Mark Hill

NATIONAL WOODLANDS CLASSIFICATION 1971

HANDBOOK OF FIELD METHODS

by

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Woodlands Research Section - Merlewood
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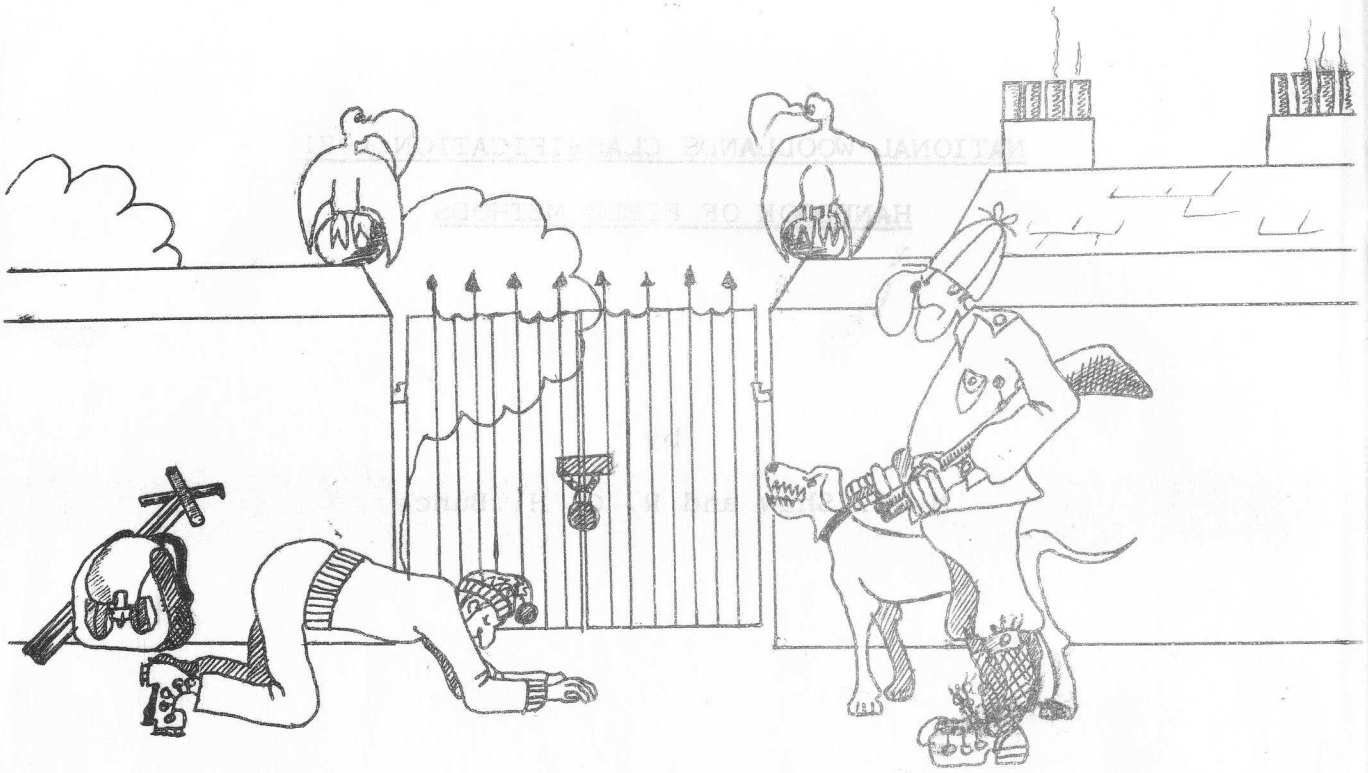
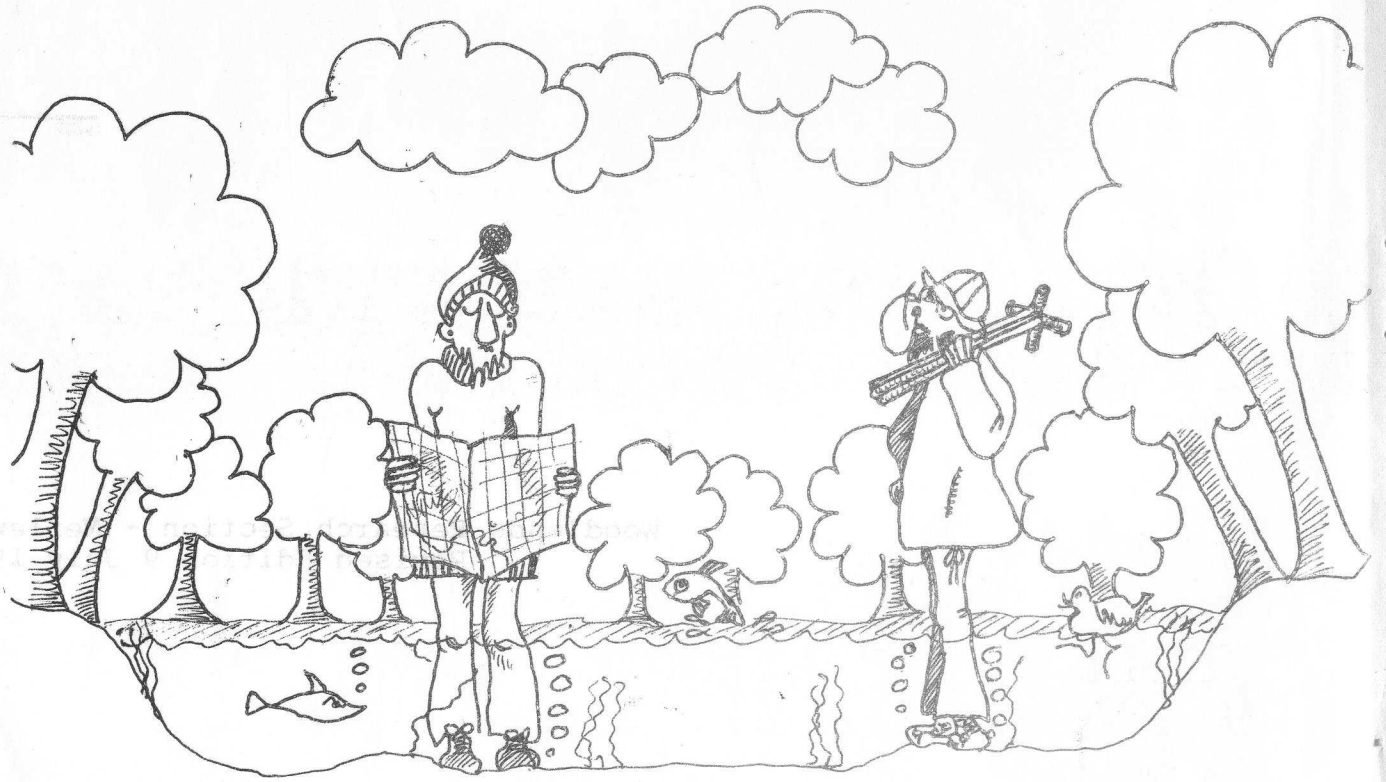
Asking permission



Locating a plot



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Acknowledgements

Cartoon drawings by Cate Walling
Inspiration by Colin J. Barr

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NATIONAL WOODLAND CLASSIFICATION SURVEY 1971
INSTRUCTIONS ON METHODS OF SURVEY AND RECORDING

General

An outline plan of operations giving the order in which you intend to survey the woods for which you are responsible should be prepared. This should attempt to reduce the amount of travelling as far as possible but must also take accommodation problems into account (i.e. it may be more efficient to survey several sites from the same base, rather than moving to get slightly nearer), any arrangements with Regional Staff and access permission if this is limited to specified dates.

You will be supplied with a full set of field equipment including all the necessary maps, recording sheets and other ancillary equipment before leaving Merlewood. A check list of all equipment is given in Appendix VI.

Woods will be located using road maps, 1" Ordnance Survey and the 2½" site maps as required. Having located the site the first important thing is obtaining PERMISSION to enter and survey the site in question.

Access and Permission to Survey Sites

You will be given advanced information about all your sites which will indicate whether or not you are solely responsible for obtaining permission. In certain cases the Regional Office will have indicated in advance that special circumstances prevail with regard to access. For example, advance permission may have been obtained by the Regional Office or Merlewood, in which case you can proceed straight on to carry out the survey. In other cases, it may be necessary to contact Regional Staff or the land-owner himself (in which case all details will be supplied), and all that is necessary here is to follow out the instructions.

In other cases the task of obtaining permission to survey the site will be your responsibility. In some instances the owner's name and address may be supplied and you should contact him or her. In other cases there may be several owners, some known, some unknown, and here it will be best to contact one of the owners (probably the one who owns the largest area if this is known) ask his permission and whether any of the others will mind. If he says yes on both counts you may proceed, and, in the unlikely event of your meeting any of the other owners, you will have to explain the situation. In yet other cases, and these may be in the majority in some areas, ownership of the woods may be a complete blank. In this case the best procedure is to contact the occupants of the farm or house, if any, which is nearest to the wood, and look as if they might themselves own it. Ask them if they do own it and if so, can you have permission to carry out your survey. If they do not own it ask who does. If they know, it may be possible to ask if the owner would mind (this may be particularly useful if the owner does not live locally). If the real owner does live locally, it will be best to carry on to ask his permission direct.

In general, all that is required is common sense and tact. Try and appreciate the owners problems; he may have fences and walls which he fears will get damaged; he may be raising game birds; he may just like his privacy and so on. If you meet with great reluctance or a blank refusal withdraw politely explaining that we have a list of alternative back-up sites which can be used if they would prefer not to allow access to their wood. If an owner gives you permission, as in our experience the vast majority will, ask him if there are areas he would like you to avoid or any precautions he would like you to take.

You will be provided with a brief written description of what the survey is about. If the owner, or anybody you come into contact with, asks you what it is all for, let him read this slip and try and answer any questions as best you can. If things get tricky offer to find out the answer for him or refer him direct to Merlewood.

Good public relations are an extremely important facet of the Nature Conservancy's work. If you upset anybody with whom you come into contact, the Regional Staff, in whose area you are working will be the ones who have to deal with the repercussions. Above all, make it quite clear the Nature Conservancy is not surveying their wood with a view to purchasing it. Some owners may fear compulsory purchase, a power which the Nature Conservancy holds (but has never exercised), or some other lesser interference with their ownership and enjoyment of the site. In the case of the present survey, nothing could be further removed from the intent, although it is of course remotely possible that the survey might turn up a few new sites which would be regarded as being of high conservation value. Some of the sites are already notified Sites of Special Scientific Interest (S.S.S.I.s) or Proposed National Nature Reserves (P.N.N.R.s), in which case the owner will know all about it anyway.

If you are unable to get permission to visit a site or think it unwise to pursue the matter further, you will have to contact Merlewood so that you can be supplied with the necessary information (map, sampling points, etc.) for the back-up site. Give a forwarding or poste restante address, and then you can work on other sites until the information is available.

Starting the Survey

Having obtained permission to visit the site the best access point(s) should be determined, as far as possible reducing the walking distance for yourself carrying equipment and samples. It may, for example, be possible to go to some of the sample points from an access point at one end of the wood and the rest from the other end. Do not, however, upset surrounding owners by flogging across fields or fences just to save a few yards walking. Try and use well marked tracks or footpaths wherever possible; it usually saves time and temper in the long run, and avoids many navigational difficulties.

Location of the Sampling Points

The $2\frac{1}{2}$" map of the site has 16 random sampling points (numbered 1-16) marked on it and the method of 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 the locating of the points:-

(1) Accuracy
(2) Absence of subjective bias (i.e. exercising choice)

the latter being far more important than the former, although high accuracy automatically ensures absence of bias. In practice, high accuracy is not possible without resorting to time consuming methods using survey poles, tapes, compasses etc., and since pin-point accuracy has no intrinsic value, more rapid, primitive methods of locating the points are valid so long as the unbiased nature of the process is not prejudiced. The essential features of the method adopted, and described below, are its predetermined, mechanical characteristics, of which reasonable accuracy is a part. Since certain information about the plots, e.g. altitude, slope position, measures of exposure, etc. will be taken from the map, a reasonable degree of accuracy is required if site and map collected data are to be compatible. The level of accuracy to be aimed at, and this should be easily obtainable in nearly all circumstances, is to get the sampling point within a 20 m radius of its true location. The following procedure should be followed:-

(a) Decide on the point to be sampled next (they need not be surveyed in numerical order if this is not convenient).

(b) Look on the map for the nearest point that can be accurately and unmistakeably pin-pointed on the ground (a control point), e.g. a ride intersection, intersection of a wall or stream or a marked change in direction of a fence line etc.

(c) By orientating the map and compass take a bearing from the control point to the sample point, not forgetting to add 9° for magnetic variation.

(d) Using the scale on the side of the compass, measure the distance from the control point to the sample point. On the $2\frac{1}{2}$" = 1 mile scale 1/32nd = 22 yards.

(e) Find the control point on the ground.

(f) Take the correct compass bearing from the control point to the sample point and pace out the correct distance in this direction. Some correction for slope is adviseable if this is more than 20°, as follows:-

20° = + 6%, 25° = + 10%, 30° = + 15%, 35° = + 22%, 40° = + 31%

Keeping accurate paces either up or down steep slopes is difficult and it is best to avoid both this problem and the slope correction

by choosing a control point at the same height on the slope, if this is possible, and pacing on the level across the slope (even if it is a bit further than from some other control point).

(g) Short of endangering one's life, adhere absolutely to the number of paces that were predetermined, the centre point of the plot being adjacent to the toe of the boot on the forward foot. Similarly, wandering away from the predetermined direction must be avoided, even at the expense of making life difficult.

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.

Order of Recording the Data

Having located the sample point according to the methods described above, four sets of data (a separate recording form for each) and two sets of samples have to be collected from each point. A flow chart showing the organisation and division of responsibility for the survey and recording of a site, and the plots therein, is given in Fig. 1.

(a) Ground Flora - presence and absence in five successively increasing quadrat sizes (see details below and Fig. 2) and % cover/abundance estimates for the largest of these. A comprehensive sample of bryophytes is also collected from the full plot.

(b) Trees, saplings and shrubs - trees, D.B.H. (cm) and species being recorded from all four quarters of a 14.14 x 14.14 m plot (200 m^2), the same data for saplings and shrubs being collected from a pair of diagonally opposite quarters 1 and 3 (see Fig. 2).

(c) Plot description and habitat data - mostly presence and absence of attributes, from the same 14.14 x 14.14 m plot.

(d) Soil data - from a small pit and auger borings taken in the centre of the plot. A composite soil sample from the top 10-15 cm is also obtained at the same time.

These can be obtained in any other order if this is found to be more convenient, except that the (a) ground flora should be recorded first so that it is not unduly disturbed by the extensive trampling that is usually involved in recording (b) tree, saplings and shrubs and to a lesser extent (d) the soil data.

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

Recording of Plot Data

(a) Ground Flora

The first operation when the plot centre has been located, is to lay out the plot. The centre post is stuck firmly in the ground at this point and the right angle gauge on top, spun to give a random orientation to the plot. When this has ceased turning, the clamping nut is screwed tight to prevent further movement. The four corner poles now have their distance lines (10 m) clipped into the centre and run out to their full extent in line with the arms of the right angle gauge and stuck into the ground. These corner posts delineate the largest 14.14 x 14.14 m (200 m^2) plot. Spaced along each of the distance strings are four coloured markers which give the half-diagonal distances of the four smaller plots (see Fig. 2). The four short pegs supplied are used to mark the corners of the successively larger plots for 2 x 2 m (4 m^2) up to 10 x 10 m (100 m^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. The species names (or the abbreviation thereof as used on a B.S.B.I. card) are entered in the wide column under the appropriate quadrat size. Assigned names which are specified in the herbarium (see Appendix I) can also be used.

N.B. It was not originally intended to include the 2 x 2 m size and on most forms there is no separate column for this. Species for this quadrat should be entered in the column for the 5 x 5 m (25 m^2) quadrat and a clear line drawn across the column where the smaller quadrat ends and the larger one begins.

Having recorded all species in a given quadrat size, the corner pegs are moved one marker further out and the new area thus enclosed is searched for additional species only, which are recorded in their appropriate column (under the line delineating the 2 x 2 m quadrat in the case of the 5 x 5 m size). 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.

Plants which cannot be immediately identified, or for which a subsequent check, in flora or herbarium, is required, should be placed in a labelled polythene bag. Specimens for the herbarium (see Appendix I) should be collected at the same time.

Because of identification difficulties, bryophytes are not being recorded in the field but a comprehensive collection of all bryophytes growing on the soil (but NOT on tree bases, logs, rocks or other specialised habitats) should be made in the course of searching the plot for vascular plants. These should be placed in the polythene bag supplied and labelled on completion. Great care should be taken to include samples of the less common or inconspicuous

species. No breakdown of bryophytes into the successive quadrat sizes is required; just one collection from the whole 14.14 x 14.14 m plot. Having completed the record of presence of the vascular plants in all five quadrat sizes and collected the sample of bryophytes, an estimate of cover abundance for the full plot (14.14 x 14.14 m) should be carried out. This should include all vascular plants recorded as present, plus the six additional categories (litter, wood, rock, bare ground, water and bryophytes) printed at the foot of the form. This is best accomplished by imagining 100 random strikes with a pin over the whole plot and estimating how many times it would touch the species in question. 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 which are present as only single or few specimens with little cover should be recorded as +. The total cover should add up to about 100% (making due allowance for the +'s and 1's), or more if the ground flora is markedly layered. These values should be entered in the right-hand column. The left-hand column, headed Code No., is for "office use only" (where the species identification codes will be inserted for subsequent data punching).

(b) 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 - stems of >5 cm D.B.H. of any species which is normally capable of attaining a tree like habit. Exceptions include hazel, blackthorn, viburnum, juniper and a number of other less common shrubs, which rarely produce stems >5 cm diameter anyway. The species and D.B.H. (cm) of all stems in the whole plot over 5 cm diameter is measured (recording by quarters). Trees with multiple stems have each stem measured and recorded separately but these are bracketed together on the recording sheet. 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 (i.e. over breast height) but <5 cm D.B.H. are recorded only in the diagonally opposite quarters 1 and 3 (see Fig. 2 - numbers on right angle gauge). The same measurements as for trees, species and D.B.H. (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.

* See additional instructions for Native Pinewood Survey.

The final job is to measure the height of the largest tree in the plot (the tree with the largest D.B.H. - regardless of species). This is done using the height measuring instrument provided (Haga or Blume-Leiss hypsometer). 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 Appendix III.

(c) Plot Description and Habitats

This is recorded on the basis of presence within the 14.14 x 14.14 m plot by striking out the appropriate attributes on the form. A detailed account of methods and definitions of the attributes is given in Appendix IV. In the case of attributes which have an appreciable defined area, e.g. ponds, glades, etc., only part of the full area need to be included 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 plot form is in fact a much reduced version of the site form. The object of the plot form is to obtain frequency data about some of the more important attributes which can reasonably be expected to occur a measurable number of times within a single site. Definitions for all the attributes occur in Appendix IV, the second number in brackets referring to plot form (first and without brackets to the site form). Only attributes 5 and 6 (really codes for variables) need further explanation.

5 Slope in degrees of % - (depends on whether you are equipped with a Haga (%) or a Blume-Leiss (°) hypsometer. This is measured on a 20 m baseline passing through the plot centre (10 m either side) between the lowest and highest point that can be found by rotating the axis of the line. The best method is to locate your partner at the top end of the base-line and measure the angle from his eye to yours (suitable corrections should be made for poorly matched height pairs).

6 Aspect ° magnetic - is the bearing of the line of maximum slope used for 5 above. Care should be taken not to record the back-bearing, the down slope bearing is what is required.

The comments column can be used to record any information that is not included elsewhere and is considered relevant or useful in interpretation.

Finally, a sketch of the ground profile along the line of maximum slope (same line as the slope that was actually measured) should be entered on the reverse side of the plot description and habitat form. This should show all the major features within the plot such as cliffs, rocks or lesser irregularities in the ground, banks boggy areas, streams, etc. The plot centre and two corners should be marked to give scale. Some artistic licence is permissible as to the exact line of section and the representation of features. Annotations can be included and additional sections if the topography is complex.

(d) Soil Data

A full description of the methods of interpretation and recording of the soil data is given in Appendix V.

The small pit and auger samples are taken from the centre of the plot or as near as possible (not more than 1 m distant). A small pit is dug using the entrenching tool to expose the upper 25-30 cm of the profile (less if this is not possible). This will usually yield information on the Aoo, Ao, A1 or A2 and possibly the upper part of the B horizons. A basic interpretation of what is visible can be made and the information on the upper horizon recorded. Investigation of the lower horizons can then be accomplished, probably with no further digging, using the screw auger. This instrument can also be used to determine the depth of soil if within auger range (i.e. about 70 cm or 80 cm using the pit).

Having completed the record form, a composite sample of the top 10-15 cm mixed should be obtained from the wall of the pit. A total of 700-800 g, i.e. a bag full, should be obtained if possible.

If difficulties in obtaining sufficient sample are encountered it may be necessary to supplement from nearest possible point in the plot, (again within 1 m distance). Should this occur, a note to this effect should be appended to the soil data form. The soil pit should be filled in and roughly disguised before leaving the plot - this is important.

Completion of the Plot

Having filled in all 4 sets of data and collected both series of samples, the recording of the plots is now complete, or at least it should be. At this point it is advisable to:-

(i) Check that all forms have been fully entered - a quick check through to see that major items have not been omitted should be made, and that the site and plot number have been correctly entered at the top of each form.

(ii) Check all the samples into the sample carrying haversack.

(iii) Check all the equipment into the equipment carrying haversack.

(iv) Check the soil pit 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.

Total Site Description and Habitats

A detailed description of how this data should be collected and recorded on the form and definitions for all attributes is given in Appendix 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. Use of control points on the boundary, where this is possible, can be made to economise on walking. Useful information can also be obtained from the site map.

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 and habitats) all the sheets should be stapled together in plots, using the mini-stapler provided, checked and put into the polythene bag they were supplied in. Four cardboard boxes have been supplied for each site and the soil samples should be put into three of these (checking at the same time that they are all present and correct and securely labelled) so that no box weighs more than about 16 lbs (maximum weight for a 1st class parcel). The bryophytes and field sheets, sealed in their polythene bag, should be placed in the remaining box (it might be necessary to overflow bryophytes into a soil box). The boxes should be sealed and securely tied up using the sellotape and string provided. A pre-paid, pre-addressed sticker and tie-on label should be affixed to each and the parcels despatched by post at the earliest convenient opportunity. It is desirable to measure the pH reasonably fresh and it will also prevent your vehicle becoming cluttered up with samples.

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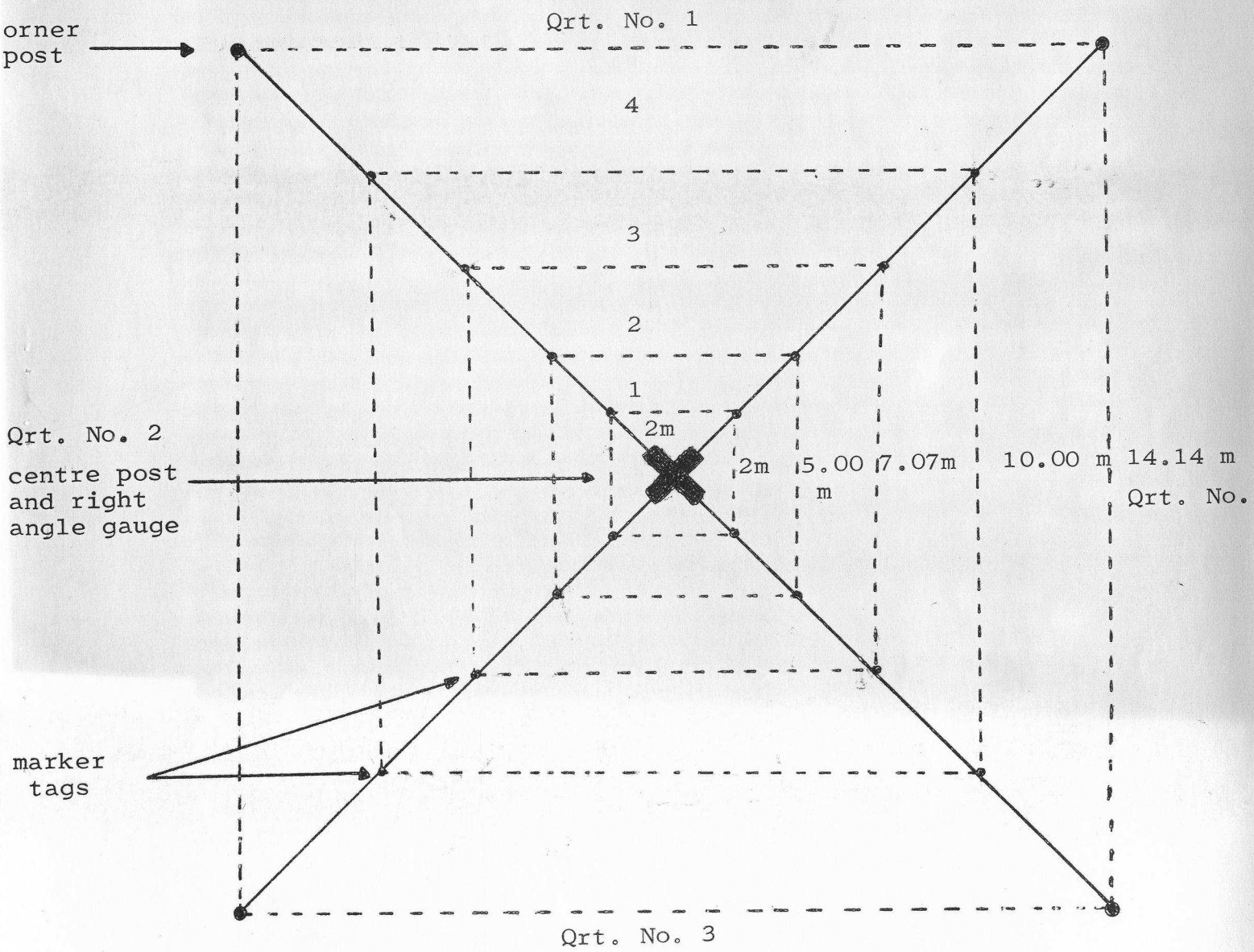
Figure 2

LAYOUT OF GROUND FLORA QUADRATS



Distance string position from centre = $\frac{1}{2}$ diagonal

2 m quadrat (4 m^2) = 1.42 m

1 Q = 25 m^2 (5.00 x 5.00 m) = 3.54 m

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

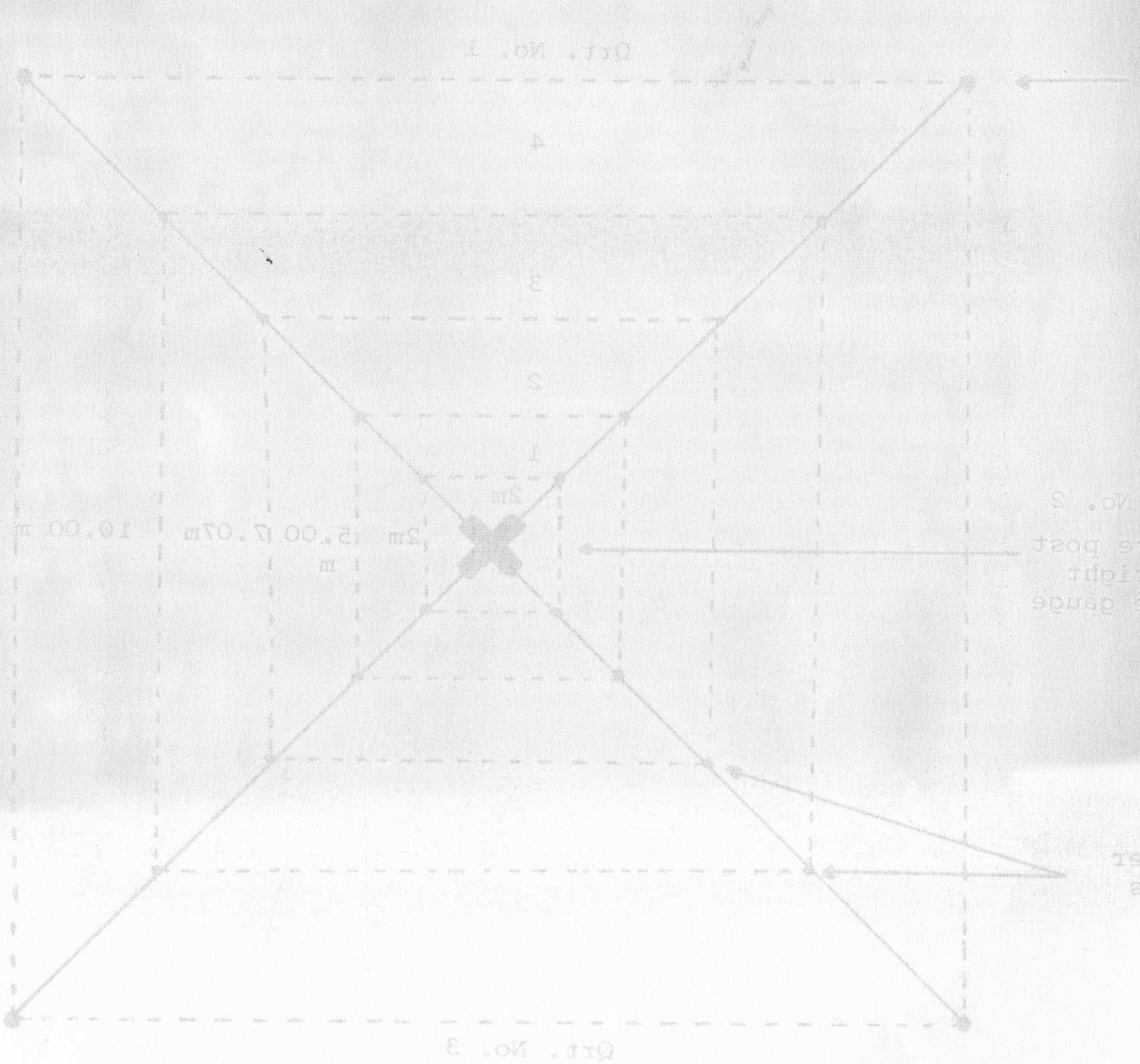
3 Q =100 m^2 (10.00 x 10.00 m) = 7.07 m

4 Q =200 m^2 (14.14 x 14.14 m) = 10.00 m

Scale 1 cm = 1 m

Figure 2

LAYOUT OF GROUND FLORA QUADRATS



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Scale 1 cm = 1 m

Appendix I

INSTRUCTIONS FOR THE COLLECTION OF HERBARIUM SPECIMENS

In order to ensure a high standard and uniformity of species identification all team leaders are responsible for the preparation and subsequent submission of a herbarium collection to demonstrate the accuracy of their species records. A type specimen should be obtained for all species occurring in the quadrats. As good a specimen as possible should be obtained with sufficient morphological characters to permit accurate identification later (preferably with flowering shoots). The supposed correct name of the species, or whatever name or code number it has been entered as in the field sheets, should be written clearly on the herbarium sheet to which the specimen should be securely attached with sellotape. A box file, blotting paper and hardboard sheets cut to size and sellotape are all provided for use in preparation of the herbarium.

When collecting and subsequently recording species under a supposed or code name, great care should be taken to ensure that all plants recorded under this identity are indeed the same. Key features for identifying such species should be noted at their first occurrence and rigidly adhered to thereafter. The rule is, if in doubt collect a specimen and enter it into the herbarium. If it does turn out to be a duplication nothing is lost and it can be merged with other records for that particular species.

Please try to present a comprehensive and well prepared herbarium. They will be examined in great detail because systematic mis-identification of species could introduce serious errors into the subsequent analysis of data.

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Appendix II

GROUND FLORA DATA (old-type form)

Site No. 200 Plot No. 1 Recorder M.W.S. Date 24/6/71

Code No.	1. Q.25m² Species	C.A. %	Code No.	2. Q.50m² Species	C.A. %
	Agrostis tenuis	1		Dryopteris filix-mas	+
	Deschampsia flexuosa	5		Potentilla erecta	1
	Holcus mollis	5			
	Lonicera periclymenum	5			
	Teucrium scorodonia	1			
	Pteridium aquilinum	75			
	Dryopteris dilitata	1			
	Oxalis acetosella	1			
	Oak sdlg.	+			
	Galium hercynicum	1			

Code No.	3. Q.100m² Species	C.A. %	Code No.	4. Q.200m² Species	C.A. %
	Rubus fruticosus	1		Rowan sdlg.	+
	Anthoxanthemum odoratum	+			
	Endymion non-scripta	+			

Cover/Abundance other categories %							
	Litter %	80	Rock %	1	Water %	—
	Wood %	5	Bare ground %	1	Bryophytes %	5

Appendix II

(old type form)

Site No. 200 Plot No. 1 Recorder M.W.S. Date 24/6/71

Code No.	1. 0.25m² species	*C.A. %	Code No.	2. 0.50m² species	C.A. %
	Agrostis tenuis	1		Trypetes filix-mas	+
	Deschampsia flexuosa	5		Potentilla erecta	1
	Holcus mollis	5			
	Luzula pseudosylvatica	5			
	Teucrium scorodonia	1			
	Pteridium aquilinum	75			
	Trypetes dilitata	1			
	Oxalis acetosella	1			
	Oak sdlg.	+			
	Galium hercynicum	1			

Code No.	3. 0.100m² species	C.A. %	Code No.	4. 0.200m² species	C.A. %
	Rubus fruticosus	1		Rowan sdlg.	+
	Anthoxanthum odoratum	+			
	Eupatorium non-scandens	+			

Cover/Abundance other categories *					
Litter %	80	Rock %	1	Water %	5
Wood %	5	Bare ground %	1	Scyphytes %	

Appendix II

PLOT GROUND FLORA DATA (New type form)

Site No. 200 Plot No. 1 Recorder M.W.S. Date 24/6/71

Code No.	1. Q.4m² species	C.A. %
	Agro. ten.	1
	Desch. flex.	5
	Hol. mol.	5
	Lonic. per.	5
	Teuc. scor.	1
	Pter. aqu.	75

Code No.	2. Q.50m² species	C.A. %
	Dryopteris-f-m.	+
	Pot. ere.	1

Code No.	3. Q.100m² species	C.A. %
	Rub. frut.	1
	Antho. od.	+
	Eudy. n-s.	+

Code No.	4. Q.25m² species	C.A. %
	Dry. dil.	1
	Oxal. acet.	1
	Oak sdlg.	+
	Gali. herc.	1

Code No.	5. Q.200m² species	C.A. %
	Rowan sdlg.	+

Cover/Abundance other categories %	Litter % 80	Rock %	Water % –
	Wood % 5	Bare ground %	Bryophytes % 5

(New type form)

Appendix III

TREE, SAPLING AND SHRUB DATA

Site No. 200 Plot No. 1 Recorder M.W.S. Date 24.6.71

Q. No	Species	D.B.H. (cm)	Ht (m)
1	Oak	37 24	16
TREES	Birch	9 7 12	
SAPS	Birch	2 5 2 2	
SHRB	Hazel	2 5 4 3 1 1 2 4 2 1	
2	Oak	16D 24	
TREES			
3	Oak	15 6D 15	
TREES			
SAPS	Birch	4 1	
	Rowan	4 3 4	
SHRB	Hazel	2 5 2 1 1 2 3 2D 3D 1 1 3D	
4	Oak	36	
TREES			

Appendix 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 (i.e. 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:

(S.E. = self-explanatory; and U.A. = unallocated)

1 (1) Site Number - S.E.

2 (2) Plot number - S.E., 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 ^{o} or %. Depends on the instrument provided - Blume Leiss = ^{o}, Haga = %. (see main text for methods).

(6) Aspect - ^{o} magnetic, S.E. (see main text for methods).

A. Trees - Management

5 Planted hardwoods - must be clear evidence that the trees have been planted, e.g. 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, e.g. 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, e.g. oak, ash, birch. New stumps can be distinguished from old 13 (11) by the absence of advanced rot, luxuriant growths of 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.

13 (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, S.E.

16 Stumps overgrown - in the more open woodlands, the older stumps in an advanced 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 - S.E.

24 Fire sites - S.E., 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) U.A.

B. Trees - Regeneration

29-48 (15-34) (as per species listed) - regeneration is any tree species >25 cm height and <5 cm D.B.H. and must be of seedling origin. The only exception (i.e. 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 - S.E.

51 Standing dead >10 cm diameter - S.E.

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 - S.E.

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

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.

51 (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 U.A.

D. Trees - Epiphytes and Lianes

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

62 (44) Bryophytes trunk - >50 cm height, trunk referring to primary structural member(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). S.E.

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

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

67 Mistletoe - S.E.

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

69 Ivy - as for 68 S.E.

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

72 U.A.

E. Habitats - Rock

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

74 (52) Rocks 5-50 cm - S.E.

75 (53) Boulders >5 cm - S.E.

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 of 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 cm (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 (57) as well. Otherwise S.E.

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. <u>Habitats - Aquatic</u>

85 (63) Small pool <1 m^2 - must not be running water, otherwise S.E.

86 (64) Pond 1-20 m^2 - as for 85 (63) S.E.

87 (65) Pond/lake >20 m^2 - as for 85 (63) S.E.

88 Stream slow <1 m - speed less than 1 m.p.h. (very slow walking or 1 m/2 secs).

89 Stream fast <1 m - speed over 1 m.p.h.

90 River slow 1-5 m speed as 88, S.E.

91 River fast 1-5 m - speed as 89, S.E.

92 River slow >5 m - speed as 88, S.E.

(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, S.E.

94 Bottom rock - S.E.

95 Bottom gravel - S.E.

96 Bottom sand - S.E.

97 Bottom mud - if water turbid, may have to poke with a stick (if turbid most likely mud anyway).

98 Bottom peat - S.E.

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, S.E.

101 (70) Marsh/bog - water exuded under feet.

102 (71) Ditch/drain dry - may be wet at other times of year, S.E.

103 (72) Ditch/drain wet - S.E.

104 (73 and 74) - U.A.

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 (i.e. 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, S.E.

107 Glade 5-12 m mixed - as for 105 but vegetation mixed, e.g. grass, herbs, brambles or even woody species <130 cm.

108 Glade >12 m mixed - as 107 above, S.E.

109 Glade 5-12 m boggy - as for 105 but ground exuding water under foot. Vegetation can be any of the boggy types, e.g. rushes, Sphagnum, even grasses such as Molinia. Is distinguished from attributes 105-108 by wetness.

110 Glade >12 m boggy - as for 109, S.E.

(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), S.E.

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 S.E.

119 and 120 U.A.

H. <u>Habitats - Human</u>

121 House occupied - S.E.

122 House unoccupied - S.E.

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 S.E.

126 Other building - S.E.

127 Ruined building - S.E.

128 Sheep pen/enclosure - S.E.

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, S.E.

135 (89) Rubbish domestic - S.E.

136 (90) Rubbish other - S.E.

I. Habitats - Vegetation

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

138 Hazel grove - as for 137, S.E.

139 Willow grove - as for 137, S.E.

140 Conifer grove - must have typical "grove" characteristics, i.e. dense branches near the ground, plenty of cover. Will therefore usually be restricted to young conifers. Otherwise as for 137, S.E. 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) S.E.

143 (93) Rhododendron thicket - as for 141 (91) S.E.

144 (94) Bramble clump - must be at least 25 m^2 in one piece to count.

145 (95) Nettle clump - as for 144 (94) S.E.

146 (96) Rose clump - as for 144 (94) S.E.

147 (97) Willow-herb clump - as for 144 (94) S.E.

148 (98) Umbellifer clump - as for 144 (94) S.E.

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) S.E.

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 - S.E.

158 (106) Macrofungi wood - on dead wood (see also 71 (50) on standing live or dead trees).

159 and 160 U.A.

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 suggestions are given below.

161 (107) Sheep - droppings, 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, browsing over 1.5 m (unless cattle present), 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 droppings 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, S.E.

(117) Squirrel (plot only) - red or grey together, S.E.

175 (118) Anthill - refers to larger species, with hill >25 cm.

176 (119) Corpse/bones - S.E. but can also be used to detect the presence of the deceased, e.g. rabbit bones record rabbit, etc.

(120) Spent cartridges - S.E.

(121) and (122) U.A.

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, characterstic 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 - S.E.

199 Spent cartridges - S.E.

200 U.A.

L. Marginal Land Use (<400 m distant)

For some of these, e.g. 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 <5 m. (Woodland 201-203 >5 m).

205 Orchard - S.E.

206 Arable - S.E.

207 Permanent pasture - S.E.

208 Rough grazing - may merge a bit with 207 and 209, but not critical.

209 Heath/moorland - S.E.

210 Marsh/fen/bog - S.E.

211 River - S.E.

212 Lake - S.E.

213 Road - S.E.

214 Railway - S.E.

215 Housing - more than five houses in a reasonable group.

216 Industrial - S.E.

217 Quarry/mine - S.E.

218 Tipping - rubbish dumps or industrial waste.

219 Waste - land which is under no immediately obvious usage.

220 U.A.

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.

N. Subjective Overall Impression of Site

236-241 Quite straightforward, simply one's subjective impression of the site.

242 Approximately time taken to survey - S.E.

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.

215 Housing - more than five houses in a reasonable group.

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Appendix IV (cont.)

PLOT DESCRIPTION AND HABITATS

1 Site No. 200 | 2 Plot No. 1 | 3 Recorder M.W.S. | 4 Date 24/6/71
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	30 Wych elm
31 Other hrwd.	32 Scots pine	33 Yew	34 Other con.

C TREES - DEAD (= HABITATS)

35 Fallen brkn.	~~36 Fallen uprtd.~~	~~37 Log. 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 Fern	49 Ivy	~~50 Macrofungi~~

E HABITATS - ROCK

~~51 Stone <5cm~~	~~52 Rocks 5-50cm~~	~~53 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 1-20m^2	65 Pond/lake>20m^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 prep~~	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 Hawthorn 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 Fern 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 Corpse/bones	120 Spent ctrdgs.	121	122

COMMENTS

Appendix II (cont.)

PLOT DESCRIPTION AND HABITATS

1 Site No. 200 | 2 Plot No. 1 | 3 Recorder M.W.S. | 4 Date 24/6/81
5 Slope 12° or | 6 Aspect 120° Mag.

A TREES - MANAGEMENT

~~1 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	30 Wych elm
31 Other hrwd.	32 Scots pine	33 Yew	34 Other con.

C TREES - DEAD (= HABITATS)

35 Fallen brk.	~~36 Fallen sprts.~~	~~37 Log. w. resting~~	38 Fall.brk.>10cm
39 Hollow tree	40 Rot hole	41 Stump <10cm	~~42 Stump >10cm~~

D TREES - EPIPHYTES AND LIANES

~~43 Moss~~	~~44 Moss dense~~	~~45 Moss branch~~	~~46 Lichen sparse~~
~~47 Fungi present~~	48 Fern	49 Ivy	~~50 Wild clematis~~

E HABITATS - ROCK

~~51 Outcrop <5m~~	~~52 Rocks 5-50m~~	~~53 Boulders >50m~~	54 Scree
~~55 Rock cut <2m~~	56 Cliff >2m	57 Rock ledges	~~58 Dry/rev. rock~~
59 Gully	60 Rock piles	61 Exp.gray/sand	62 Exp.min.soil

F HABITATS - AQUATIC

63 Sml.pool <1m²	64 Pond 1-20m²	65 Pond/lake>20m²	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 Grass <1m~~	76 Grd. >1m	77 Rky.knoll <12m	78 Rky.knoll >12m
79 Path <5m	80 Ride >5m	~~81 Track non prep~~	82 Track metalled

H HABITATS - HUMAN

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

I HABITATS - VEGETATION

91 Bkthorn thkt.	92 Hawthorn thkt.	93 Rhodo. thkt.	94 Bramble clump
95 Nettle clump	96 Moss clump	97 W.herb clump	98 Umbel.clump
~~99 Bracken dense~~	100 Moss bank	101 Fern bank	102 Grass bank
103 Leaf drift	104 Herb veg.sim	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 Arthill
119 Corvid/Pheas	120 Spent cartdgs.	121	122

COMMENTS

Appendix IV (cont.)

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 Macfungi soil~~	~~158 Macfungi 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 B.O.P.	~~188 Blackbird~~
~~189 Thrush~~	190 Heron	191 Wildfowl	192 Robin
~~193 Wren~~	~~194 Finches~~	~~195 Tits~~	~~196 Woodpecker~~
197 Pheasant	198 Other game	199 Spent ctrdgs.	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 Smashing~~	238 Pleasant	239 O.K.	240 Nasty
241 Nightmare	242 Approx. time taken to survey =		hrs.

COMMENTS

Appendix IV (cont.)

I HABITATS - VEGETATION

137 Alder grove	~~138 Hazel grove~~	139 Willow grove	140 Con. grove
141 Blackthorn.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. nm~~
~~157 Waterngi soil~~	~~158 Waterngi 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 B.O.P.	~~188 Blackbird~~
~~189 Thrush~~	190 Heron	191 Wildfowl	192 Robin
~~193 Wren~~	~~194 Finches~~	~~195 Tits~~	~~196 Woodpecker~~
197 Pheasant	198 Other game	199 Spent crdgs.	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 Hedging direct~~

N SUBJECTIVE OVERALL IMPRESSION OF SITE

~~237 Smashing~~	238 Pleasant	239 O.K.	240 Nasty
241 Nightmare	242 Approx. time taken to survey =		hrs.

COMMENTS

Appendix IV (cont.)

SITE DESCRIPTION AND HABITATS

1 Site No. 200 2 Plot No. 1-16 3 Recorder M.W.S. 4 Date 24-25/6/71

A TREES - MANAGEMENT

~~5 Plntd. hard~~	~~6 Plntd. 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 hard.~~	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 bnh.>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 <5cm~~	~~74 Rocks 5-50cm~~	~~75 Boulders >50cm~~	76 Scree
~~77 Rock outcp.<5m~~	78 Cliff >5m	~~79 Rock ledges~~	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.5-12m mxd.~~	~~108 Gld.>12m 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

DESCRIPTION AND HABITATS

1 Site No. 1-1b 3 Recorder M.W.S. 4 Date 24-25/9/94

A TREES - MANAGEMENT

1 Pollards	2 Pollards cut	3 Pollards new	4 Coppice
5 Coppice cut	6 Pitted cut	7 Pollards old	8 Coppice stool
9 Coppice new	10 Rec. cut cop.	11 Stump old	12 Stump nurse
13 Stump new	14 Stump coppice	15 Stump overgrown	16 Stump nurse
17 Brash/pruning	18 Stump treated	19 Cord wood	20 Cop. sticks
21 Stick/timber	22 Felled trees	23 Chips/sawdust	24 Fire sites
25 Fnt/bla/smks.	26 Extra/ton nurse	27 Veneer trees	28
	29 Ash	30 Hawthorn	31 Aspen
32 Beech	33 Elm	34 Hazel	35 Oak
36 Rowan	37 Holly	38 Lime	39 Poplar
40 Sycamore	41 Willow	42 Sweet Chestnut	43 Wych Elm
44 Other conif.	45 Other broad	46 Spruce	47 Pine
48 Rot holes	49 Stump decay	50 Stump rotten	51 Stump cut 10cm
52 Fall bnk. >10cm	53 Stump nurse	54 Hollow trees	55 Stump dead/hollow
56 Hollow trees	57 Rot holes	58 Fungi/v rotten	59 Stump <10cm
60			

D TREES - EPIPHYTES AND LIANNAS

61 Ivy/bnch	62 Ivy/trunk	63 Ivy/ground	64 Ivy/fence
65 Ivy/wall	66 Ivy/fence	67 Mistletoe	68 Clematis
69 Ivy/bnch	70 Honeysuckle	71 Mistletoe	72

E HABITATS - ROCK

73 Stones >50cm	74 Stones 5-50cm	75 Boulders >50cm	76 Scree
77 Rock outcrop	78 Cliff >5m	79 Rock faces	80 Bryo.covd.rock
81 Gully	82 Rock pillar	83 Exp.gran.sand	84 Exp.rock soil

F HABITATS - AQUATIC

85 Sml.pool <1m²	86 Pond 1-20m²	87 Pond/lake >20m²	88 Riv.slow 1-5m
89 Riv.fast <1m	90 Riv.slow 1-5m	91 Riv.fast 1-5m	92 Riv.slow >5m
93 Riv.fast >5m	94 Bottom stones	95 Bottom gravel	96 Bottom sand
97 Bottom mud	98 Bottom peat	99 Aquatic veg.	100 Spring
101 Marsh/bog	102 Ditch/drain dry	103 Ditch/drain wet	104

G HABITATS - OPEN

105 Grd.5-12m grass	106 Grd.5-12m mixd.	107 Grd.5-12m mixd.	108 Grd.>12m mixd.
109 Grd.5-12m bgy.	110 Grd.<12m bgy.	111 Rky.knoll <12m	112 Rky.knoll >12m
113 Field	114 Path 1-2m	115 Ride >5m	116 Track non-prop.
117 Track metalled	118 Road tarmac	119 Ride <5m	120
121	122	123	124

H HABITATS - HUMAN

125 Houses occ.	126 Houses unocc.	127 Farm unocc.	128 Farm occ.
129 Agri.bldg.	130 Other bldg.	131 Ruined bldg.	132 Embankment
133 WATT DRY	134 Mortared wall	135 Unmortared wall	136 Rubbish other
137 Soil excav.	138 Quarry/mine	139 Rubbish dom.	

Appendix V

INSTRUCTIONS FOR COLLECTING THE SOIL DATA AND COMPLETING THE FORM

Unfortunately many of the properties of soils which affect the plants and animals which are primarily or secondarily dependent on them are difficult or time-consuming to measure. In the case of large surveys, such as the present one, with a total of 1648 plots for which information on the soils is required, it is quite out of the question to carry out a full range of physical or chemical analyses. The traditional methods of studying soils depend largely on descriptive methods which cannot readily be adapted to the types of numerical analysis which are to be used in the current project.

The solution to the problem of obtaining adequate soil data within the resource limitations of the project has been to combine the measurement of a limited number of physical/chemical characteristics together with a numerical method of soil description using presence or absence of attributes. The physical/chemical measurements which will be carried out on the soil samples collected from the plots are:-

(a) pH

(b) Loss on ignition

(c) Mechanical analysis (% sand/silt/clay, by a simplified method)

Dried sub-samples will also be retained so that further analyses may be carried out at a later stage in the project if necessary.

In order to get the maximum interpretable information out of the method of numerical description, it has been found desirable to incorporate some of the elementary profile interpretative procedures which are involved in the standard descriptive methods. This involves dividing the soil profile up into named horizons according to the main trends in the pedological processes. Fortunately there is a fairly limited range of major soil types in Britain and the identification of the basic pedological process is not difficult.

Major Woodland Soil Types in Britain

In the basically temperate climate of Britain, most soils under conditions of free drainage belong to the Podzolic Soil Group. This group as a whole is characterised by consisting of freely leached soils in which calcium carbonate (or sulphate) is only a fugitive constituent. They are thus on the acid side of neutrality (<pH 7). Brown earths, brown forest soils, brown podzolic soils and podzols are some of the common types within this group.

When drainage conditions become sufficiently impeded, and often this is just a localised condition, there is a transition to hydromorphic soils in which the position of the water table and its chemical composition are the dominant factors. Gley, peat, and similar soils found in marshes and bogs, belong to this group. Similarly, where the weathered mineral layer on which soils are developed is shallow, either due to the nature of the underlying rock or erosion, skeletal soils are developed in which the dominant factor is lack of constituent material. Both hydromorphic and skeletal soils tend to occur mixed with the basic, climatically determined podzolic types, often in a complex mosaic based on the land form and drainage patterns.

The degree to which leaching has advanced in podzolic soils is dependent on a number of factors, some independent, some interrelated.

(i) Rainfall - or better still the potential amount of water available to run through the soil (= rainfall - evapo-transpiration).

(ii) The nature of the soil matrix - water percolates freely through sandy or stony soils but not through clay.

(iii) The base and/or weatherable mineral content of the soil - siliceous sands and sandstones are low in bases and weatherable minerals, and what there is is soon removed by leaching (water is also free to percolate - see (ii)), whereas calcareous rocks (chalk and limestone) or base rich igneous rocks are high in bases, and leaching takes much longer to remove them. Base rich materials often include, or weather to produce, a high clay fraction, which also tends to reduce the intensity of leaching.

(iv) The vegetation type and/or land use - heathy vegetation, often with burning, increases the rate of leaching (change to mor humus type producing organic acids etc.) whereas mixed deciduous woodland slows leaching down (mull humus and possibly less available leaching water).

(v) Time - the longer the soil has been developing, in the absence of disturbance by erosion, the more leached it will become. In Britain the soils are generally relatively young, those north of the glaciation line (Thames - Bristol Channel) having been under development for only 20,000 years or less.

Many podzolic soils in high rainfall areas (>70" p.a.) are for various reasons, finely balanced on the threshold of impeded drainage. Changes in land-use and vegetation or advancing podzoloisation can tip the balance resulting in the formation of a surface layer of peat (peats and peaty podzols).

In addition to the podzolic soils and their related types, there is another group of soils which also occur in Britain and will certainly be encountered in the survey, and this is the calcareous soils. These are characterised by the presence of free calcium

carbonate in the profile and are thus on the alkaline side of neutrality (>pH 7). As might be expected under British climatic conditions, calcareous soils are limited to those developed on calcium rich rocks, and particularly chalk and limestone. As already explained for the podzolic soils, the dynamics of these soils are also very complex, and they indeed grade without discontinuity into the podzolic group. There is also a strong geographical/geological relationship since the soft, easily weathered chalk mostly occurs in southern England where, due to the high evapotranspiration, potential leaching is at a minimum. Under these conditions, calcium carbonate in the profile is thus not readily leached out and the Rendzina soil type is quite common in this area. The harder, less weatherable limestones, most areas of which occur further north than the chalk, also produce calcareous soils, sometimes black, base saturated soils (pH >7) but under other conditions red soils, or Terra Rossa, which border on the acidic (c. pH 7) are developed. The degree to which calcium carbonate is retained in the soil depends on such factors as time, rainfall, depth of the soil to the calcareous rock, the hardness or fragmentation of that rock. On flat ground markedly acid soils may develop over hard, massive, limestone lying only a few inches below the surface. Similarly, shallow podzols can be observed on deep soils over chalk in the Chilterns.

In some situations the calcareous base rock (the solid geology) may be overlain by other material of different origin and composition, e.g. may be a layer of non-calcareous drift over a calcareous base rock and in this case, the soil profile will be determined by the superficial material. Within a given site, the depth of superficial deposit may vary so that a mosaic of types is produced. Even where larger fragments of limestone are well distributed in the profile, their effect may be quite localised with no free calcium carbonate in most of the material (pH <7). Such soils belong to the podzolic group.

It will be appreciated from the above discussion that the soil forming or pedological processes are essentially dynamic, and most of the soils you will meet in the field will be immature and undergoing changes of one sort or another, which means they will often be transitional between the classical textbook descriptions.

Methods of Interpretation and Recording Soil Profile

The use of the mattock and/or trowel to dig a small sloping pit is described in the main text. The auger can be used to investigate the lower levels. The first thing to do is dig a small pit about 30 cm deep if this is possible (i.e. the soil is not too rocky or shallow).

Having filled in the attributes 1-4 Site No., Plot No., etc. at the top of the form, the best procedure is to continue working down the profile (and form) interpreting on the way.

Each section of the form deals with a single named horizon (with the exception of the B horizon which is the B1 and B2 horizon combined). Having decided that a particular horizon is present

according to the methods of interpretation and definitions given below, the appropriate section of the form should be completed starting with depth from/to(cm). The from/to method is used instead of simple depth = thickness to avoid cumulative errors in scaling of the profile. Where horizon limits are irregular or poorly defined an average or best approximation should be given. Only in C Underlying Material, is the depth given as from, and if this value is not the soil depth, in terms of auger penetration, this should be given separately in brackets. Methods of determining, and the definitions of, the other attributes are given in their appropriate sections below. If a given horizon is not present it should be deleted by a diagonal line and not applicable = N.A. written across it.

Aoo Litter Layer (identifiable plant remains)

This is quite straightforward, either there are plant remains, and they can be identified from their appearance or by inference from the vegetation, or there are not.

Whether there is or is not a layer of identifiable plant remains at the soil surface and its depth, is the first major clue as to the nature of the profile (i.e. the pedological process that is dominant):-

(i) If there is no Aoo horizon or a shallow one, this is indicative of a MULL humus type and soil profile in which there will probably be no, or a very shallow Ao horizon, a + or - well developed A1 horizon, no A2 horizon, and no deposition layer in the B horizon.

(ii) If there is a well developed Aoo, several cm in depth, then this is indicative of a MOR humus type and a soil profile in which there is likely to be a well developed Ao horizon, no or a poorly developed A1 horizon, there may be a well developed A2 horizon and there may be a deposition layer in the B horizon.

Intermediate or MODER humus types are quite common, resulting in an intermediate profile type.

Composition - attributes 6-13 are all self-explanatory, more than one may be recorded and normally this will be the case.

Ao Organic Layer (decomposed plant remains with little or no mineral soil)

As explained above this may be very shallow, or virtually non-existent, or it may occupy the whole of the rest of the profile with no other recordable horizons; in other words, deep peat.

The presence or absence of mineral material can be tested by rubbing a sample between the fingers or on the palm of the hand, when mineral particles will normally be felt.

Having decided whether or not there is an Ao horizon delete or record.

Texture - attributes 15-17, needs little explanation. Pulling the material apart will detect whether it is 15 fibrous (do not mistake live roots for fibres, dead ones are legitimate) and breaking in the fingers will decide whether it is 16 granular or 17 amorphous.

Moisture - attributes 18-21, should be decided as follows:-

18 v wet - dripping with water without squeezing.
19 wet - water expressed on squeezing.
20 damp - obviously containing appreciable water but none expressed on squeezing.
21 dry - looks and feels reasonably dry.

A1 Mixed Mineral/Organic Layer (humus masking colour of mineral soil)

Again, the first thing to do is decide if this horizon is present or not:-

(i) If there is a well developed A1 horizon there will be little or no distinction between the Aoo, Ao and A1 layers, the profile grading almost imperceptibly from organic to organic/mineral mixed soil (this is a true brown earth or brown forest soil). In this case, the humus content will gradually decrease with depth, the soil paling from dark brown to a lighter colour as the true mineral colour of the soil is revealed by decreasing humus content. The actual boundary may be difficult to see and may be <40-50 cm in depth.

On the other hand, the A1 horizon may be poorly developed, shallow and exhibiting a + or - sharp transition with the mineral soil below. Common sense, colour and rubbing sample between the fingers will decide this.

(ii) If immediately beneath the Ao horizon there is a much paler, often white or greyish, layer with no organic matter in it (if there were organic matter it would be black or brown), then there is indeed no A1 horizon and what you are looking at is an A2 horizon (this is a true podzol).

Difficulties may arise in wet soils but this will usually occur in boggy areas (due to local drainage conditions) or on very heavy clay soils. Both these contingencies will be fairly obvious. In these cases water level, and the seasonal changes thereof, will be affecting the profile by producing alternate aerobic and anaerobic conditions. Where this is taking place in mineral soil, deposition of iron oxides on the structural units of the soil will occur. Breaking the soil between the fingers will reveal alternating pale and ocherous patches. If there is evidence of organic matter in this layer, it must be regarded as a gleyed A1 (and recorded appropriately) if not then it is

a gleyed B horizon (also to be recorded appropriately). Both gleyed A1 and B horizons will occur together in some profiles.

If the A1 has a high organic content, (but an appreciable quantity of mineral material must still be present) as may occur in boggy areas, the signs of mottling will not be visible. In this case it will be recorded as dark coloured (brown or black), wet or v. wet A1.

Having decided whether or not an A1 horizon is present, delete or record.

Transition with mineral soil - attributes 23 and 24, have already been discussed above and should now be obvious.

Texture - attributes 25-28, can be decided as follows:-

Roll a sample on the palm of the hand, wetting with spit if necessary. If it can be rolled into a coherant sausage it is either clay or silt.

25 Clay - if a sausage about 10 cm (4") long can be bent into a complete circle without breaking (must of course be sufficiently moistened) it is clay.

26 Silt - if the sausage breaks it is silt.

27 Sand - if it cannot be rolled into a sausage it is sand.

28 Stony - unless almost pure gravel will normally be recorded as well as one of the attributes 25-27. Must be >10% stones of any size to count.

Structure - attributes 29-31, refers to the compounding of the primary particles (sand, silt or clay) into aggregates. Breaking of the soil between the finger will reveal if such aggregates occur.

29 Powder - aggregates non-existent or very weak (coarse sands will usually exhibit this condition but other soils as well).

30 Crumb - aggregates, as the name suggests, like crumbs from a loaf of bread.

31 Clod - aggregates large and adherent, often breaking in more or less flat sided lumps up to several cm in length. Usually occur only on soils with a high silt or clay content.

Colour - attributes 32-35, self-explanatory. If the colour is markedly different from black, brown or possibly reddish-brown, then you have probably incorrectly identified this layer as A1, because the humus which must be present mixed with the mineral soil, being itself black or brown, will be masking other mineral colours.

35 mottled, has been adequately described above as indicating alternate aerobic/anaerobic conditions as a result of impeded drainage. Most commonly found in silts or clays.

Moisture - attributes 36-39 as for the Ao horizon.

A2 Leached or Eluviated Layer (bleached mineral soil)

The identification of this horizon has already been discussed at some length in connection with the Ao and A1 layers. Normally there will be a very sharp transition of the Ao with a paler layer of soil, usually showing a whitish or greyish colour, but it may be speckled with black humus fragments. Beneath this leached layer the soil will be much more brightly coloured again (= B horizon), and in extreme cases will have intensely coloured, horizontal zonation of black and/or reddish-brown colour. The black is humus deposition and the reddish-brown oxides of iron. A closer examination will reveal that these materials have been deposited on the surface of the soil particles, (sand grains or pebbles). In the majority of cases, particularly in western Britain, the A2 will merely be underlain by a fairly uniform, bright red or reddish-brown layer which again is the B horizon but with generalised, rather than localised, deposition of iron oxides. Many of these soils are only incipient podzols and no distinct A2 horizon will be visible, the profile passing from a sharply defined Ao, through a brownish layer to the much brighter B horizon. In this case it will be necessary to record what, although it is an incipient A2, as an A1 horizon (small quantities of humus are indeed present in this layer).

Having decided whether an A1 horizon is present or not delete or record.

Colour - attributes 40 and 41 have already been explained above. Must be one or other of these colours to be an A2.

Texture - as above for the A1 horizon. Is very unlikely to be clay of course, as the processes leading to the development of an A2 requires both low base status and free drainage. Note, that neither structure nor moisture are recorded for this layer as these will invariably be powdery (i.e. no aggregates) and damp or dry, respectively, almost by definition.

B Weathered Mineral Layer (B1 and B2 combined)

The B horizon is commonly divided into two layers, the B1 deposition layer and the B2 weathered mineral soil. For the purposes of this survey they are being grouped together.

As explained above the B1 can consist of local or more generalised deposition of humic or iron materials. A deposition layer is only to be recorded as present if it is of the localised variety with distinct horizontal (may be somewhat wavy) zonation. If present, record attributes 48-51, if not, delete and write N.A. on this sub-group of attributes.

Colour - attributes 48 and 49 are self-explanatory.

Compaction - attributes 50 and 51, pick at the layer with a finger tip, if it is hard, record compacted, if not uncompacted.

Texture - attributes 52-55, as A1 above.

Colour - (other than deposition layer) attributes 56-60, as A1 above.

Structure - attributes 61-63, as A1 above.

Moisture - attributes 64-67, as Ao above.

C Underlying Material

This may or may not be the parent material of the soil and for the purposes of this survey it will not be necessary to determine whether this is the case.

The term underlying material refers to whatever lies under the lowest of the overlying horizons that has been recorded for a given profile. Most commonly it will refer to the material that is immediately under the B horizon but in other cases it may be the A1 or Ao horizons, but not the A2 horizon which will always have some sort of B horizon beneath it.

On deep soils it may not be possible to determine the depth or nature of the underlying material since investigations will be limited to the length of auger (about 70 cm) plus the depth of the hole (i.e. about 80 cm at the limit). In this case the lower limit of the overlying horizon will be given as 75 cm + and the section on underlying material deleted and TOO DEEP written across it.

The most common problem will be determining the transition between the B horizon and the underlying material, and indeed there may be no marked division if the soil matrix is deep and uniform. Generally, the underlying material should be taken as commencing from where there is no further colour change (usually a gradual paling) in the B horizon. Other cases will be quite clear, with the B or some other horizon lying immediately on the top of some quite different material such as fragmentary or solid rock, gravel, clay etc. If the depth to which the auger can be inserted in the pit is less than 70 cm this should be recorded separately in a bracket () immediately beneath attribute 47.

The only attributes to be recorded for this horizon are Texture - attributes 69-74. The first four of these are as previously described for the A1 horizon, to which has been added 73 Rock (fragments) and 74 Rock (solid). These are self-explanatory and both can be recorded if necessary.

Rocks in Soil

Refers to stones or rocks anywhere in the profile from surface to underlying material.

Shape % - attributes (variables) 75-77, record approximate %, self-explanatory; rounded = really rounded, sub-angular = angular with the corners knocked off, angular - sharp corners.

Size range % - attributes (variables) 78-81, self-explanatory.

Composition % - attributes 82-89, very much depends on how good you are at identifying rocks. Scratching with a knife or breaking with the mattock may assist in identification. If in doubt, retain samples of main types and send samples in with soil in separate bags clearly labelled. Also add note to field sheet to this effect.

Comments

Earthworms - attribute 90, if you see any earthworms whilst digging the profile or observe earthworm burrows or casts record as present.

Any comments can be added on the reverse side of the form. In cases of extreme difficulty or doubt in the interpretation of a profile, draw a fully annotated diagram of the horizons observed and their various characteristics, on the back of the form. Disturbed profiles (excavation, ploughing, etc.), buried profiles, newly layed alluvium and soils on steep slopes with rapid erosion, may all present rather atypical horizons or total lack of same. Skeletal or immature soils may also have very limited horizon development. Watch out for all of these.

Two sample forms are attached as an example, showing the method of filling in two common profile types:-

A = a deep brown earth.

B = a slightly devèloped podzol.

Shape % - attributes (variables) 75-77, record approximate %, self-explanatory; rounded = really rounded, sub-angular = angular with the corners knocked off, angular - sharp corners.

Size range % - attributes (variables) 78-81, self-explanatory.

Composition % - attributes 82-89, very much depends on how good you are at identifying rocks. Scratching with a knife or breaking with the mattock may assist in identification. If in doubt, retain samples of main types and send samples in with soil in separate bags clearly labelled. Also add note to field sheet to this effect.

Comments

Earthworms - attribute 90, if you see any earthworms whilst digging the profile or observe earthworm burrows or casts record as present.

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Two sample forms are attached as an example, showing the method of filling in two common profile types:-

A = a deep brown earth.

B = a slightly developed podzol.

Appendix K. (cont.) Example 1.

SOIL DATA

1 Site No. 200 2 Plot No. 1 3 Recorder M.W.S. 4 Date 24/6/71

Aoo LITTER LAYER (identifiable plant remains)

5 Depth - cm

Composition: ~~(6 Leaves tree~~ (7 Needles (8 Grass (9 Herb

Composition: (10 Fern (11 Ericoid (12 Bryophyte (13 Wood

N.A.

Ao ORGANIC LAYER (decomposed plant remains with little or no mineral soil)

14 Depth - cm

Texture: ~~(15 Fibrous~~ (16 Granular (17 Amorphous

Moisture: (18 V. wet (19 Wet (20 Damp (21 Dry

N.A.

A1 MIXED MINERAL/ORGANIC LAYER (humus masking colour of mineral soil)

22 Depth 0 - 30cm

Transition with min. soil: (23 Sharp ~~(24 Gradual~~

Texture: (25 Clay ~~(26 Silt~~ (27 Sandy (28 Stony

Colour: (32 Black ~~(33 Brown~~ (34 Red (35 Mottled

Structure: (29 Powder ~~(30 Crumb~~ (31 Clod

Moisture: (36 V. wet (37 Wet ~~(38 Damp~~ (39 Dry

A2 LEACHED OR ELUVIATED LAYER (bleached mineral soil)

40 Depth - cm

Colour: ~~(41 Whitish~~ (42 Greyish

Texture: (43 Clay (44 Silt (45 Sandy (46 Stony

N.A.

B WEATHERED MINERAL LAYER (B1 and B2 combined)

47 Depth 30 - 60cm

Deposition layer if present? (48 Black (49 Red/brown (50 Comp. (51 Uncomp.

N.A.

Texture: (52 Clay ~~(53 Silt~~ (54 Sandy ~~(55 Stony~~

Colour other than deposition layer: (56 Yellow ~~(57 Yell./brn.~~ (58 Brown (59 Red (60 Mottled

Structure: (61 Powder ~~(62 Crumb~~ (63 Clod

Moisture: (64 V. wet (65 Wet ~~(66 Damp~~ (67 Dry

C UNDERLYING MATERIAL

68 Depth from 60cm 70+

Texture: (69 Clay ~~(70 Silt~~ (71 Sandy

Texture (cont.): ~~(72 Stony~~ (73 Rock (frag.) (74 Rock (solid)

ROCKS AND STONES IN SOIL

Shape %: (75 Round = %100 (76 Sub-angular = % (77 Angular = %

Size range %: (78 < 5 cm = %75 (79 5-10 cm = %25 (80 10-20 cm = % (81 > 20 cm = %

Composition %: (82 Slate/shale = %80 (83 Sandstone = %20 (84 Grit = % (85 Chalk = % (86 Limestone = % (87 Flint = % (88 Granite = % (89 Others = %

GENERAL

Fauna ~~90 Earthworms~~

Soil depth at plot corner: (91 1/2 cm (92 2/3 cm

Soil depth at plot corner: (93 3/4 cm (94 4/1 cm

Example 1

SOIL DATA

Site No. 200 Plot No. Recorder M.W.S. Date 24/6/71

A00 LITTER LAYER (identifiable plant remains)

S Depth - cm

Composition (6 Leaves, Stems (7 Needles (8 Cones (9 Bark (10 Bracts (11 Fruits (12 Bryophyte (13 Wood

B0 ORGANIC LAYER (decomposed plant remains with little or no mineral soil)

L4 Depth - cm

Texture (15 Fibrous (16 Granular Moisture (19 Wet (20 Damp (21 Dry

MIXED MINERAL ORGANIC

Depth 0

C MIXED MINERAL/ORGANIC LAYER (humus masking colour of mineral soil)

Depth 0 - 30cm

Transition (23 Sharp (24 Gradual

with min. soil

Texture (25 Clay (26 Silt (27 Sandy (28 Loamy

Colour (32 Black (33 Brown (34 Red (35 Mottled

Structure (29 Powder (30 Crumb (31 Clod

Moisture (36 V. wet (37 Wet (38 Damp (39 Dry

A2 LEACHED OR ELUVIATED LAYER (bleached mineral soil)

40 Depth - cm

Colour (41 Whitish (42 Greyish

Texture (43 Clay (44 Silt (45 Sandy (46 Stony

MINERAL MINERAL

B WEATHERED MINERAL LAYER (B1 and B2 combined)

47 Depth 30 - 60cm

Texture (48 Clay (49 Silt (50 Sandy (51 Stony

Structure (52 Powder (53 Crumb (54 Clod

Colour (55 Black (56 Red (57 Brown (58 Yellow (59 Mottled

Moisture (60 V. wet (61 Wet (62 Damp (63 Dry

Deposition (48 Black

Layer is (50 Comp. (51 Uncomp. deposition (58 Brown

present? other than (59 Red (60 Mottled

D UNDERLYING MATERIAL

C UNDERLYING MATERIAL

68 Depth from 60cm

Texture (69 Clay (70 Silt (71 Sandy (72 Stony

Colour (73 Rock (parag.) (74 Rock (solid)

ROCKS AND STONES IN SOIL

Shape % (75 Rounded = %100 (76 Sub-angular = %75 (77 Angular = %50

Composition % (78 Sandstone = %20 (79 Slate shale = %60 (80 Grit = % (81 Chalk = % (82 Limestone = % (83 Flint = % (84 Granite = % (85 Other = %

Size range % (86 0-2cm = %25 (87 2-5cm = %25 (88 5-10cm = %25 (89 10-20cm = % (90 >20cm = %

CLIMATE

Rainfall (91 Low (92 Medium (93 High

Temperature (94 Hot (95 Warm (96 Cool

FAUNA

Fauna (97 Earthworms (98 Termites (99 Others

Soil depth at pilot corner (101 1/2 cm (102 2/3 cm

Soil depth at pilot corner (103 3/4 cm (104 4/1 cm

Example 2.

Appendix V. (cont.)

SOIL DATA

1 Site No. 200 2 Plot No. 2 3 Recorder M.W.S. 4 Date 2.

Aoo LITTER LAYER (identifiable plant remains)

5 Depth 0 - 4 cm

Composition: (~~6 Leaves tree~~, (7 Needles, ~~(8 Grass~~, (9 Herb

Composition: (10 Fern, ~~(11 Ericoid~~, (12 Bryophyte, (13 Wood

Ao ORGANIC LAYER (decomposed plant remains with little or no mineral soil)

14 Depth 4 - 10 cm

Texture: (15 Fibrous, (16 Granular, ~~(17 Amorphous~~

Moisture: (18 V. wet, (19 Wet, ~~(20 Damp~~, (21 Dry

A1 MIXED MINERAL/ORGANIC LAYER (humus masking colour of mineral soil)

22 Depth - cm

Transition with min. soil: (23 Sharp, (24 Gradual

N.A.

Texture: (25 Clay, (26 Silt, (27 Sandy, (28 Stony

Colour: (32 Black, (33 Brown, (34 Red, (35 Mottled

Structure: (29 Powder, (30 Crumb, (31 Clod

Moisture: (36 V. wet, (37 Wet, (38 Damp, (39 Dry

A2 LEACHED OR ELUVIATED LAYER (bleached mineral soil)

40 Depth 10 - 13 cm

Colour: ~~(41 Whitish~~, (42 Greyish

Texture: (43 Clay, (44 Silt, ~~(45 Sandy~~, (46 Stony

B WEATHERED MINERAL LAYER (B1 and B2 combined)

47 Depth 13 - 35 cm

N.A.

Deposition layer if present? (48 Black, (49 Red/brown, (50 Comp., (51 Uncomp.

Texture: (52 Clay, (53 Silt, ~~(54 Sandy~~, (55 Stony

Colour other than deposition layer: (56 Yellow, (57 Yell./brn., (58 Brown, ~~(59 Red~~, (60 Mottled

Structure: (61 Powder, ~~(62 Crumb~~, (63 Clod

Moisture: (64 V. wet, (65 Wet, ~~(66 Damp~~, (67 Dry

C UNDERLYING MATERIAL

68 Depth from 35 cm 50+

Texture: (69 Clay, (70 Silt, ~~(71 Sandy~~

Texture (cont.): ~~(72 Stony~~, (73 Rock (frag.), (74 Rock (solid)

ROCKS AND STONES IN SOIL

Shape %: (75 Round = %100, (76 Sub-angular = %, (77 Angular = %

Size range %: (78 < 5 cm = %100, (79 5-10 cm = %, (80 10-20 cm = %, (81 > 20 cm = %

Composition %: (82 Slate/shale = %, (83 Sandstone = %100, (84 Grit = %, (85 Chalk = %, (86 Limestone = %, (87 Flint = %, (88 Granite = %, (89 Others = %

GENERAL

Fauna: 90 Earthworms

Soil depth at plot corner: (91 1/2 cm, (92 2/3 cm

Soil depth at plot corner: (93 3/4 cm, (94 4/1 cm

Example 2.

Appendix V. (cont.)

1. Site No. 200 2. Pit No. 2 3. Recorder M.W.S. 4. Date 2.

SOIL DATA

A00 INTRA LAYER (identifiable plant remains)

5. Depth 0 - 4 cm

Composition	(6 Herbaceous Trees)	(10 Fern)
	(7 Mosses)	(11 Bracket)
	(8 Grasses)	(12 Bryophyte)
	(9 Herb)	(13 Wood)

A0 ORGANIC LAYER (decomposed plant remains with little or no mineral soil)

14. Depth 4 - 10 cm

Texture	(15 Fibrous	(18 V. wet
	(16 Granular	(19 Wet
	(17 Amorphous	(20 Damp
		(21 Dry

A1 MIXED MINERAL/ORGANIC LAYER (humus mixture colour of mineral soil)

22. Depth - cm

Texture	(25 Clay	Colour	(32 Black
	(26 Silt		(33 Brown
	(27 Sandy		(34 Red
	(28 Stony		(35 Mottled

Transition with m. soil

(23 Sharp		(36 V. wet
(24 Gradual		(37 Wet
Structure	(29 Powder	Moisture (38 Damp
	(30 Crumb	(39 Dry
	(31 Clod	

A2 LEACHED OR ELUVIATED LAYER (bleached mineral soil)

40 Depth 10 - 15 cm

Colour	(41 Whitish	(43 Clay
	(42 Greyish	(44 Silt
Texture		(45 Sandy
		(46 Stony

B. WATERED MINERAL LAYER (B1 and B2 combined)

47 Depth 15 35 cm

Texture	(52 Clay	Structure (61 Powder
	(53 Silt	(62 Crumb
	(54 Sandy	(63 Clod
	(55 Stony	

Deposition layer if present

(48 Black		(64 V. wet
(49 Red/brown		(65 Wet
(50 Comp.	Colour	(66 Damp
(51 Uncomp.	other than deposition layer	Moisture (67 Dry
		(68 Brown
		(69 Red
		(70 Mottled

C. CHANGING MATERIAL

98 Depth from 35 cm

35+

Texture	(69 Clay	
	(70 Silt	Texture (73 Rock (fragd.)
	(71 Sandy	(cont.) (74 Rock (solid)
		(75 Stony

ROCKS AND STONES IN SOIL

Shape %	(75 Round	= %100	Composition %	(82 Slate/shale = %
	(76 Sub-angular	= %		(83 Sandstone = %
	(77 Angular	= %		(84 Grit = %
				(85 Chalk = %
Size %	(78 < 5 cm	= %100		(86 Limestone = %
	(79 5-10 cm	= %		(87 Flint = %
	(80 10-20 cm	= %		(88 Granite = %
	(81 > 20 cm	= %		(89 Others = %

Finish

90 Remarks Soil depth (91 1/2 cm at plot corner (92 2/3 cm Soil depth (93 3/4 cm at plot corner (94 4/1 cm

Appendix VI

LIST OF FIELD EQUIPMENT

1 x plot marking equipment (comprising centre pole + right angle gauge, 4 x corner poles + distance strings)

Haversack 1 (clean)

1 x magnetic compass
1 x hypsometer
1 x diameter tape
1 x 30 m tape

2 x tag boards
2 x label sticks
1 x calipers

(soil and bryophyte samples usually carried in this bag)

Haversack 2 (dirty)

1 x mattock
1 x trowel
1 x auger + handle
4 x marker pegs

Site Bag (polythene bag one per site)

Map
Field sheets
Metal labels (soil and bryophyte)
Polythene bags (soil and bryophyte)
Paper labels
Spare metal labels

General Equipment

Balls of string
Roll narrow sellotape
Roll broad sellotape
Spare pencils
Rubber
Herbarium box + hardboard and blotting paper sheets
Fold-flat cardboard boxes
Set 1" maps
Spare labels
Mini-stapler
Insect repellant cream

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LIST OF FIELD EQUIPMENT

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1 x calipers

(soil and bryophyte samples usually carried in this bag)

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1 x mattock
1 x trowel
1 x auger + handle
4 x marker pegs

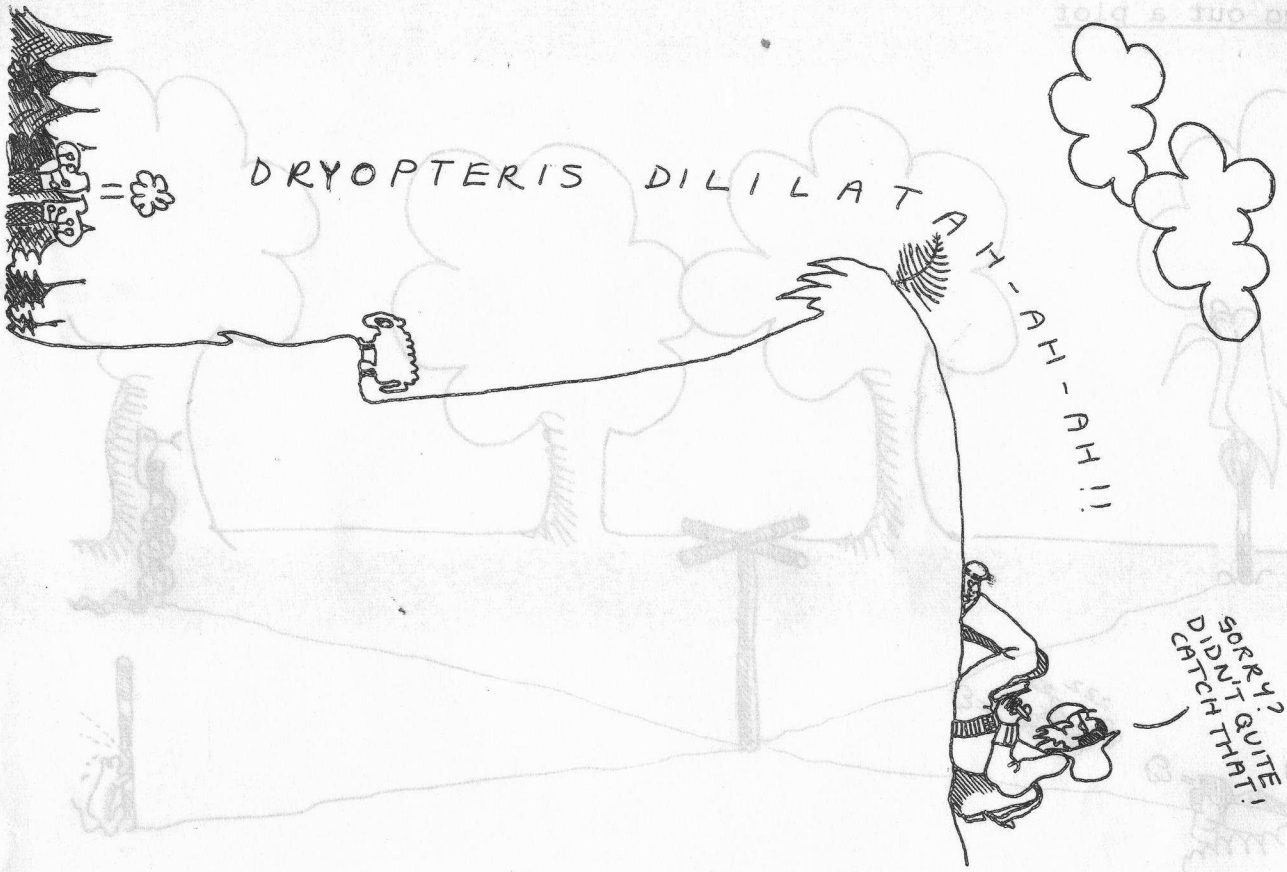
Site Bag (polythene bag one per site)

Map
Field sheets
Metal labels (soil and bryophyte)
Polythene bags (soil and bryophyte)
Paper labels
Spare metal labels

General Equipment

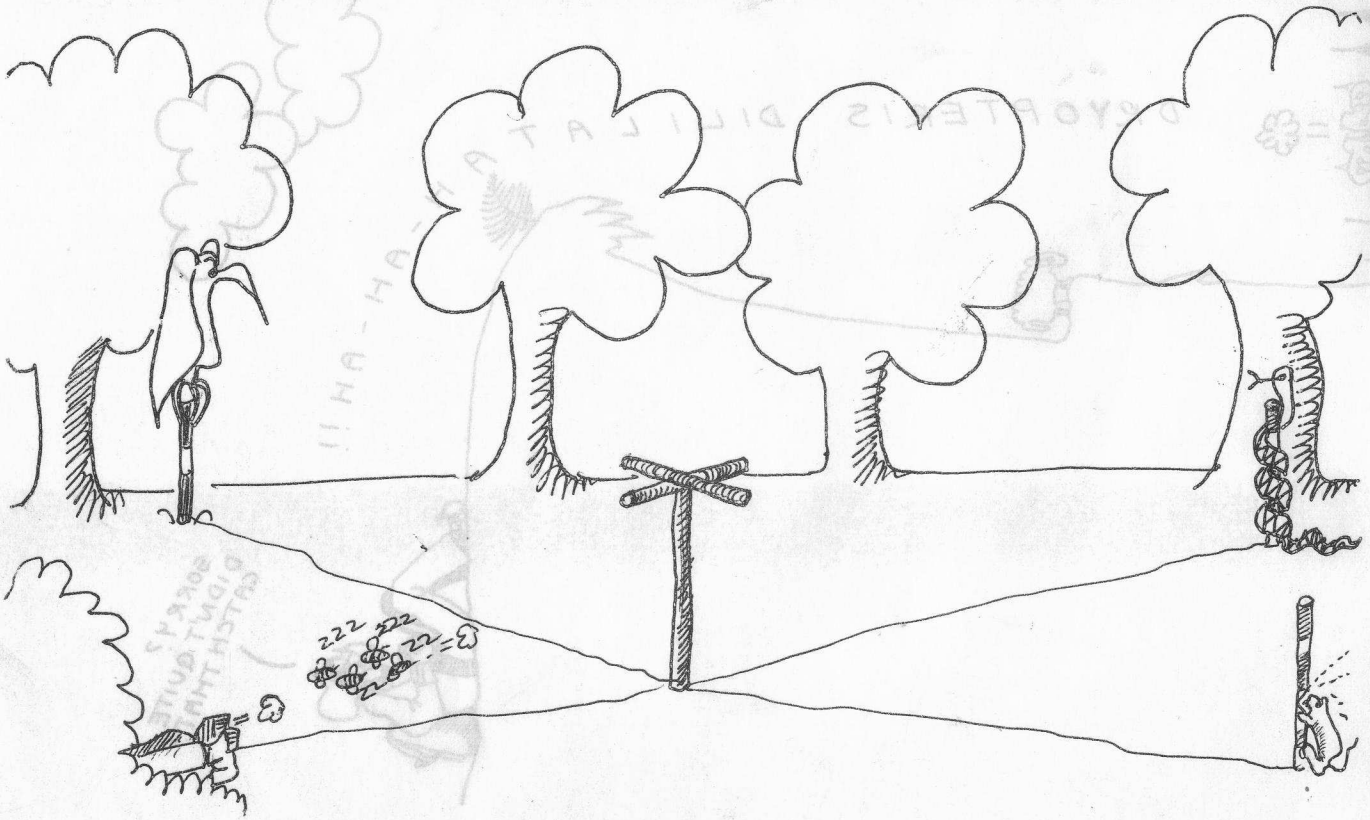
Balls of string
Roll narrow sellotape
Roll broad sellotape
Spare pencils
Rubber
Herbarium box + hardboard and blotting paper sheets
Fold-flat cardboard boxes
Set 1" maps
Spare labels
Mini-stapler
Insect repellant cream

Recording ground flora



Taking a soil sample

Setting out a plot



Measuring tree d.b.h.'s