.53	ns		
63	0.24	ns	-0.17	ns	-0.23	ns	-7.80	*	0.02	ns	-0.13	ns	0.10	ns	0.42	ns	9.33	ns	3.11	ns
64	0.01	ns	-0.09	ns	-0.37	ns	-10.31	***	-0.33	*	0.08	ns	0.25	ns	-1.97	ns	-0.23	ns		
65	-0.11	ns	0.22	ns	0.23	ns	-8.73	**	0.15	*	0.06	ns	-0.31	**	-39.40	*	17.83	*	-7.95	*
66	0.04	ns	-0.14	ns	0.49	ns	-4.38	ns	0.10	ns	0.06	ns	-0.15	**	-3.93	ns	30.77	*	23.50	***
67	0.54	ns	-0.19	ns	0.04	ns	-21.38	***	0.13	ns	0.05	ns	-0.27	*	-16.63	ns	22.81	*		
68	-0.29	*	-0.34	*	0.36	ns	-2.44	ns	-0.06	ns	0.01	ns	0.11	ns	1.16	ns	-4.41	**	-13.63	ns
69	0.03	ns	-0.57	*	0.47	ns	-6.07	*	-0.10	ns	0.14	ns	-0.08	ns	-3.21	ns	-9.03	ns	1.25	ns
70	-0.25	*	0.39	**	-0.41	ns	-14.00	***	0.19	ns	-0.32	**	0.00	ns	7.94	ns	16.41	*		
71	-0.17	**	-0.04	ns	0.11	ns	0.75	ns	0.19	**	-0.43	***	0.12	*	1.89	*	4.34	ns	-19.50	*
72	-0.48	ns	0.21	ns	0.42	ns	-5.44	*	0.04	ns	0.03	ns	-0.09	ns	9.22	ns	21.84	ns	12.36	ns
73	0.54	ns	-0.02	ns	0.27	ns	0.31	ns	0.10	ns	-0.06	ns	-0.22	*	-30.50	**	12.72	ns	-4.13	ns
74	0.75	*	-0.19	ns	-0.05	ns	-8.29	ns	0.14	*	-0.09	ns	-0.06	ns	4.00	ns	21.43	ns	-37.50	***
75	0.04	ns	-0.18	ns	0.56	ns	-20.56	***	-0.21	ns	0.08	ns	0.24	*	4.66	ns	-1.91	ns	7.56	ns
76	-0.18	ns	0.37	*	-0.53	ns	-5.63	*	0.18	*	-0.14	ns	-0.09	ns	8.91	ns	-11.46	ns	-49.38	***
77	-0.09	ns	0.13	ns	0.44	*	-10.14	*	-0.04	ns	0.00	ns	-0.07	ns	3.25	ns	-12.17	ns	-11.54	ns
78	0.53	ns	-0.36	***	0.47	*	-11.13	***	0.47	**	-0.38	*	-0.20	ns	-36.09	***	-6.07	ns	10.22	ns
79	-0.46	ns	-0.10	ns	-1.16	ns	6.79	*	-0.10	ns	0.07	ns	-0.08	ns	0.61	ns	-5.75	ns	5.00	ns
80	-0.29	*	-0.11	ns	-0.09	ns	-0.75	ns	-0.04	ns	-0.09	ns	0.09	ns	8.88	ns	3.00	ns	15.00	*
81	0.03	ns	-0.20	*	0.76	ns	-8.38	**	-0.10	ns	0.25	**	-0.08	ns	-25.03	**	13.41	ns	25.34	**
82	-0.31	ns	-0.08	ns	0.76	**	0.67	ns	-0.04	ns	-0.08	ns	0.06	ns	-17.97	**	6.30	ns	12.88	*
83	0.84	***	0.40	*	0.47	ns	7.20	ns	-0.07	ns	-0.60	***	0.90	***	10.87	ns	-24.63	*	-33.17	***
84	0.24	ns	-0.15	ns	0.59	ns	-3.50	*	0.06	ns	-0.36	**	0.08	ns	-16.38	*	-8.97	ns		
85	0.28	ns	-0.10	ns	0.12	ns	-12.94	***	0.21	**	-0.16	ns	-0.15	ns	26.06	**	1.81	ns	-37.38	***
86	0.61	ns	-0.05	ns	0.28	ns	-6.63	**	0.06	ns	-0.06	ns	-0.04	ns	5.34	ns	-3.19	ns	24.75	**
87	0.31	ns	0.21	*	0.29	ns	-12.06	***	0.06	ns	-0.32	**	0.50	***	2.94	ns	8.43	ns	-22.84	**

SITE	R_cov	sig	L_cov	sig	B area	sig	Spp_rich	sig	C	sig	S	sig	R	sig	Gram_cov	sig	Dom_cov	sig	Bryo_cov	sig
88	-0.46	*	-0.26	**	-0.61	ns	7.75	**	0.13	*	-0.40	***	0.37	***	-6.77	ns	-13.53	ns	1.78	ns
89	0.49	ns	0.05	ns	0.75	*	-4.63	***	0.14	ns	-0.10	ns	-0.21	ns	-17.09	*	7.88	ns		
90	-0.57	**	-0.47	**	-0.03	ns	-1.87	ns	0.11	ns	-0.21	ns	-0.08	ns	5.89	ns	-20.80	ns	-6.54	ns
91	0.29	ns	0.05	ns	-0.31	ns	6.60	ns	-0.21	ns	0.08	ns	0.34	*	17.85	**	-2.17	ns	8.67	ns
92	-0.03	ns	-0.04	ns	0.22	ns	-8.81	**	-0.03	ns	-0.03	ns	-0.08	ns	-17.41	*	20.16	*	-8.53	*
93	0.27	ns	-1.10	***	0.85	*	-12.13	***	0.34	**	-0.18	ns	-0.30	ns	-3.60	ns	-30.34	*	-13.47	ns
94	-0.42	*	-0.14	ns	-0.19	ns	4.13	ns	-0.16	ns	-0.14	ns	0.21	ns	5.38	ns	-2.00	ns		
95	-0.04	ns	-0.40	ns	-1.30	ns	2.88	ns	-0.04	ns	0.09	ns	0.05	ns	-8.94	ns	-11.91	ns	-4.46	ns
96	-0.12	ns	-0.66	***	1.47	***	-15.19	***	-0.02	ns	-0.10	ns	0.21	*	-4.50	ns	-8.34	*	-24.13	**
97	0.16	ns	0.09	ns	-0.27	ns	-9.56	**	0.00	ns	0.02	ns	-0.04	ns	-11.13	ns	-2.88	ns	-0.50	ns
98	0.50	ns	0.25	*	0.10	ns	-7.77	*	0.22	*	-0.38	**	0.16	ns	-0.69	ns	-2.46	ns	-17.92	**
99	0.02	ns	0.01	ns	0.90	*	2.54	ns	-0.31	*	0.17	*	0.17	ns	-2.60	*	-33.81	**	2.90	*
100	0.13	ns	0.03	ns	0.60	ns	-7.38	***	0.09	ns	-0.01	ns	-0.22	*	-31.11	**	-7.31	ns		
101	0.34	ns	0.03	ns	0.84	ns	-13.25	***	0.08	ns	0.08	ns	-0.39	***	-13.03	ns	11.59	ns	1.17	ns
102	0.80	ns	-0.42	ns	1.18	*	-2.06	ns	0.09	ns	-0.22	ns	0.15	ns	-18.68	ns	-0.22	ns		
103	0.13	ns	-0.30	*	0.24	ns	-0.19	ns	-0.22	*	-0.13	ns	0.21	*	18.16	ns	-10.84	ns		

Appendix 9 Deviations from the GB pattern of changes; by country, ancient woodland status and SSSI designation

England (n=70) , Wales (n=20) & Scotland (n=13)
Interpretation of between country differences

Because of very unequal sample sizes, tests of change in ecological variables will have less power for Wales and Scotland. At the same time the dominance of England in the site series means that GB results will be more heavily influenced by English results even though this reflects real differences in area and broadleaved woodland cover across GB. In light of these caveats, non-significant results for Wales and Scotland should be interpreted cautiously while significant results for England would be expected because of higher sample size and where GB significance was also found.

In the following sections, results are highlighted only where country-level tests differed from the overall GB test.

Basal area of trees and shrubs

Only the relatively small sample of Scottish woods deviated from the GB change. Even though the mean change was upward and of similar magnitude, variation among plots and sites and small size probably contributed to lack of significance.

Stratum	Mean change	se	Df	T	p
GB	0.24	0.052	104	4.51	**<0.0001**
Wales	0.57	0.093	17.6	6.06	**<0.0001**
England	0.16	0.075	71.6	2.11	**0.0384**
Scotland	0.21	0.159	10.5	1.35	0.2055

Site level woody regeneration richness

All within-country tests were consistent with the GB change.

Stratum	Mean change	se	df	T	P
GB	-0.13	0.022	102	-6.02	<0.0001
Wales	-0.14	0.055	19	-2.63	**0.0165**
England	-0.13	0.027	69	-4.75	**<0.0001**
Scotland	-0.13	0.045	12	-2.8	**0.0160**

Plot level regeneration richness

All country level changes in mean richness were consistent with GB but change was not significant in the Welsh sample.

Stratum	Mean change	se	Df	T	p
GB	-0.04	0.006	101	-6.39	<0.0001
Wales	-0.02	0.012	17.8	-1.30	0.2086
England	-0.04	0.008	67.7	-5.20	**<0.0001**
Scotland	-0.06	0.009	11	-6.58	**<0.0001**

Plot level abundance of open habitats

The GB-level decrease in weighted count of open habitats at the plot level reflects decreased means in all country subsets. However, only in Wales was the decrease significant with Scotland approaching significance at the 5% level. This suggests that upland woods may have started more open in 1971, a supposition supported by examining mean values of the index for each year (Figure ?).

Stratum	Mean change	se	df	T	P
GB	-0.03	0.007	101	-4.21	<0.0001
Wales	-0.08	0.019	17.8	-4.35	**0.0004**
England	-0.01	0.008	68.4	-1.03	0.1303
Scotland	-0.04	0.017	10.9	-2.10	0.0601

Site level abundance of open habitats

Results are similar to the plot level pattern. English sites show no significant change overall although the mean decreased. Again Wales is highly significant reflecting the largest reduction in weighted site-level abundance of open habitats.

Stratum	Mean change	se	df	T	p
GB	-0.13	0.029	102	-4.54	<0.0001
Wales	-0.34	0.072	19	-4.77	**0.0001**
England	-0.06	0.032	69	-2.00	0.4991
Scotland	-0.16	0.061	12	-2.65	**0.0213**

Site level management signs

While not significant at the GB level, significantly fewer site level management signs were recorded in the Welsh site sample in 2002.

Stratum	Mean change	se	df	T	P
GB	-0.006	0.058	102	-0.11	0.9116
Wales	-0.15	0.050	19	-2.97	**0.0079**
England	0.05	0.082	69	0.65	0.515
Scotland	-0.11	0.074	12	-1.49	0.1613

Signs of grazing

The lack of significance at the GB level seems to have masked rather different within-country changes. In Wales, where grazing signs were dominated by sheep, counts decreased while in England, where deer signs were most common, the number of signs increased between surveys.

Stratum	Mean change	se	df	T	p
GB	0.81	0.599	102	1.34	0.1817
Wales	-3.00	1.165	19	-2.57	**0.0186**
England	2.07	0.707	69	2.93	**0.0046**
Scotland	-0.15	1.652	12	-0.09	0.9273

Mean Ellenberg fertility within plots (unweighted)

The only significant change was in the larger English sample where mean score decreased.

Stratum	Mean change	se	df	T	p
GB	-0.04	0.023	100	-1.67	0.0976
Wales	0.005	0.048	18.1	0.10	0.9207
England	-0.07	0.285	68.6	-2.39	**0.0198**
Scotland	0.03	0.067	10.4	0.38	0.7128

Mean Ellenberg pH within plots (unweighted)

In contrast to the GB-wide increase in soil pH, the tendency was for Ellenberg pH to decrease although the only significant reduction was in the English sit sample.

Stratum	Mean change	se	df	T	P
GB	-0.04	0.020	101	-1.80	0.0754
Wales	-0.02	0.037	18	-0.52	0.6112
England	-0.05	0.026	69	-2.03	**0.0458**
Scotland	0.01	0.053	10.5	0.20	0.8457

Mean Competitor score within plots (unweighted)

Competitive traits only increased significantly in their contribution in the Scottish sample of woods.

Stratum	Mean change	se	df	T	p
GB	0.03	0.019	99.3	1.55	0.1249
Wales	0.02	0.049	17.7	0.31	0.7586
England	0.02	0.023	66.7	0.87	0.3879
Scotland	0.09	0.035	10.9	2.62	**0.0239**

Mean Stress-tolerator score within plots (unweighted)

The GB-wide reduction in constribution of stress-tolerant traits was mirrored by significant reductions in Scotland and England. While the mean change was down in Wales, the size of the effect was not significant.

Stratum	Mean change	se	df	T	p
GB	-0.08	0.021	100	-3.60	0.0005
Wales	-0.02	0.048	17.6	-0.40	0.6933
England	-0.09	0.026	68.1	-3.34	**0.001**
Scotland	-0.10	0.042	10.6	-2.41	**0.0356**

Mean Ellenberg light score within plots (unweighted)

Surprsisngly, given correlated changes in basal area and species richness, no significant changes were seen in the contribution of ruderal traits between surveys.

Stratum	Mean change	se	Df	T	p
GB	-0.01	0.023	102	-0.51	0.6107
Wales	-0.08	0.048	17.8	-1.68	0.1107
England	0.01	0.029	68.9	0.36	0.7102
Scotland	-0.005	0.040	11	-0.12	0.9105

Mean Ruderal score within plots (unweighted)

Surprisingly, given correlated changes in basal area and species richness, no significant changes were seen in the contribution of ruderal traits between surveys.

Stratum	Mean change	se	df	T	p
GB	0.02	0.028	98.9	0.56	0.5734
Wales	-0.04	0.057	17.9	-0.72	0.4791
England	0.03	0.036	66.2	0.88	0.3797
Scotland	0.03	0.069	11	0.46	0.6534

Ground flora species richness in plots

All changes at country-level were decreases and therefore consistent with the GB change.

Stratum	Mean change	se	Df	T	p
GB	-8.14	0.828	99.8	-9.83	<0.0001
Wales	-12.24	1.604	16.9	-7.63	**<0.0001**
England	-6.66	1.000	67	-6.66	**<0.0001**
Scotland	-8.65	2.372	10.1	-3.65	**0.0044**

Ancient Woodlands (n=66)

Since the number of Ancient Woodland sites comprised a large proportion of the total, changes would not be expected to differ greatly from overall GB results because of differences in statistical power. This was indeed the case so that results for all variables tested were the same in terms of direction of change and statistical significance.

Basal area of trees and shrubs

Stratum	Mean change	se	Df	T	p
GB	0.24	0.052	104	4.51	**<0.0001**
AWI	0.32	0.078	65.3	4.08	**<0.0001**

Site level woody regeneration richness

Stratum	Mean change	se	df	T	p
GB	-0.13	0.022	102	-6.02	<0.0001
AWI	-0.15	0.027	65	-5.77	**<0.0001**

Plot level regeneration richness

Stratum	Mean change	se	Df	T	p
GB	-0.04	0.006	101	-6.39	<0.0001
AWI	-0.04	0.008	63.6	-5.08	**<0.0001**

Plot level abundance of open habitats

Stratum	Mean change	se	df	T	P
GB	-0.03	0.007	101	-4.21	<0.0001
AWI	-0.03	0.010	63.7	-3.33	**0.0015**

Site level abundance of open habitats

Stratum	Mean change	se	df	T	p
GB	-0.13	0.029	102	-4.54	<0.0001
AWI	-0.15	0.037	65	-4.00	**0.0002**

Site level management signs

Stratum	Mean change	se	df	T	P
GB	-0.006	0.058	102	-0.11	0.9116
AWI	-0.02	0.069	65	-0.25	0.8070

Signs of grazing

Stratum	Mean change	se	df	T	p
GB	0.81	0.599	102	1.34	0.1817
AWI	0.17	0.755	65	0.22	0.8259

Mean Ellenberg fertility within plots (unweighted)

Stratum	Mean change	se	df	T	p
GB	-0.04	0.023	100	-1.67	0.0976
AWI	-0.02	0.029	63	-0.74	0.4592

Mean Ellenberg pH within plots (unweighted)

Stratum	Mean change	se	df	T	p
GB	-0.04	0.020	101	-1.80	0.0754
AWI	-0.03	0.026	63.6	-1.03	0.3048

Mean Competitor score within plots (unweighted)

Stratum	Mean change	se	df	T	p
GB	0.03	0.019	99.3	1.55	0.1249
AWI	0.03	0.023	63.1	1.26	0.2135

Mean Stress-tolerator score within plots (unweighted)

Stratum	Mean change	se	df	T	p
GB	-0.08	0.021	100	-3.60	0.0005
AWI	-0.07	0.027	63.3	-2.56	**0.0128**

Mean Ellenberg light score within plots (unweighted)

Stratum	Mean change	se	Df	T	p
GB	-0.01	0.023	102	-0.51	0.6107
AWI	0.002	0.026	64	0.09	0.9291

Mean Ruderal score within plots (unweighted)

Stratum	Mean change	se	df	T	p
GB	0.02	0.028	98.9	0.56	0.5734
AWI	-0.004	0.033	62.1	-0.13	0.8996

Ground flora species richness in plots

Stratum	Mean change	se	Df	T	p
GB	-8.14	0.828	99.8	-9.83	<0.0001
AWI	-8.63	0.986	63.7	-8.75	**<0.0001**

SSSI (n=30)

Only change in the proportion of stress-tolerant attributes differed between the GB and SSSI sample. While the mean decreased in both, it was not significant across SSSI plots. All other changes were consistent in direction and in terms of whether test outcomes were statistically significant.

Basal area of trees and shrubs

Stratum	**Mean change**	**se**	**Df**	**T**	**p**
GB	0.24	0.052	104	4.51	**<0.0001**
SSSI	0.29	0.121	27.7	2.42	**0.0225**

Site level woody regeneration richness

Stratum	**Mean change**	**se**	**df**	**T**	**p**
GB	-0.13	0.022	102	-6.02	**<0.0001**
SSSI	-0.10	0.029	29	-3.37	**0.0022**

Plot level regeneration richness

Stratum	**Mean change**	**se**	**Df**	**T**	**p**
GB	-0.04	0.006	101	-6.39	**<0.0001**
SSSI	-0.04	0.011	28.1	-3.33	**0.0024**

Plot level abundance of open habitats

Stratum	**Mean change**	**se**	**df**	**T**	**P**
GB	-0.03	0.007	101	-4.21	**<0.0001**
SSSI	-0.04	0.016	27.9	-2.66	**0.0129**

Site level abundance of open habitats

Stratum	**Mean change**	**se**	**df**	**T**	**p**
GB	-0.13	0.029	102	-4.54	**<0.0001**
SSSI	-0.17	0.053	29	-3.29	**0.0026**

Site level management signs

Stratum	Mean change	se	df	T	P
GB	-0.006	0.058	102	-0.11	0.9116
SSSI	-0.03	0.046	29	-0.73	0.4733

Signs of grazing

Stratum	Mean change	se	df	T	p
GB	0.81	0.599	102	1.34	0.1817
SSSI	0.23	1.175	29	0.20	0.8440

Mean Ellenberg fertility within plots (unweighted)

Stratum	Mean change	se	df	T	p
GB	-0.04	0.023	100	-1.67	0.0976
SSSI	0.002	0.038	26.9	0.05	0.9594

Mean Ellenberg pH within plots (unweighted)

Stratum	Mean change	se	df	T	p
GB	-0.04	0.020	101	-1.80	0.0754
SSSI	-0.008	0.032	46.7	-0.24	0.8117

Mean Competitor score within plots (unweighted)

Stratum	Mean change	se	df	T	p
GB	0.03	0.019	99.3	1.55	0.1249
SSSI	0.03	0.029	27.7	1.08	0.2907

Mean Stress-tolerator score within plots (unweighted)

Stratum	Mean change	se	df	T	p
GB	-0.08	0.021	100	-3.60	**0.0005**
SSSI	-0.05	0.037	27.7	-1.27	0.2159

Mean Ellenberg light score within plots (unweighted)

Stratum	Mean change	se	Df	T	p
GB	-0.01	0.023	102	-0.51	0.6107
SSSI	-0.04	0.033	27.5	-1.08	0.2911

Mean Ruderal score within plots (unweighted)

Stratum	Mean change	se	df	T	p
GB	0.02	0.028	98.9	0.56	0.5734
SSSI	0.007	0.047	27.9	0.15	0.8806

Ground flora species richness in plots

Stratum	Mean change	se	Df	T	p
GB	-8.14	0.828	99.8	-9.83	**<0.0001**
SSSI	-9.12	1.690	28	-5.41	**<0.0001**

Appendix 10 An analysis of plot turnover and change between NVC formations and woodland groups

Allocation of plot data

Plots were allocated to NVC community units using the MAVIS software available free at the CEH web-site. This implements the Czekanowski similarity coefficient in the same way as MATCH.

Several aspects of the woodland survey data complicated the matching process and will have weakened the accuracy of each allocation. Firstly, software tools such as TABLEFIT, MAVIS, SIMIL and MATCH often perform poorly in comparison to expert judgement carried out using NVC keys and a knowledge of the habitat concerned (Palmer 1992). Matching also tends to be worse for individual plots than constancy tables because the published NVC constancy tables are usually much more species rich than single plots and this initself will reduce matching coefficients and bias matching toward more species poor NVC units. Pplot matching carries no information on species frequency, the user must either risk all species carrying the same information or use cover as a dubious surrogate for between-stand frequency. The additional complications for woodland plots were the absence of cover data for trees and shrubs, amalgamation of critical taxa such as *Quercus* and *Betula*, and the under-recording of bryophytes in 2002.

These problems were tackled as follows: 1. Cover data for the ground flora were converted into frequency between 1 and 5 using the translation of Dring (1996). 2. All trees and shrubs in the canopy were arbitrarily given a frequency code of 5 (ie 81-100% between-stand frequency). 3. Where *Quercus* sp was recorded, the entry was converted into two entries; one for *Q.robur* and one for *Q.petraea*. 4. Only the limited number of common bryophytes recorded in the 2002 survey were allowed in the 1971 data, so as to balance survey datasets.

Many of the automated allocations are not likely to be correct in the sense that a woodland expert would probably allocate an unknown number of plots to different community units. However in the following analysis, the effect of mis-allocations has been minimised by grouping sets of related woodland communities. In all cases, the NVC unit to which the plot was most similar was accepted for assignment to each group.

Turnover and net change 1971 to 2002

41% of plots staying in the same group. (Table A10.1, A10.2). The magnitude of gain and loss was clearly related to the commonness of the group in 1971. Hence, most woodland plots were classified, in order of abundance in 1971, as either W10-11, Other Vegetation (95% of these being OV27), W8-9, W16-17 or scrub (93% being W21). Between surveys the largest losses were fromW10-11 and W8-9 and the largest gains to scrub and Other Vegetation. Mesotrophic Grassland, W14-15 and W16-17 also made small gains (Figure A15.). The net losses from W10-11 seem large; 147 plots were lost in all. However turnover was very high with 183 plots lost from W10-11 to other woodland groups but 133 gained from other woodland groups to W10-11.

The large gains to scrub (mainly W21) and Other Vegetation (mainly OV27) at first sight appear at odds with the increase in basal area and therefore canopy closure. Relocation error is unlikely to be responsible for all the changes, nor does it seem likely that problems with the

NVC matching process can explain the changes. What may therefore be happening is that there is a trend towards more plots being converted to non-woodland – seen to some degree in the loss of woodland plots, but this is more than off-set by increased shading in the plots that do remain in the woodland categories.

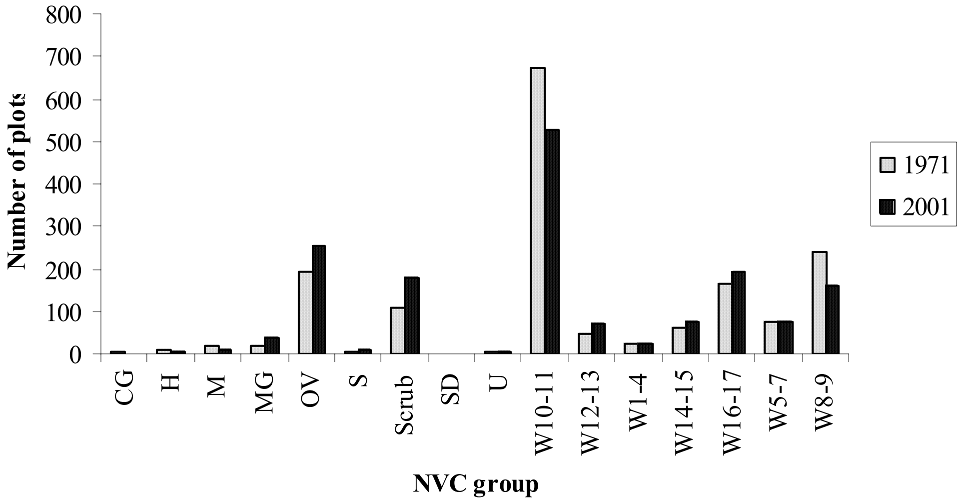


Figure A10.1 Net change in plot membership of NVC formations and groups of NVC woodland communities.

Table 10.2 Matrix of turnover between NVC formations and groups of woodland communities between 1971 and 2002. Data are numbers of pared plots.

		2001																
		CG	**H**	**M**	**MG**	**OV**	**S**	**Scrub**	**SD**	**U**	**W10-11**	**W12-13**	**W1-4**	**W14-15**	**W16-17**	**W5-7**	**W8-9**	
	CG							2									1	**3**
	H		**1**							2	1		1	1	3			**9**
	M		1	**4**		1	1	1					6		3			**17**
	MG			1	**2**	3		3			2	1	2			1	2	**17**
	OV			1	8	**64**	3	28			36	9	1	8	8	10	11	**187**
	S					1	**3**						2	1				**7**
1971	**Scrub**				3	16	1	**37**			16	7		3	3	3	18	**107**
	SD																	**0**
	U			1							1				3			**5**
	W10-11			2	13	93		34		1	**339**	7	3	35	81	20	37	**665**
	W12-13					10		13			1	**18**			1	2	3	**48**
	W1-4			2		3					3		**3**	2	7	2		**22**
	W14-15				2	8		1			19	6		**15**	7	1	1	**60**
	W16-17		2		2	15		1			57		2	11	**71**	2	1	**164**
	W5-7					14	1	7			16	1	2		1	**28**	5	**75**
	W8-9				9	28	1	51	1		37	21		1	4	6	**78**	**237**
		0	**4**	**11**	**39**	**256**	**10**	**178**	**1**	**3**	**528**	**70**	**22**	**77**	**192**	**75**	**157**	**1623**

Appendix 11 An analysis of change in numbers of repeat plots allocated to the eight aggregate classes of the Countryside Vegetation System

All repeat plots were allocated to one of each of the 100 CVS classes listed and defined by Bunce et al (1999) based on Countryside Survey (CS) botanical data. Plots were allocated objectively using the MAVIS software available free on the world-wide web. Allocation was based on species presence only and was carried out by applying the weightings generated for each species in the original TWINSPAN classification of CS data.

Table 11.1 Matrix of change between the eight aggregate vegetation classes of the Countryside Vegetation System based on assignment of botanical plot data for 1971 and 2002.

		Resurvey 1	2	3	4	5	6	7	8			Change in plot count	% change
	1			1						**1**	**Crops/weeds**	2	0.1
	2		1	1		11	4			**17**	**Tall-herb/grassland**	24	1.5
	3				2					**2**	**Fertile grassland**	23	1.4
1971	**4**		4	1	12	18	32	4		**71**	**Infertile grassland**	-5	-0.3
	5	3	29	17	15	728	101	2		**895**	**Lowland wood**	44	2.7
	6		7	5	34	180	336	19	7	**588**	**Upland wood**	-94	-5.8
	7				3	2	18	9	6	**38**	**Moorland grass/mosaics**	-1	-0.1
	8						3	3	5	**11**	**Heath/bog**	7	0.4
		3	**41**	**25**	**66**	**939**	**494**	**37**	**18**	**1623**			

Counts placed along the diagonal line indicate plots that did not change aggregate class over time. Hence, in total, 67% of repeat plots remained in the same class. The major net changes appeared to be a loss from upland (6% of repeat plots) and gain to lowland woodland classes (3% of repeat plots). This is likely to reflect significant cross-site reductions in *Betula* spp.

Despite the overall tendency for woodland canopies to have become less open, small increases were also seen in the proportion of plots allocated to the two highly fertile, mid-successional aggregate classes, tall-herb/grassland and fertile grassland. The extent to which this change in vegetation type coincided with a loss from woodland and a gain to other land-use was determined for each changing plot (Table A11.2).

In all 49 plots changed from aggregate class 5 to either class 1 (crops/weeds), 2 (tall herb/grassland) or 3 (fertile grassland). The three plots recruited to class 1 were all planted with wheat by 2002. While three plots at each of two nearby sites – Love's Copse and Austy Wood – fell in setaside. The majority of the remaining plots coincided with grass and tall-herb dominated glades and canopy gaps still within the woodland boundary and therefore judged not to have been lost to non-woodland land-cover (Table A11.2). By contrast in the grazed/wood pasture plots, despite scattered trees still being present, the ground layer was dominated by improved grasslanA11.3).

Table A11.2. Woodland plots in 1971 that were recorded in either AC1 (Crops/weeds), AC2 (Tall herb/grassland) or AC3 (Fertile grassland) in 2002. Site survey reports and plot data were used to determine how the plot had changed.

SITE	PLOT	Lost from woodland	Habitat type/woodland feature in 2002
4	12	no	Grazed wood pasture
7	9	no	Grazed wood pasture
7	11	no	Grazed wood pasture
8	1	no	Canopy gap
9	15	no	Canopy gap
10	1	no	Canopy gap
10	11	no	Canopy gap
13	1	no	Canopy gap
18	16	no	Grazed wood pasture
20	1	no	Canopy gaps
20	16	no	Canopy gaps
21	3	no	Glade
21	7	no	Glade
22	14	no	Glade
25	11	no	Canopy gap
29	4	no	Mown ride
29	9	no	Glade
31	8	no	Canopy gap
46	6	no	Disturbed for culverting along stream
46	11	no	Canopy gap
46	12	no	Canopy gap
53	1	no	Canopy gap
70	13	no	Canopy gap
70	15	no	Canopy gap
82	11	no	Canopy gap
103	1	no	Canopy gap
103	5	no	Canopy gap
103	8	no	Canopy gap
5	1	yes	*Lolium* ley
5	2	yes	Setaside
5	6	yes	Setaside
5	10	yes	Wheat
5	11	yes	Wheat
5	14	yes	Wheat
13	2	yes	Setaside
13	3	yes	Setaside
13	7	yes	Setaside
24	1	yes	*Lolium* ley
24	2	yes	*Lolium* ley
24	3	yes	*Lolium* ley
24	4	yes	*Lolium* ley
24	5	yes	*Lolium* ley
24	7	yes	*Lolium* ley
24	11	yes	*Lolium* ley
24	12	yes	*Lolium* ley
29	2	yes	Garden/ tennis court
29	15	yes	Garden/ tennis court
44	4	yes	Semi-improved grassland
63	1	yes	Garden

Table A11.3. The species composition of plot 9 at Compton Wood in Somerset in 1971 and in 2002, assuming the plot was re-recorded in the same place. In 2002 the plot was described as being in cattle-grazed "..open wood pasture with mature widely spaced ash and planted conifer standards over a grassy sward." The uppermost rows refer to counts of woody species stems >1.3m height.

Species	1971	2002
Prunus padus	5	
Fraxinus excelsior (c)	4	
Acer campestre	3	
Salix seedling/sp	2	
Salix caprea	1	
Quercus seedling/sp	1	
Corylus avellana	1	
Dactylis glomerata	5	5
Agrostis capillaris	1	
Deschampsia cespitosa	1	
Mercurialis perennis	1	
Prunella vulgaris	1	
Rubus fruticosus agg.	1	15
Veronica chamaedrys	1	0.5
Ajuga reptans	0.5	
Brachypodium sylvaticum	0.5	
Carex caryophyllea	0.5	
Circaea lutetiana	0.5	0.5
Cirsium palustre	0.5	
Corylus avellana	0.5	
Crataegus monogyna seedling	0.5	
Dryopteris dilatata/carthusiana	0.5	
Dryopteris filix-mas	0.5	
Euphorbia amygdaloides	0.5	
Festuca ovina agg.	0.5	
Fragaria vesca	0.5	0.5
Fraxinus excelsior seedling	0.5	0.5
Galium pumilum	0.5	
Geum urbanum	0.5	
Hyacinthoides non-scripta	0.5	1
Lysimachia nemorum	0.5	
Poa nemoralis/trivialis	0.5	
Primula vulgaris	0.5	
Urtica dioica	0.5	1
Veronica montana	0.5	
Viola riviniana/reichenbiana	0.5	
Castanea sativa		0.5
Cirsium arvense		1
Holcus lanatus		75
Lolium perenne		5
Ranunculus acris		0.5
Rumex obtusifolius		0.5
Senecio jacobaea		0.5
Taraxacum agg.		0.5
Vicia orobus		0.5

Appendix 12 Management and ownership in 2002 – a review of the surveyors' reports

All surveyors prepared reports of varying length and detail on each of their sites including the pilot woods. All were asked to include specific sections relating to management and the majority gave at least some information in addition to the tick-list of management signs filled in at plot and site levels.

Relationships between types of management reported for the site and the ownership status of the 103 woods were examined. Three broad categories of ownership were apparent (Figure A12.1).

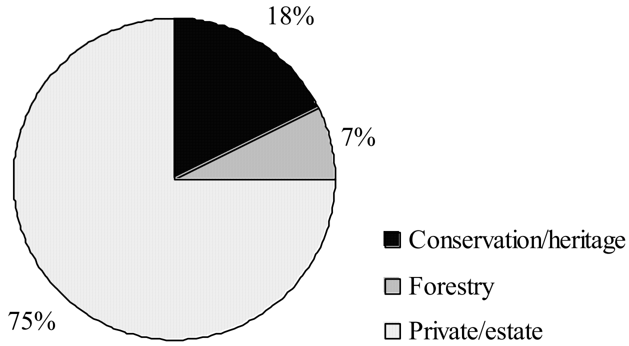


Figure A12.1 The 103 woodland sites by ownership category in the 2002 survey. Note that sites in multiple ownership were counted more than once.

Uneven representation of ownership categories means cautious interpretation is required, especially for forestry owned woods. Moreover, indications of management in survey reports often gave no indication of the extent of each practice. For example, a note made of active coppicing may only have applied to a small portion of a larger area of woodland. Despite these caveats a number of clear patterns emerged (Table A12.1). Coppicing was clearly much more prevalent in conservation/heritage owned sites but hardly practiced at all on privately owned sites. The same applied to Sycamore and Rhododendron control and installation of nesting boxes; both practices much more likely on conservation/heritage owned sites.

Evidence of broadleaf planting was more common on private/estate woodlands while exotic removal was more common on estate as opposed to private woodlands where more exotics would be expected to feature anyway. Although still seen on a relatively small proportion of private/estate woods, the popularity of new broadleaf planting probably reflects the availability of funding.

The two management types that were much more evident in private/estate woodlands compared to conservation/heritage were pheasant rearing and 'neglect' with 71% of private and 64% of estate owned woods having no signs of recent management. While many sites were described as dark, overgrown and hard to access, surveyors explicitly noted the presence of long-neglected coppice stools on 23 sites.

Deer signs were reported on sixty-nine sites in 2002, but only16 were judged to be overgrazed by deer in the survey reports, all of which were in private/estate ownership. Sheep signs were reported in fourteen sites in 2002 in ten of which over-grazing was judged by surveyors. These included two partly sheep grazed National Trust woodlands (Seatoller and Pen-yr-Allt) and eight privately owned woods all of which were in NW England, Wales or Scotland. On several of these, sheep grazing seemed also to be accompanied by clearance of parts of the woodland edge (Haverigg Holme, New Laund & High Wood, Rotten Butts) or a blurring of the boundary between the wood and surrounding grazing land as a result of increases in grass, decrease in juvenile trees and shrubs and selective removal of mature trees (Coed Cochion)

Public recreation featured fairly prominently among all ownership categories being predictably least popular in the three commercial non-Forestry woodlands (New Close Wood, Carmel Wood and Fridd Wood) and in private, non-estate owned woodlands. In many cases the prevalence of public recreation centred on public or permissive paths traversing an otherwise impenetrable and unmanaged wood. Woodlands where recreational activity was an integral part of the management of the site were mainly Local Authority owned and associated with nearby urban centres (eg. Lower Nut Hurst, Den of Alyth and Dulwich Wood).

Table 12.1 **Numbers of woodland sites under different ownership subject to different activities as noted by surveyors reports in 2000-'03**

Intervention	Private	Estate	Commercial & private Forestry	Commercial non-forestry	National Trust	Woodland Trust	Local Authority inc. National Parks	Wildlife Trusts & English Nature
commercial forestry - conifer	5	1	3	0	1	0	0	1
commercial forestry - broadleaf	0	0	1	0	0	1	0	0
coppicing	4	5	1	0	0	3	1	4
selective felling	10	6	1	2	0	0	1	3
no recent management	40	18	1	2	2	1	1	3
pheasants	12	6	1	0	0	0	0	0
rubbish dumping	6	2	0	0	0	0	1	0
fire	0	1	0	0	0	0	0	0
public recreation	13	13	1	0	6	2	3	3
1987 storm damage	8	0	0	0	1	0	0	0
deer fencing	6	1	0	0	1	0	0	1
overgrazing - deer	6	1	0	0	0	0	0	0
overgrazing - sheep	8	0	0	0	2	0	0	0
overgrazing - cattle	0	1	0	1	0	0	0	1
exotic planting	2	0	0	0	0	0	0	0
exotic removal	2	5	0	0	0	0	0	2
Sycamore & Rhododendron control	2	0	0	0	1	0	1	1
broadleaf planting	8	5	1	1	1	1	1	0
grey squirrel control	0	0	1	0	0	0	0	0
nesting boxes	3	0	0	0	0	1	1	2
woodland destruction - pasture	3	1	0	0	1	0	0	1
woodland destruction - improved grass	1	0	0	0	0	0	0	0
woodland destruction - arable	1	1	0	0	0	0	0	0
woodland destruction - urban	3	1	0	0	0	0	0	0
TOTAL SITES	**56**	**28**	**5**	**3**	**6**	**3**	**4**	**7**