# ECOLOGICAL SURVEY OF CUMBRIA

# HANDBOOK OF FIELD METHODS

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## Preface

The purpose of this handbook is to inform you of the background to this summer's survey, to explain its purpose, and to give a detailed account of the methods involved in the survey.

## Introduction

Cumbria is over 7,000 sq. km. in extent having been reborn on 1 April 1974 by the amalgamation of the old counties of Cumberland and Westmorland, the Furness area of Lancashire and the north western extremity of the Yorkshire Dales National Park. Its centre consists of the Lake District National Park, covering approximately a third of the County. Existing Areas of Outstanding Natural Beauty (AONB) are the Arnside/Silverdale area on the southern boundary, and the Solway Coast. The North Pennines area, consisting of the Cross Fell Escarpment overlooking the Eden Valley, is a proposed AONB.

The topography, geology, climate and land use throughout the County is diverse enabling it to be subdivided into reasonably uniform areas on physical grounds. These areas are not coincident with the administrative boundaries which subdivide the County into six district council areas. The centre is dominated by the high, rocky fells of the Lake District with their steep slopes on Borrowdale Volcanic Rocks. The other highland area is the North Pennines on Carboniferous limestone, with a much flatter moorland top. The Eden Valley runs NNE between these two areas from Appleby to Carlisle and is predominantly a dairy farming region. The sub-coastal fringes of the County cover a large area to the north, whilst the coast proper can be sub-divided into coastal and estuarine areas, such as Morecambe Bay, the Solway Firth and the Duddon Estuary.

## Background to the survey

One of the functions of the County Council is to produce a Structure Plan for the County setting out policies for future land use.

Nature conservation and the impact of land use upon wild life habitats is a major issue in Cumbria. Before policies can be set up to deal with this issue information is required on the extent and nature of wildlife habitats. Information about specific sites is readily available, there being 200 designated sites of biological/ geological importance (SSSIs and nature reserves) in Cumbria. However, comparable information about the overall ecological situation is not available; and it is this information gap that the ecological survey of Cumbria is designed to fill.

The survey is being carried out jointly by the Cumbria County Planning Department and the Institute of Terrestrial Ecology, with the intention of producing a report for the Structure Plan by March/ April 1976. The Planning Department is supplying most of the staff for the survey and for evaluating the data collected; ITE will provide the computer and laboratory facilities needed.

## The ecological survey

The ecological survey is based on methods developed at ITE's Merlewood Research Station for surveys of the semi-natural woodlands of Great Britain and used in a survey of the native pinewoods of Scotland. The methods have been further adopted to regional ecological surveys and applied to the Lake District National Park and Shetland.

A number of randomly distributed points are marked on a map, and these are taken as the sampling plots for the survey. Each plot, is visited, and a $200m^2$ quadrat is set up. Within this quadrat, all the plants are recorded, a soil pit is dug and described, and information is recorded on the habitats present. After the summer, this data will be analysed, using multivariate techniques, such as ordination, to help establish the range of variation in Cumbria's ecosystems.

## Methods

### Locating the plot

You will be working in pairs on the survey, and the work can be split between you; you will soon develop your own method of working as a team.

The first step will always be to locate the sampling plot you are going to visit. These plots are marked as points on the 6" O.S. maps which you will have been given. The 16 black plots must be visited; if this is impossible owing to danger to life and limb, or permission to enter the land is refused, then you can substitute the nearest red plot.

Since the plots are distributed in a random manner, it is important that there should be no subjective bias in locating them on the ground, and the plots in the field should be located as accurately as possible from the map. This is done in stages.

(i) Firstly, find an easily-recognisable landscape feature on the map, near the plot to be sampled, which can be readily located in the field; such a feature could be a sharp bend in a road or track, a fork in a river, the corner of a lake, or any other unambiguous feature.

(ii) Go to this control point on the ground.

(iii) Using the map and Silva compass provided, take a bearing from the control point to the plot to be visited. Don't forget to add 10° for magnetic declination.

(iv) Measure the distance from the control point to the plot, using the scale on the Silva compass. This is in 1/16ths of an inch; 1/16 of an inch on the six inch scale map will equal 18.33 yds on the ground.

(v) Now pace the <u>exact</u> number of yards measured from the control point, following the correct bearing on the compass. The last pace you take will land your foot exactly in the middle of the plot to be sampled.

You should make allowance if your pace is less than one yard on average (i.e. if your average pace is 2' 6", add on 6" for each pace, or in other words, one extra pace every five).

If you need to pace uphill, you will have to add on extra paces to compensate for this. Thus for slopes of the approximate angle given below, add the given percentages onto the original number of paces.

| 20° | 25° | 30° | 35° | 40° |
|---|---|---|---|---|
| 6% | 10% | 15% | 22% | 31% |

For example, if the distance from your control point to the plot

is 1/16" on the map, (i.e. 18.33 yds on the ground), and it is all up a slope of about 25°, you should add on 1.8 yards, making 20 paces in all.

If this procedure is rigidly adhered to, it will ensure absolute absence of bias in locating the sampling plot. There may be some loss of accuracy (for example due to a slight deviation from the bearing walked, or the paces being slightly longer or shorter than 1 yard), so that the point on the map and the point in the field do not correspond exactly. This however, is not important, as long as there has been no subjective bias in locating the plot in the field.

Recording data in the plot

The basic sampling unit, as mentioned above, is a 200$m^2$ quadrat. This is set up using the five posts and strings provided. The centre post has a bolt on top, on which is a right-angled cross held on by a wing-nut. The other four posts are the corner-poles of the plot, and each has a 10-metre cord tied to it. Each of these cords can be attached to the centre pole by clips, and they form the diagonals of the plot.

When a quadrat is set up, the centre post should be struck into the ground at the central point of the plot (which has been paced out as described above). The cross is used to orientate the four diagonals, and spinning it ensures that this orientation is random.

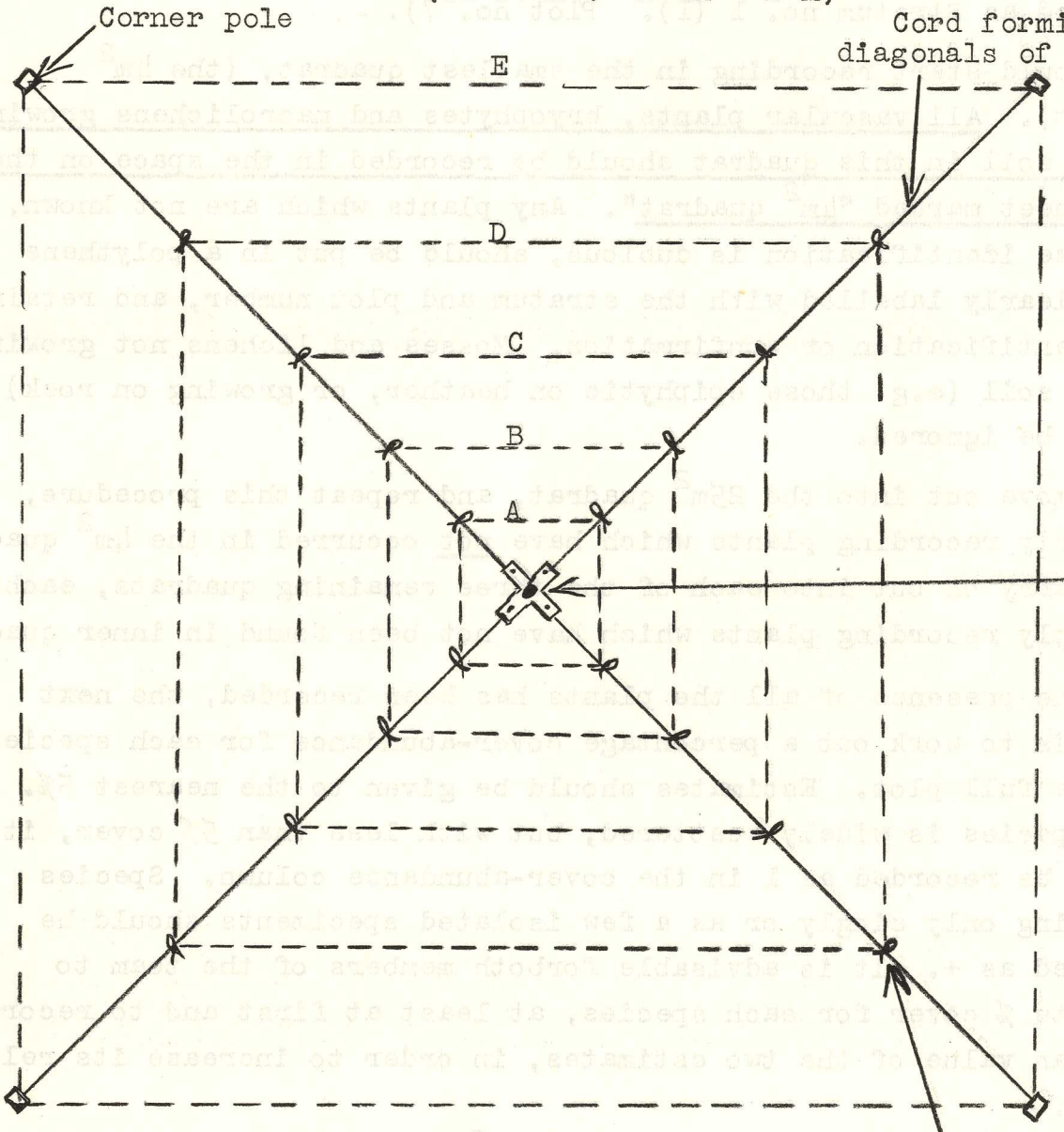
The next stage is to unroll the orange cord from each of the corner posts, and to clip it onto the centre post. The corner post should be carried out by one member of the team until the cord is taut; the other member can use the nails in the right-angled cross to sight onto the corner post, to make sure that it is orientated correctly.

When the cords are stretched out, it will be seen that they have four pieces of coloured rope tied on them at specified distances from the centre. These mark the corners of successively smaller quadrats within, and concentric with, the large 200$m^2$ quadrat. Thus there are five quadrats in all, of respectively 4$m^2$, 25$m^2$, 100$m^2$ and 200$m^2$. This is illustrated in Figure 1. These five quadrats are the sampling units for the vegetation.

AERIAL VIEW OF QUADRAT

Fig. 1

(To scale: 1 cm = 1 m)




Key: A = outside of $4m^2$ quadrat
B = " " $25m^2$ "
C = " " $50m^2$ "
D = " " $100m^2$ "
E = " " $200m^2$ "

Ground flora (Species data sheet)

The sheet used for recording the plant species is shown in Figure 2. When filling it in, first enter the stratum and plot numbers as given on the map. (Thus point no. 1 (1) 7 on the map is recorded as Stratum no. 1 (1). Plot no. 7).

You should start recording in the smallest quadrat, (the $4m^2$ quadrat). All vascular plants, bryophytes and macrolichens growing on the soil in this quadrat should be recorded in the space on the data sheet marked "$4m^2$ quadrat". Any plants which are not known, or whose identification is dubious, should be put in a polythene bag, clearly labelled with the stratum and plot number, and retained for identification or confirmation. Mosses and lichens not growing on the soil (e.g. those epiphytic on heather, or growing on rock) are to be ignored.

Next, move out into the $25m^2$ quadrat, and repeat this procedure, this time only recording plants which have not occurred in the $4m^2$ quadrat; then carry on out into each of the three remaining quadrats, each time only recording plants which have not been found in inner quadrats.

When the presence of all the plants has been recorded, the next thing is to work out a percentage cover-abundance for each species for the full plot. Estimates should be given to the nearest 5%. If a species is widely scattered, but with less than 5% cover, it should be recorded as 1 in the cover-abundance column. Species occurring only singly or as a few isolated speciments should be recorded as +. It is advisable forboth members of the team to estimate % cover for each species, at least at first and to record the mean value of the two estimates, in order to increase its reliability.

The cover-abundance % of the other categories (rock, water, litter, bare ground and bryophytes) should be recorded at the bottom of the sheet.

Ignore the column marked "code". This is for use later on when sorting out the data. An example of a completed field sheet is given in Figure 2.

# SPECIES DATA

Stratum No: Plot No: Recorder: Date:

| Code | Species ($4m^2$ quadrat) | C.A. % |
|---|---|---|
| | | |

| Code | Species ($25m^2$ quadrat) | C.A. % |
|---|---|---|
| | | |

| Code | Species ($50m^2$ quadrat) | C.A. % |
|---|---|---|
| | | |

| Code | Species ($100m^2$ quadrat) | C.A. % |
|---|---|---|
| | | |

| Code | Species ($200m^2$ quadrat) | C.A. % |
|---|---|---|
| | | |

Cover abundance ) Rock =
of other categories ) Bare ground =

Water = Litter =
Bryophytes=

Soil data sheet

To obtain a general picture of the type of soil present in the plot, without letting soil sampling become a time-consuming exercise, the soil is to be described from a single profile, in the exact centre of the plot (i.e. where the centre pole was placed). The soil data sheet has been worked out in advance (see Figure 3), and all that you have to do is to cross off those attributes which apply to the profile in question. To expose a profile, dig down as deep as you can with the trowel and collect cores of the soil below this level using the auger. In digging try to disturb the smallest area possible.

First, it is necessary to distinguish between the different horizons of the soil. The litter layer consists of undecomposed or readily recognisable plant remains. If this is present, record the depths between which it is found (attribute 5) and its composition; this is done by seeing what plant remains you can recognise in the litter (attributes 6 - 15). If there is standing water in the soil saturating the litter layer, record attribute 16. If there is no litter layer, delete this section completely with a diagonal line.

The organic matter layer consists of decomposed plant remains, with no (or virtually no) admixed mineral matter. This may be very shallow, as on some grassland, or very deep, where there is deep peat cover. If this is present, record the depths between which it occurs. If the peat is deeper than the length of the auger, record the maximum depth as 75+ cm (75 cm is the length of the auger.)

Colour (attributes 18 - 20): self explanatory.

Decomposition: this is a measure of the amount of decay of the organic matter. To determine this, take a handful of the organic matter and squeeze it in your hand. If only clear water oozes out, record low decomposition (23). If the whole handful oozes out as a black mush, then the material is completely decomposed (attrib. 21). If blackish or brownish water emerges, record medium decomposition (22).