

CHANGES IN KEY HABITAT: A SURVEY OF LOWLAND HEATH

FIELD HANDBOOK

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1. INTRODUCTION

- 1.1 Land use research has become an area of scientific and political interest during the last decade. The Natural Environment Research Council (NERC) has listed the major aims of land use research as: to classify land according to its capability and quality, for different purposes; to determine the constraints on land use; to assess the sustainability and consequences of land use; to test which combinations of land use are most suitable for particular areas; to monitor change in land use and quality; and to provide a basis for policies which optimise the environmental, social and economic benefits of changes in land use. Data collection is clearly essential in order to provide inputs to other areas of land use research.
- 1.2 ITE has carried out three major surveys of GB to gather data on the natural environment; these were based on the application of the ITE Land Classification System. The first was in 1977/8 with an emphasis on recording ecological data, especially vegetation and soils. The second was in 1984 and concentrated on the mapping of land cover and landscape features. The third formed a contract to ITE, part-funded by NERC, DOE and the former NCC, and was known as "Countryside Survey 1990" (CS1990). This project, by far the largest of the three, included field surveys of land cover, landscape features and vegetation quadrats. It also included soil surveys of all sample squares and was linked to a project mapping the land cover of GB using satellite imagery.
- 1.3 In all three field surveys, a sample unit of 1 x 1 km square has been used. In 1978, eight squares were drawn from each of the 32 ITE Land Classes giving a total of 256 sites; this was increased by 50% in 1984 so that 12 squares were visited in each class (384 sites in total). The same squares were surveyed in 1990 and an additional 124 squares were added to the sample, being allocated to Land Classes in proportion to their size, and giving a total of 508 squares. A further 25 essentially urban squares were also surveyed as a separate subproject. These three surveys are known as the ITE Countryside Surveys.
- 1.4 Data collected from these surveys have been used to characterise the Land Classes, leading to a better understanding of the classification and to its wider use as a stratification for ecological sampling. A comparison of the land cover and landscape data from the surveys has allowed quantitative assessments of recent changes in the countryside to be made. The survey data have also been used in a series of contract projects, forming a basis for modelling the rural environment.
- 1.5 Although the ITE Countryside Surveys provide comparatively up to date information on general changes in the British Countryside, the sample-based system has not been developed to yield data on rarer, or specialised, habitats. To complement the Countryside Surveys, DOE have commissioned ITE to carry out additional surveys work into habitats which are perceived to be under threat, or which represent areas of concern to the Department. These broadly correspond to the five Landscape Types as defined by the Countryside Commission's Stewardship Scheme:

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- i) Lowland heath
- ii) Chalk and limestone grasslands
- iii) River valleys and waterside landscapes (lowlands)
- iv) Coasts
- v) Uplands

1.6 The objectives of the project, paraphrased from the schedule of work, are:

For each Landscape Type:

- i. Assess the distribution in England
- ii. Survey habitats and historic features and determine quantity and quality of these features
- iii. Assess the effects of current designation on the preservation of these features
- iv. Develop conceptual models to predict the effects of changes (eg climate, policy) on distribution of the Landscape Type
- v. Recommend policy refinements which would increase protection
- vi. Develop methodologies to measure change

1.7 The first of the Landscape Types, lowland heath, is to be surveyed in late summer 1992 with a report following in early 1993. The others will be surveyed during 1993 and the project concludes in 1994. To provide essential background data for monitoring change, the survey is to be extended to sites which have potential to become lowland heath, given the right management and/or natural conditions.

1.8 Although the survey approach may not be optimal for each of the Landscape Types, it has the advantage of being broadly objective, and therefore reproducible, and is more or less compatible with the Countryside Surveys. This is essential if these rarer habitats are to be related to changes taking place in the wider countryside.

1.9 An important lesson that has been learned from previous ITE surveys is that variation in field recording (observer bias) is a major contributory factor when assessing the statistical accuracy of change data. It is therefore important that every attempt is made to standardise recording between observers and, during the 1990 survey, a Quality Assurance (QA) programme was carried out to check on the consistency of approach. Many lessons were learned from this exercise and a comprehensive and unambiguous Field Handbook was shown to be a vital prerequisite to survey.

1.10 The purpose of this Handbook is to define the set of guidelines to be used during survey. Inevitably circumstances will arise which are not fully covered here; it is important that field recording should be as consistent as possible. A set of definitions of features to be surveyed is provided but, again, not every interpretation of a data item can be covered. Where atypical or doubtful categories arise, the surveyor is asked to qualify or comment on his/her choice of recording.

- 1.11 Further information on the ITE surveys, and on the way the list of sample squares for lowland heath survey has been derived, is available from ITE, Merlewood Research Station, Grange over Sands, Cumbria. LA11 6JU.

2. SURVEY LOGISTICS

- 2.1 A stratified sample of 80 1km squares is to be surveyed; over half of the squares are in south England but the sample extends to Leeds and Penrith in the north. The order of survey will be decided by the Survey Leader but it is anticipated that a start will be made in the south where summer conditions may cause the recording of vegetation to become more difficult with time.
- 2.2 Each square is reckoned to take one team-day to survey, on average, with those sites having most lowland heath taking longer. The day-to-day working arrangements are in the hands of the Survey Leader and will be guided by the following principles:
- a. Each survey team will comprise two persons who are expected to work closely together.
 - b. The survey teams are expected to be reasonably flexible in their working arrangements and, similarly, the Survey Leader will be sympathetic to requests for leave of absence for special occasions, when possible.
 - c. Travelling is expensive both in terms of overall project time and finance - every attempt should be made to avoid returning to a site more often than is necessary, even if this involves some evening work. There will be no overtime payments, in the first instance, but any large accumulations of overtime will be compensated by 'time off in lieu'. Surveyors are advised to keep a record of their hours.
 - d. The costings of the project are based on the assumption that accommodation will be required for five nights each week, and that surveyors will meet on a Sunday night so that a prompt start can be made on Monday mornings.
 - e. By arrangement, a team of two persons may work for a weekend and take two days off in lieu. However, to ensure that surveyors have some break from their work, no two consecutive weekends should be worked.
 - f. During the week, surveyors are expected to stay in the same area each night so that they can meet to discuss progress; species records can be compared and checked, if time permits. As far as possible, accommodation will be arranged in advance by the Survey Leader.

3. **EQUIPMENT**

3.1 This survey requires some equipment even though it is largely a mapping and recording exercise, rather than a measuring one.

3.2 Equipment may be divided into two categories:

i) provided by Merlewood

- Recording booklets (FAB's)
- Maps of the site (1:10,000)
- Aerial photographs of the site (where available)
- Handouts (explaining project)
- Weatherproof clipboards
- Metal marker plates
- Hammer
- Navigation equipment
- Measuring tape (50 metre)
- Identity card
- Maps to locate sites
- Pencils and rubber
- Camera
- Print films
- First Aid kit
- Whistle
- Dry-board and pens
- Ranging poles
- Wooden stakes
- Bamboo canes
- Skewers
- Protractors

ii) provided by surveyor

- Personal waterproof clothing etc.
- Reference books (if available)
- Rucksack (if available)
- Camera (if available)
- Binoculars (if available)

4. **PERMISSIONS**

4.1 There are several reasons why permission to access land must be obtained. The most obvious is to gain legal access to all parts of the square. It is also important to ensure the goodwill of the farmer/landowner, not only to avoid an embarrassing confrontation, but to gain useful background information (see Farmer/landowner Information Sheet) and to assist data recording. In no circumstances should on-the-site survey be carried out where access has not been agreed.

4.2 Where possible, early contact has already been made with owners of sites (especially where English Nature have an interest). The Survey leader will arrange permissions for access on a weekly basis and surveyors must satisfy themselves that permissions have been obtained before proceeding with survey.

- 4.3 Copies of a relevant ITE publication, containing a brief explanation of this survey, will be available to all survey teams for distribution as appropriate. Surveyors should carry some form of identity - preferably their ITE identity card.
- 4.4 If permission to access land is withdrawn on the day of survey, surveyors should contact the Survey leader as soon as is possible and arrange to start surveying a new site. Details of a replacement square will be provided in due course.
- 4.5 In the event of partial-permission being achieved, then the following rules apply:
- if permission is refused for access to any point which falls within a lowland heath landscape, then the square should not be surveyed.
 - if permission is refused to access more than 5 of the grid points, irrespective of their land cover, then the square should not be surveyed.
 - if there are up to 5 points for which access cannot be arranged then an attempt should be made to assess the land cover of these points, from a distance (even if only in general terms).

5. GENERAL FIELD SURVEY PROCEDURE

- 5.1 How a square is surveyed will depend on a number of factors including the type of land, and the degree of access. However there is a recommended procedure which includes the following points:
- a. On arrival at the square, surveyors should have a quick look round (where motorised access permits), assess likely problems and generally acquaint themselves with the area.
 - b. Although permissions for access will usually have been obtained in advance (by the Survey leader), surveyors will be informed if contact with farmers or landowners is required on the day of survey. This should be done before commencing survey.
 - c. A suitable route should be chosen which will allow a full and detailed examination of the whole square. Barriers, such as large rivers, should be noted to optimise travelling around the square.
 - d. Having completed recording, surveyors should allow time to read through the records they have made, checking for omissions and ensuring full coverage and clear presentation.
- 5.2 For some sites (and eventually for all) aerial photographs will be available. These will be useful aids to locating positions on the ground and should not be used in any other way during field survey.
- 5.3 Aerial photographs should be protected against weather and should not be marked in any way. They must be returned to ITE Merlewood by the end of the survey.

6. THE FIELD ASSESSMENT BOOKLET (FAB)

6.1 For each square, the data recording forms, together with their 6" maps, have been combined into a booklet which, for historical reasons, is known as a Field Assessment Booklet (FAB). The order of the pages is not significant.

6.2 It is extremely important that the FABs are completed as neatly as possible. If information is not clearly interpretable by those undertaking analysis of data in due course, then effort has been wasted.

6.3 There are several general points about filling in the FAB's.

- i. The square series number should be recorded on every page.
- ii. Where possible, a pencil should be used - mistakes can then be erased and waterproofing is enhanced.
- iii. If recent change is obvious then please make use of codes where possible to show this, or else make a note on the sheet concerned.
- iv. Dotted lines after a coded category are intended to invite further information e.g. what type of quarry/mine or what sort of race track, etc.
- v. Note the guidelines below for recording information in woodlands and immediately adjacent to non-agricultural curtilages.

6.4 The FAB should contain the following pages:

Front cover
Map of area at 1:50,000 scale - for information
Ownership map
Farmer/Landowner information page
Land cover map and recording form
Boundaries map and recording form
Historical features map and recording form
Up to 25 quadrat recording forms

Front cover of the FAB

6.5 All sections of the cover must be completed.

NB. Series number - this must be filled in on every page on the FAB.
Location - this should refer to the nearest village/town/
geographical location.

Ownership

- 6.6 This page will be completed by the Survey Leader but, for information, guidelines on its use are given here.
- 6.7 As explained previously, permission must be obtained before survey commences. During this exercise, the ownership of all parts of the square should be established in detail and marked on the map. All the land units (e.g. fields) belonging to owner number 1 should be marked with a "1", those belonging to number 2 with a "2" etc.
- 6.8 The **exact** address and telephone number of each owner or tenant should be recorded.
- 6.9 While recording ownership information, the letter "T" should be written against the name of tenant farmers, and a "C" against the name of owners of farms which have changed ownership since 1984.
- 6.10 The code numbers to the right of "address" are to be circled according to how interested/cooperative/helpful the owner appears to be, as follows:
- 0 = Not available or unable to judge
 - 1 = Less than interested/cooperative/helpful
 - 2 = Generally interested/cooperative/helpful
 - 3 = Very interested/cooperative/helpful.
- 6.11 This will provide useful introductions on further possible surveys but will not be used in any way as part of an analysis etc.
- 6.12 If the owner asks for information on his land to be sent, this should be noted on the ownership page of the FAB.

Farmer/Landowner information

- 6.13 This is not intended as an official questionnaire and details recorded here will only be used as background information, hence a uniform cover of all farmers is not required. However, many farmers do like to chat about their land and in this event the surveyor is requested to steer the conversation towards the questions posed on this sheet.
- 6.14 The clipboard should not be much in evidence but notes should be made, or a summary of the conversation recorded, on leaving the premises.

7. RECORDING LAND COVER AND BOUNDARIES

- 7.1 The Changes in Key Habitat survey of Lowland Heath has two basic types of data to be recorded: in each of 80 sample 1 km squares, (i) to describe the land cover and associated boundaries at each of a regular grid of 25 points, and (ii) to record vegetation in 2 x 2m quadrats at each of the 25 points which fall within a lowland heath landscape (determined by the presence of species indicative of acid soils).

- 7.2 To obtain quantitative information on land cover and boundaries from each sample square, the land cover at each of a regular grid of 25 points will be described using Countryside Survey 1990 code numbers. Similarly, the nearest boundary (within 100m) will be described using CS1990 codes, except in built environments (see below).
- 7.3 Boundaries, in this context, include the following:
- hedgerows
 - walls
 - fences
 - earth or stone banks acting as a field boundary
 - any combination of the above
 - water courses wider than 2.5m (when watercourse full)
 - edge of inland water body
 - coastline (at HWM)
- 7.4 The grid of 25 points will be marked on maps within the FABs. Locating the points on the ground must be done using measurements and bearings from prominent features. In particularly featureless terrain, it may be necessary to construct a transect using ranging poles. If using compass bearings to obtain the straight line then, to fit the grid on the map, grid north must be used.
- 7.5 The nearest boundary length of 20 m to each point (provided it is within 100 m) should be described using combinations of codes. Its position should be marked on the map and a line drawn between the grid point and its associated boundary.
- 7.6 There are a number of rules concerning the recording of information depending on where a point falls:
- i. if a point falls on a linear feature which can be described as a physical boundary (see above), then the land cover description should be given for a point which is 10m away from the original point, in a direction at right angles to the linear feature, and on the more northerly side of the linear feature. (Where a linear feature runs North-South, the point should be re-located on the easterly side of the boundary)
 - ii. if, however, the 10 m distance takes the point past the neighbouring land cover type (eg across a road), then the point should be moved to the centre of that land cover type.
 - iii. if a point falls on any other linear feature (eg a road, or a railway) then this should be described as a land cover type and, additionally, a nearby boundary should be described.
 - iv. if a point falls on the non-physical boundary between two land cover types (eg edge of an unfenced wood) then the land cover description should refer to a point 10m away, as in (i) above, and marked on the map accordingly.

- v. if a point falls in a built area, then no adjacent boundary information should be recorded.
- vi. if a point falls close to a built environment, then the boundary information should be taken from the nearest boundary which is not associated with buildings (curtilages).
- vii. if a point falls on a linear feature (road, railway etc) which is bordered by built environment on both sides, then no boundary information should be recorded (as in v. above).

7.7 Surveyors will be provided with two recording sheets, one for land cover and one for boundaries, each of which will comprise a 1:10,000 scale map and a matrix of boxes for recording coded information. The maps will have the grid of 25 points marked and coded from A - Y. Information on land cover and boundaries will be entered as a string of codes underneath each map. Wherever possible, this information should be coded according to the list of options available, but rarely it may be necessary to add other categories to the list.

7.8 Codes may be taken from any part of the code list to describe a land cover or a boundary feature, eg a boundary may include a ditch or a hedgerow tree. However, in describing boundaries, the ground flora (eg codes 146 - 168) should not be coded.

7.9 The strings of numeric codes used to describe a land cover type or a boundary should be written into the boxes at the foot of each recording sheet, preceded by the Alpha code for the grid point. For instance the nearest length of boundary for point "A" might be coded as 321, 342, 351, 353, 357, 361 where:

- 321 = Hawthorn hedge;
- 342 = <2 m high;
- 351 = stockproof;
- 353 = gaps filled along <10% length;
- 357 = hedge trimmed;
- 361 = laying.

7.10 There are two types of code: primary, which are generalised names for the land cover and boundary types, and secondary, which provide additional descriptive information. All features must be annotated with at least one primary code (which are shown in **bold** on code lists). In general, the use of more than one primary code should be avoided. However, where more than one primary code has to be used (eg multiple land use) then the code reflecting the dominant use must come first. For example an area of Molinia/Heather moorland might be recorded as 103/175/163/176/106/175/161/180/189 where:

- 103 = Moorland - grass
- 175 = 25-50% (ie 25-50% of the mapped area is moorland grass)
- 163 = Molinia caerulea;
- 176 = 50-75% (ie 50-75% of the moorland grass is Molinia)

- 106 = Moorland - shrub heath
- 175 = 25-50% (ie 25-50% of the mapped area is moorland shrub heath)
- 161 = Calluna vulgaris;
- 175 = 25-50% (ie 25-50% of the shrub heath is Calluna)
- 180 = <30cm (ie the Calluna was <30cm high on average)

- 189 = Sheep (ie the whole area was grazed by sheep)

- 7.11 It is very important that the codes are used in an order which links the information logically eg a cover code always follows a species code etc.
- 7.12 For land cover, the choice of codes should reflect the "mappable unit" in which the point falls. Mappable units were the areas of land cover that were recorded as part of CS1990 where the minimum mappable area was 1/25th ha (400m²). Each mappable unit was determined by the constancy of the codes which described it. If one characteristic (eg cover of a dominant plant species) was sufficiently different from an adjacent area to be given a different code, then a new mappable unit was recognised.
- 7.13 The surveyor in the field is the best person to make decisions about data recording. It is not useful if a decision is deferred in the field and, instead, is forced onto the data-processor "back in the lab". Decisions must be made on the spot and, in exceptional circumstances, may be accompanied by a qualifying note or comment.
- 7.14 There follows a page-by-page guide on how to complete the data sheets, including some definitions or notes on those data categories which are not self-explanatory.

N.B. The following sections are taken straight from the Countryside Survey 1990 Field Handbook and may not relate directly to the survey of lowland heaths. However, they should give an indication as to how codes were used in CS1990 and an understanding of their use is important for the present project.

Physiography/Inland water/Coastal

Inland physiographic features

1. **Cliff >30m high:** a vertical or near-vertical face of rock
2. **Cliff 5-30m high:**
3. **Rock outcrop & cliff <5m:** areas of bare rock should be included here together with a % cover category (12-14)
4. **Scree:**
5. **Surface boulders:** boulders are defined as >50 cms in any direction and should be mapped as an area with a % cover code (12-14)
6. **Limestone pavement:**
7. **Peat hags:** includes any bare or eroding peat which is not vegetated
8. **Current peat workings:** where peat has obviously been extracted in the current or previous season
9. **Old peat workings:**
10. **Soil erosion:** includes both human and natural erosion in any situation

11. **Ground levelling:** includes any formerly raised area that has been reduced to the level of the surrounding terrain (eg for development)
12. **100% rock:**
13. **>50% rock:**
14. **10-50% rock:**
15. **100% peat:**
16. **>50% peat:**

Coastal features

31. **Cliff > 30m high:**
32. **Cliff 5-30m high:**
33. **Rock outcrop & cliff <5m:** to be used when the rock is outcropping base-rock, as opposed to ...
34. **Rocky/Boulder shore:** used when the shore is of shattered rocks or boulders >10cm diam (ie grapefruit-size)
35. **Pebble/Gravel shore:**
36. **Sandy shore (or dune):**
37. **Bare mud:**
38. **Sea:** this may seem obvious but is helpful in estuarine and coastal marsh situations - always record.

Inland water features (These features should be recorded and mapped whether they are dry at the time of survey or not).

51. **Lake - natural:** any inland water body, of any size, should be mapped using this code.
52. **Lake - artificial:** usually distinguished by the presence of a dam or embankment.
53. **River:** defined as being more than 2.5m wide; a stream is less than 2.5m. (2.5 m would be a very brave leap).
54. **Canalised river:** rivers which have been modified (eg sections straightened, banks smoothed), but which still follow the same basic direction as the natural watercourse.
55. **Canal:** constructed where no watercourse existed previously.
56. **Stream:** defined as being less than 2.5m wide (see River)
57. **Roadside ditch:** linear excavations with the purpose of drainage; should be recorded even if dry at the time of survey.
58. **Other ditch:** (see Roadside ditch)
59. **Spring:** usually marked on the map but implies evidence of a continual supply of water at ground surface.
60. **Well:**
61. **Signs of drainage:** includes evidence of tile-drains or mole-drains ie lines of disturbance across a field.
62. **Not used**
63. **Gorge:**
64. **Levee:** artificial raised banks at the sides of rivers, characteristic of canalised rivers.

7.15 Banks - two codes should be used for each length of watercourse, one for each side. Record the Righthand bank first, as seen looking downstream. Measurements refer to distance on ground, not height.

65. **Bank <1m:** to describe the bank intimately associated with, or effected by, a watercourse ie river, stream, ditch, canal etc.; the bank would run from the 'normal' water's edge to a boundary, or change in land cover type.
66. **Bank <5m:**
67. **Bank >5m:**

Agriculture/Natural vegetation

[For codes 90 to 99 (heather condition) see after code 184]

- 7.16 This sheet includes most of the ground cover types in GB except urban and woodland. The first section, cover types, includes categories which may be qualified by the other codes, such as species, use or measurements.
- 7.17 It is important to note that these cover types should **not** be used in a **built-up area**. Once a **curtilage** has been recognised, as defined in Section viii, then all land within the curtilage is to be recorded according to the Section viii categories. Hence an orchard in a residential garden is not to be recorded on this sheet.

Cover types

- 7.18 Cover types - many of these categories need defining in the context of this survey and the definitions given may not be those with which the surveyors are familiar.
- 7.19 Types of grassland are notoriously difficult to distinguish, especially since their current species composition and general appearance is decided by management practices, rather than origin, history or use. Hence the primary codes are limited but there are several general descriptive codes, as well as species codes, by which such areas can be described.
- 7.20 **Bracken** is to be treated differently to other categories. Even where bracken occurs in smaller areas than a minimum mappable unit, details should be recorded using a cross (X) to mark its location.
101. **Lowland agricultural grass:** includes any grass crop or pasture in a generally lowland, or enclosed, situation (ie most grass)
102. **Upland grassland:** natural grassland (unimproved) in an upland situation but with a high proportion of palatable grasses and usually on a mineral soil. Typical species include *Festuca ovina*, *Agrostis tenuis*, *Anthoxanthum odoratum*, *Galium saxatile*, often with bracken.
103. **Moorland - grass:** coarse upland grass in a moorland setting, usually dominated by species such as *Nardus*, *Molinia*, *Deschampsia flexuosa*, *Juncus squarrosus*. Soils usually have a peaty top.
104. **Moorland - shrub heath:** dominated by dwarf shrub species often growing on peat, invariably dominated by *Calluna* or *Vaccinium*
105. **Calcareous grassland:** found on calcareous soils and with a high proportion of calcicole species of limestone, chalk, dunes and machair. Typical species include *Bellis perennis*, *Lotus corniculatus*, *Linum catharticum*, *Thymus druceii*, *Poterium*

sanguisorba, and *Briza media*.

106. **Maritime vegetation:** found on sea cliffs or other coastal situations and usually herb-rich due to salt spray.
 107. **Lowland heath:** shrub heath at low altitudes and in lowland England and Wales, usually characterised by dry soils.
 108. **Aquatic macrophytes:** major species characteristic of standing water such as *Typha*, *Ranunculus fluitans* and *Phragmites*.
 109. **Aquatic marginal veg:** growing at the fringe of open water eg *Valeriana*, *Epilobium hirsutum*, *Filipendula*, *Oenanthe croccata* etc
- 7.21 There are various classifications of bogs, mires etc; the following division is a compromise.
110. **Raised bog:** occurs mainly in lowland situations, often formed in level flood plains of mature rivers; typically convex and gently sloping from the centre to a steep margin and bounded by a watercourse.
 111. **Blanket bog:** characteristic of large areas in north-west, upland, high-rainfall parts of Britain. Characterised by *Eriophorum* with or without *Sphagnum*; other species include *Molinia*, *Trichophorum*, *Calluna* and *Erica tetralix*.
 112. **Valley bog:** (including basin mires) form in depressions where there is a slow, directional flow of water.
 113. **Fen:** lowland peat usually dominated by sedges or rushes often with alder or willow.
 114. **Marsh:** Nutrient-rich wetland on predominantly inorganic soil dominated by rushes or sedges.
 115. **Flush:** Localised, narrow areas of moving water which tend to have species which are different from surrounding vegetation. Calcareous flushes are characterised by species such as *Prunella vulgaris*, *Plantago lanceolata*, *Linum catharticum* and *Parnassia palustris* and are relatively rare. Non-calcareous flushes are usually dominated by rushes, often with sphagnum.
 116. **Saltmarsh:** Should only be recorded where the area is vegetated, otherwise bare mud (Physiography section) is appropriate.
- 7.22 117-132 These categories are self-explanatory even though young crops may be difficult to recognise. The following notes may help:
- cereal crops are nearly always drilled in rows with a high proportion of soil visible between the plants.
 - wheat plants have broad, glaucous blades with auricles.
 - barley has dull green leaves and auricles.
 - oat plants have broad soft glaucous leaves with no auricles.
117. **Wheat:**
 118. **Barley:**
 119. **Oats:**
 120. **Sugar beet:**
 121. **Turnips/Swedes/Roots:**
 122. **Kale:**
 123. **Potatoes:**
 124. **Field Beans:**

125. Peas:
126. Maize:
127. Rye:
128. Oilseed rape:
129. Other crop
130. Flowers:
131. Commercial horticulture:
132. Orchard:
133. **Unmanaged grass:** this is grassland that has no obvious use (agricultural, amenity etc) but which cannot be called an abandoned land use. (Wide roadside verges, only cut once/twice per year, may be coded as unmanaged grass - or tall herb vegetation, as appropriate).
134. **Tall herb vegetation:** semi-natural vegetation, often in wet or disturbed positions; dominated by tall herbs but with grasses present.
136. **Ley:** a short-term grassland, re-seeded less than five years previously. Characterised by evidence of ploughing, bare soil between grass plants, scarcity of broadleaf species and is often dominated by a single grass species eg Lolium. This code should only be used if there is absolutely no doubt about these factors (eg from landowner information or recent sowing). Any field with more than 10% Lolium multiflorum (a short-lived ley species) would be included here.
137. **Unimproved grass:** pasture in an enclosed situation which contains many palatable grasses but which has not been agriculturally improved by the use of fertilisers or other agricultural inputs. A comparatively rare category, containing species such as Conopodium majus, Plantago lanceolata, Lotus corniculatus etc. Would include most 'hay meadows'.
138. **Forbs >10%:**
139. **Forbs >25%:**
140. **Forbs >50%:**
141. **Neglected:** agricultural land for which there is no obvious intended change of use, but where the former use has been temporarily neglected (for up to 3 years). **Fallow** land (which has been unused as part of an agricultural rotation) should be recorded here. **Set aside** land should also be recorded here (but only if identified without doubt)
142. **Abandoned:** agricultural land which has been neglected for more than 3 years and in which long-lived perennials and shrubby species are becoming established.
143. **Ploughed:** the crop harvested before ploughing should be identified (from fragments that remain) and this code used as an extra description.
144. **Burnt (moorland):** land which has been burned deliberately as a management practice e.g. for grouse (muirburn).
145. **Mown:** to be used for any grassland type that has been mown such that the 'normal' vegetative structure of grasses is not present and therefore hinders species identification.

Species (if >25% cover)

- 7.23 The following major agricultural grasses and semi-natural ground cover species (which are listed according to a gradient from rich to poor land) are recorded if they cover 25% or more of a mapped unit, irrespective of the number of canopies present (ie total cover can reach more than 100%). For any species which is not listed here and which reaches 25% cover, one of the blank code numbers should be used:

146. <i>Lolium multiflorum</i>	158. <i>Juncus effusus</i>
147. <i>Lolium perenne</i>	159. <i>Deschampsia flexuosa</i>
148. <i>Trifolium repens</i>	160. <i>Nardus stricta</i>
149. <i>Dactylis glomerata</i>	161. <i>Calluna vulgaris</i>
150. <i>Anthoxanthum odoratum</i>	162. <i>Vaccinium myrtillus</i>
151. <i>Phleum pratense</i>	163. <i>Molinia caerulea</i>
152. <i>Cynosurus cristatus</i>	164. <i>Eriophorum angustifolium</i>
153. <i>Holcus lanatus</i>	165. <i>Eriophorum vaginatum</i>
154. <i>Agrostis tenuis</i>	166. <i>Tricophorum cespitosum</i>
155. <i>Festuca ovina</i>	167. <i>Sphagnum</i> spp
156. <i>Pteridium aquilinum</i> - dense	168. <i>Juncus squarrosus</i>
157. <i>Pteridium aquilinum</i> - scattered	169. <i>Erica tetralix</i>
	170. <i>Erica cinerea</i>

Cover

- 7.24 175-178 These cover % codes should be used with the species codes 146-168 and, where a mosaic of vegetation categories exists, with land cover types. No more than three cover codes may be used to describe any area.

175. 25-50%:
176. 50-75%:
177. 75-95%:
178. 95-100%:

Heights (Calluna & Pteridium)

- 7.25 179-184 These height class codes should only be used with Bracken and Heather and should reflect the average height of the stand at the time of survey.

179. <10cms:
180. <30cms:
181. <50cms:
182. <1m:
183. <1.5m:
184. >1.5m:

- 7.26 For the survey of lowland heath, the following codes (after MacDonald and Armstrong, 1989) should be used to describe heather condition for any area in which heather occurs, irrespective of 25% cover values (note the use of different height categories):

90. **Burnt heather:** recently burnt heather with a low vegetation cover.
91. **Regenerating heather:** young regenerating heather stands. The sward/canopy height will be less than 15 cm and the vegetation

- will be recognisably short even from some distance. Heather cover will be variable and may be low. The cover of grasses such as wavy hair-grass (*Deschampsia flexuosa*) or other dwarf shrubs such as blaeberry/bilberry (*Vaccinium myrtillus*) may be high.
92. **Vigorous heather:** areas of well developed, taller heather bushes intimately mixed with other species. The heather bushes will be erect and taller than about 30 cm.
 93. **Heather mosaic:** areas where there is a mosaic of small heather-dominated patches (each smaller than about 30 m x 30 m) among other vegetation.
 94. **Heather dominant:** areas of complete heather dominance which are neither very short regenerating stands nor tall mature-to-old stands. The canopy height will be about 15 - 30 cm. These areas will appear dark and with a relatively even, fine texture on aerial photographs.
 95. **Collapsing heather:** areas of tall, mature or old heather, more than 30 cm tall, or with branch lengths longer than 30 cm, where holes may be developing in the canopy due to the outward collapse or death of central branches of larger heather bushes.
 96. **Mat heather:** areas where the heather forms a short carpet or mat, less than 15 cm tall, of densely packed intertwined branches. Many of the branches will be growing horizontally or at an oblique angle and they may be more or less contorted. These areas may not be apparent till the ground is walked.
 97. **Bushy heather:** areas where the heather bushes are taller than 15 cm, or do not form a carpet, and have compact, rounded canopies of densely packed, contorted and intertwined branches and shoots. The heather bushes may be in patches or may be individual bushes intimately mixed with other species. These areas may not be apparent till the ground is walked.
 98. **Mop heather:** areas of 'drumstick' or 'mop' heather in which heather bushes comprise lengths of bare woody stem each ending in a small rounded mass of contorted shoots and foliage.
 99. **Dead heather:** areas of dead heather canopy. If damage has been recent, foliage and shoots will be orange-brown but this will gradually bleach to pale grey. This may not be apparent till the ground is walked.

Uses etc

- 7.27 These codes should be used to qualify the cover types where known. Stock type can be told from recent dung as well as presence of animals.
185. **Beef:** should include 'sucklers' (0-6 mths) and 'rearers' (6 mths onwards)
 186. **Dairy:** N.B. mixed herds of beef cattle and dairy cattle should be coded 176/177
 187. **Breeders:** only to be used if it is confirmed that the primary purpose of the herd is for breeding.
 188. **Dual purpose:** applies to the few remaining cattle breeds which are bred for beef and milk production e.g. Simmentals, South Devons, some Shorthorns and some Fresians.
 189. **Sheep:**
 190. **Goats (with no.):** the numbers of goats and horses in fields should be recorded where possible, including those animals in a field, only part of which is in the square. Numbers should follow the

5. Less than 6 individuals? YES .. Code 201
NO .. 6
6. Less than 0.25 ha with canopy >25% area? ... YES .. Code 205
NO .. 7
7. Linear feature (ratio 1:5 and < 50m width)? YES .. 8
NO .. 9
8. Single tree width? YES .. Code 203
NO .. Code 204
9. Canopy cover less than 25%? YES .. Code 202
NO .. Code 206

201. **Individual trees:** should be marked with a cross. Groups of less than 6 trees should be recorded as individuals as should lines of trees of less than 20 m in length. A coppice stool is recorded as a single tree.
202. **Scattered trees:** do not make a wood or clump (see definitions) because their crowns are not contributing 25% cover of the mapped unit.
203. **Line of trees:** must be single tree width and be at least 20 m long with crown contact. They should be marked with a line.
204. **Belt of trees:** 2 or more trees wide with a width to length ratio of at least 1:5, parallel-sided and with a maximum width of 50m.
205. **Clump of trees:** a small woodland or group of trees (6 or more) and of less than 0.25 ha.
206. **Woodland/Forest:** an area of trees of more than 0.25 ha (but see Belt) and a crown cover of more than 25%.
207. **Individual scrub:** consists exclusively of shrubby species often with tree regeneration and brambles. Individual trees of more than twice the average height of the scrub should be separately marked as individuals or scattered.
208. **Scattered scrub:** scattered as for trees.
209. **Line of scrub:** line as for trees.
210. **Patch of scrub:** an area of continuous scrub (canopy >25%) of any size.
215. **Closed canopy:** canopies touching or overlapping
216. **Canopies not touching:** to be used for linear features, if the gap between two canopies does not exceed the average canopy width of the two individuals on either side.
217. **Hedgerow:** trees in a hedgerow which are twice the average height of the hedge, or where the hedge has been trimmed to favour the growth of a young tree. They should be marked with an X.
218. **Parkland:** a series of isolated mature trees over usually grazed grassland, often associated with large country houses or recreational areas.

- 7.33 Species (if >25%) - should be recorded with one of the cover types if they constitute more than 25% of the canopy. It is not necessary to qualify "unspecified conifer" or "unspecified broadleaf" with a species name. The mixed category codes should be used in the same way ie when >25%.

221. Fir - Douglas
222. Larch
223. Pine - Corsican
224. Pine - Lodgepole
225. Pine - Scots
226. Spruce - Norway
227. Spruce - Sitka
228. Unspecified conifer

231. Alder
232. Ash
233. Beech
234. Birch
235. Bramble
236. Elder
237. Elm
238. Field maple
239. Gorse
240. Hawthorn
241. Hornbeam
242. Lime
243. Oak
244. Poplar
245. Rowan
246. Sweet Chestnut
247. Sycamore
248. Willow

250. Mixed broadleaves
251. Mixed conifers
252. Unspecified broadleaf

- 7.34 Proportions - these are for use with the tree species codes and should refer to the percentage cover of the dominant canopy layer. No more than three codes should be used to describe any one feature.

256. 25-50%
257. 50-75%
258. 75-95%
259. 95-100%

- 7.35 Age - should be used in conjunction with any of the cover-type codes. To help with age category recognition the following table may be of use. These figures are a guideline and individuals will vary according to vigour, climate and other environmental factors, particularly fast-growing species of exotic origin. Further information is available in "Trees of Britain and Europe" by Mitchell.

Age (yrs.) Diam. at breast height

5	3-4 cm
20	18-20 cm
100	70-75 cm

- 261. 1-4 yrs
- 262. 5-20 yrs
- 263. > 20 yrs
- 264. > 100 yrs

7.36 Use - To be used for an area of trees (ie not individuals). It can be extremely difficult to decide the use and many woodlands, especially broadleaved, appear to have no particular use. These should be left uncoded in terms of use.

- 266. **Timber production:** all(?) coniferous forest and highly managed broadleaved woodland is likely to be included here.
- 267. **Landscape:** usually covering trees planted to improve the amenity of a site (usually visual amenity), or to fringe and 'hide' commercial plantations.
- 268. **Sporting/Game:** to be used if there is clear evidence that the wood is used to rear pheasants or other game birds.
- 269. **Public recreation:** where there is active encouragement for the public to use the area for recreation eg car parks, forest walks, arboreta etc.
- 270. **Nature conservation:** only to be used if there is clear evidence that the feature is being managed for nature conservation purposes.
- 271. **Shelter:** includes signs of wintering livestock as well as windbreaks etc.

Condition (to be used with woodland/forest >0.25 ha only)

- 275. **Managed:** to be used if there are clear signs of management activity for the primary use of the woodland area, eg, for timber production: weeding, thinning, brashing/snedding; for amenity: planting; for nature conservation: planting, scrub clearance etc
- 276. **Unmanaged - thriving:** no signs of active management but healthy trees, varied age structure and regeneration present.
- 277. **Unmanaged - improvable:** no signs of active management with healthy trees but no structure and grazing preventing natural regeneration
- 278. **Declining:** trees not healthy, often old, and with no structure and no regeneration; no longer woodland if existing trees removed.

Descriptions/Features

- 281. **Felling/Stumps:**
- 282. **Natural regeneration:** to be used only where tree species <1.3m high, which have grown naturally from seed (or suckers) are outside the canopy of a dominant woodland feature.
- 283. **Underplanting:** where semi-natural woodland has been under-planted

with standard exotics or native species.

- 284. **Planted:** Planted may be used with any of the cover types where it is obvious that planting has taken place, rather than self-seeding.
- 285. **Ploughed land:** to be used where land has been ploughed (or scarified) in advance of forestry planting.
- 286. **Staked trees:** to be used for isolated trees only and not where 288 applies.
- 287. **Tree protectors:** light-weight plastic tubes (about 1 m high) which provide protection as well as a favourable micro-climate for planted trees.
- 288. **Fenced (single trees):**
- 289. **Windblow:** can be used to qualify an area of forest or a single individual which has clearly been blown over, or had the top blown out, by wind.
- 290. **Dead standing tree(s):** recorded either singly or as a description for an area of woodland.
- 291. **Regrowth - cut stump:** applies to isolated regenerating trees
- 292. **Grazing (stock):** to be used if there is any evidence of agricultural stock using the feature for grazing, intentionally or otherwise.
- 293. **Ride/Firebreak:**
- 294. **Bracken dense:** any bracken in a woodland area must be recorded as for codes 156 and 157.
- 295. **Bracken scattered:**

Boundaries

- 7.37 All boundaries should be recorded **unless** they form part of a curtilage or they are within the canopy of a woodland (except that boundaries of woodlands must be recorded). It is important that the boundary between urban and rural is marked, but it need not be coded if a curtilage is involved.
- 7.38 It is the total boundary feature which is to be coded, using a combination of primary codes if appropriate (eg fence with hedge). In these cases, the most complete (stockproof) element of the boundary should be coded first.

Walls

- 301. **Dry-stone:**
- 302. **Mortared:** includes dry-stone walls which have been capped with mortared stone.
- 303. **Other:** ... (include a description)

Fences

- 311. **Wood only:**
- 312. **Iron only:**
- 313. **Wire on posts:**
- 314. **Other:** ... (include a description)

Hedges

7.39 It can be difficult to distinguish between 'mature' hedges and lines of trees. A hedge is defined as woody vegetation that has been subject to a regime of cutting in order to maintain a linear shape. When hedge management is abandoned, and the natural shape of the tree is regained, then the feature can no longer be described as a hedge.

321. **>50% Hawthorn:** only to be used if Hawthorn constitutes more than half of the length of hedge under consideration.

322. **>50% Other:** (specify)

323. **Mixed hedge:** should be used for any length of hedge where no single species dominates.

Other

331. **Stone bank:**

332. **Earth bank:** N.B. stone and earth banks are common and should be coded as 331/332

333. **Grass strip:** to be used where a grass strip separates two fields with no vertical boundary.

Descriptions

341. **>2m high:** if different heights apply on either side of the boundary, then the height should apply to the side on which stock are kept; otherwise, the lowest height category should be used.

342. **<2m high:**

343. **<1m high:**

351. **Stockproof:** where possible, this should apply to the stock that would normally use the surrounding fields; if in doubt, assume sheep

352. **Not stockproof:**

353. **Filled gaps <10%:** should be used to show that the boundary has had gaps which have been filled in an attempt to make it stockproof. The %'s refer to the gaps as a % of the boundary unit being coded.

354. **Filled gaps >10%:**

355. **Signs of replacement:** (of one boundary type by another)

356. **Signs of removal:**

Codes 357 - 360 represent a transition from a well managed, trimmed hedge, to a relict line of shrubs.

357. **Trimmed:** signs of management within the previous 12 months and a neat, cropped appearance.

358. **Uncut:** has had recent management but has been 'let go' over one or more seasons.

359. **Derelict:** still obviously a hedge but all attempts at management having been abolished.

360. **Line of relict hedge:** usually a line of shrubs showing where a hedge has once been (see definition of hedge; can be used in addition to codes on the forestry page)

- 361. **Laying (recent):** to be used if it appears likely that the hedge has been laid in the last five years.
- 362. **Flailing:** to be used if flailed in the last year; recognisable by smashed and shattered ends to cut branches.
- 363. **Regrowth from stumps:** this applies to hedges that have been cut to ground level but have sprouted again, often at intervals along the old boundary.
- 364. **Bracken present:** to be used if any bracken is present in the boundary.

Buildings/Structures/Communications

- 7.40 This sheet covers features associated with built structures and routes of communication. Note that features which are immediately adjacent to a non-agricultural curtilage (except roads) need not be recorded on other FAB pages. Similarly no information from other FAB pages need to be recorded within a curtilage (except trees - see 402 below)
- 7.41 Colour Coding - if using colours because code numbering is too complex then please use the following choice of colours wherever possible:
 - Grey = Residential Building
 - Yellow = Agricultural curtilage (+ green dots with trees >10% cover)
 - Green-solid = other curtilage without trees
 - Green-dots = other curtilage with trees
 - Orange = Commercial Buildings
 - Dark Blue = Public Service Buildings
 - Purple = Religious Buildings
 - Pink = Road (tarmac)
 - Red = New development
- 7.42 Other buildings and grounds should be number-coded, most being large enough to accommodate a written code.

Cover types

- 7.43 Built-cover types - these categories should cover the majority of "urban" land and built features in the countryside but special codes may be needed on rare occasions. Where possible they should be qualified by use and description codes.
- 7.44 A curtilage is an area of ground that is associated with a building and which has a use linked with that building eg gardens, 'grounds', forecourts etc. Apart from the presence of trees (cf code 402), it is not necessary to record any features within curtilages. If in doubt about whether a feature is a curtilage, then only treat it as such in an urban situation (eg land around a rural resevoir is not curtilage).
 - 401. **Building:** usually present on the map - the exceptions will be new buildings which must be coded or coloured with code 441.
- 7.45 Gardens/Grounds apply to curtilages associated with residential or other buildings. Gardens/Grounds may be mapped and coded in groups if they are all alike.

- 402. **Garden/grounds with trees:** Gardens/Grounds with trees includes those curtilages or mapped group of curtilages, which have a cover of 10% or more.
- 403. **Garden/grounds without trees:**
- 404. **Public open space:** includes Parks, Ornamental Gardens and Accessible Common Land, especially near large conurbations.
- 405. **Amenity grass >1ha:** non-agricultural grass which is clearly being used for amenity purposes (not recreation); to be recorded in units of 1ha or more eg parks, large lawns etc (but see 404). Should be used on golf courses.
- 406. **Allotments:**
- 407. **Car park:**
- 408. **Glasshouse:** refers to commercial, large-scale enterprises, not greenhouses at the bottom of gardens.
- 409. **Garden Centre/Nursery:**
- 410. **Embankment:** to be used for any constructed embankment in any situation eg motorway, resevoir etc.
- 411. **Other land:** for use in exceptional circumstances; try and use other primary codes first. Always qualify.

Use - these categories should be used to describe the cover type.

- 421. **Residential:** covers all domestic living area.
- 422. **Commercial:** includes all buildings devoted to selling things, including shops, garages, hotels, pubs, commercial offices etc.
- 423. **Industrial:** those used for the manufacture of goods and include workshops, warehouses and associated buildings such as stores.
- 424. **Public Service & facilities:** Public Services and facilities are those buildings which are associated with services available to the public, such as Police Stations, Hospitals, Libraries and facilities associated with electricity, gas and telephone.
- 425. **Institutional:** includes all buildings belonging to forms of public or private institutions, such as old peoples homes, local government and central government buildings, MOD buildings, Crown land, Remand homes, Prisons and even Research Stations.
- 426. **Educational/Cultural:** includes schools, establishments of further education, museums, theatres and cinemas.
- 427. **Religious:** confined to places of worship including Churches, Mosques and Synagogues, and their curtilages eg graveyards, cemeteries etc.
- 428. **Agricultural:**
- 429. **Sporting/Recreational:**
- 430. **Waste - domestic:**
- 431. **Waste - industrial:** and to include agricultural
- 432. **Quarry/Mine:**
- 433. **Gravel pit:**

Description

- 441. **New:** those developments which are not shown on the OS Map. Boundaries of associated Gardens or Grounds should also be drawn.
- 442. **Vacant:** building land which is temporarily out of use; often has sign posted and is adjacent to building land.
- 443. **Derelict:** buildings or land that have been abandoned or neglected such that they are beyond ordinary repair.

Communications

451. **Railway track/land:**

452. **Road (tarmac):** includes any road, whether private or not, which is totally tarmac across its width.

7.46 453-445 Verges should be marked separately for each side of the road so that two numeric codes should be used to describe the verges for the length of road concerned (even if they are the same). Record the 'northmost' verge first. If road runs north-south, then record 'eastmost' first. If there is no verge (eg tarmac up to a wall) then do not use a code at all. Verges should be mapped adjacent to constructed tracks, as well as tarmac roads.

453. **Verge <1m:**

454. **Verge <5m:**

455. **Verge >5m:**

456. **Constructed track:** includes any track which has been manufactured using stone or hard material.

457. **Unconstructed track:** those tracks which are not defined as above ie no construction has been involved along their length.

458. **Footpath (exclusive):** a path which uses land area for the purposes of a footpath only - often walled or fenced.

459. **Footpath (other):** those which are shared with some other land use, such as a path across a grazed field.

Surface: (these codes should be used as qualifiers for any Right of Way, ie footpath, bridleway, byways, and 'roads used as public paths')

460. **satisfactory throughout:**

461. **parts in poor condition:**

462. **impassable/difficult:**

Barriers: (some can be shown as primary codes; others as descriptions of Rights of Way as above)

463. **difficult stile/gate:**

464. **difficult bridge:**

465. **difficult fence/wall:**

466. **ploughed/crops:**

467. **natural vegetation:**

468. **muddy/flooded:**

469. **fallen trees/rock:**

470. **bull(s):**

471. **other**

Recreation

Designated

7.47 These are generally areas deliberately set aside for recreational purposes; examples other than those given, may be entered using new codes.

- 501. School playing fields:
- 502. Other playing fields:
- 503. Golf course:
- 504. Race track
- 505. Tennis courts:
- 506. Boating area:
- 507. Static caravan(s):
- 508. Touring caravan park:
- 509. Camp site:
- 510. Launch site
- 511. Other designated area ...

Non-designated

- 7.48 Information or signs - where land normally given to some other use, has been used for recreation, often on a very ad hoc basis.

- 521. Horsiculture: any signs of horses used for recreational purposes eg jumps, schooling rings etc
- 522. Angling: any signs of angling eg notices, platforms etc.
- 523. Boat - inland water: any evidence that a boat is used on a piece of water, eg boathouse, moorings etc.
- 524. Other

Universal codes

- 888. New to map:
- 999. No longer on map:

8. VEGETATION RECORDING

General

- 8.1 In 1977/8, as part of the first ITE national sample survey, detailed information on plant species was collected from quadrats and from linear plots adjacent to some features (hedges, roads and streams). In 1988, a sub-sample of the original sites were re-recorded and changes noted. As a result of this work, and additional support from the Nature Conservancy Council, quadrats were resurveyed again in 1990 as part of a monitoring programme looking at changes in the quality of land cover types, as well as overall changes taking place.
- 8.2 As well as recording vegetation data from plots visited earlier, new plots were established which will give more information on specific elements of rural vegetation; these were concerned particularly with linear features and semi-natural habitat types.
- 8.3 Although the requirements and methods are different in the current project, the experience gained from the previous ITE surveys will be used, especially in relation to the permanent marking of quadrats.

Placement of quadrats

- 8.4 The purpose of recording vegetation in quadrats is to give some qualitative information about the areas within the sample squares that either have, or might be able to support, lowland heath. To this end, it is necessary to record quadrats at points on the grid which fall in vegetation which is indicative of acid soils (these being considered to have the potential to become lowland heath with suitable management).
- 8.5 The species that are likely to have high cover values for such quadrats include:

Agrostis canina
Agrostis capillaris (tenuis)
Agrostis curtisii
Anthoxanthum odoratum
Calluna vulgaris
Deschampsia flexuosa
Erica spp.
Eriophorum angustifolium
Eriophorum vaginatum
Festuca ovina
Holcus mollis
Juncus squarrosus
Pteridium aquilinum
Molinia caerulea
Myrica gale
Nardus stricta
Sphagnum spp.
Tricophorum cespitosum
Ulex spp.
Vaccinium myrtillus

- 8.6 If there is any doubt about whether the quadrat is on an acid soil, eg in acid-neutral grasslands, then the quadrat should be recorded.

Orientation and laying out quadrats

- 8.7 Once the position of the point which is marked on the map has been estimated on the ground, then the quadrat should be laid out as follows:
- i. The point which is adjudged to correspond to the centre of the cross, as marked on the map, will form the south-east corner of the quadrat, and should be marked with a bamboo cane.
 - ii. Locating points of the compass with care, a tape should be run in a westerly direction from the first cane for a distance of 2 meters, and a second cane positioned. The tape is continued in a northerly and then easterly direction until all four sides are measured and marked with poles. The diagonals should be measured to ensure that the quadrat is square.

Method of recording vegetation

8.8 The standardised recording sheet (Figure 1) has the following sections:

- a) Header - information on the broad environmental and management attributes of the plot should be recorded, according to the following guidelines:
 - i. The slope should be recorded as:
 - flat (no slope discernable by eye);
 - slight (<5 degrees, by eye);
 - moderate (between 6 and 15 degrees);
 - steep (>15 degrees).
 - ii. Aspect should be given in degrees from North (if the ground is flat, then indicate by using a dash)
 - iii. Shade should be described as:
 - open
 - partial shade
 - full shade (full canopy)
 - iv. Soil should be described in general terms eg:
 - sand
 - gravel
 - mineral
 - peat
 - rock outcrop
 - v. Description allows space to include any other information which might be relevant, eg a special feature or an unusual situation.
- b) Listed species - the main part of the form is taken up with a list of 200 common species of plants (herbs, grasses, bryophytes). Where any of these is present, then a '1' should be written in the first column of the recording form. On completion of recording, the estimated cover % should be written against each species, using 5% cover categories, in the second column.
- c) Unlisted species - a space remains at the foot of the form in which should be recorded the names and cover %, for any other species which are not listed.

(It has been found that the species list from most plots is made up very largely from the species already listed on the recording form with perhaps 10% having to be added.)

8.9 In all cases a sketch should be included on the back of the recording sheet which shows the position of the plot and all relevant measurements and angles, as described below. All vascular plants should be recorded, together with bryophytes and lichens. The list of aggregates and restricted list is given in Tables 1 and 2. Species

which cannot be easily identified should be collected and pressed or bagged for later identification. Mosses/lichens growing on rocks/trees should be ignored.

- 8.10 Estimates of cover should then be made within 5% categories. It is necessary to constantly check between partners that there is not a tendency to over or under estimate. Cover may be over 100% if several layers are present e.g. Pteridium over Agrostis. Species with less than 5% cover are not given cover values.
- 8.11 Cover of woody species, if rooted in the plot, should be recorded in the normal way; there is no need to record any difference between seedlings and adult trees. Tree species which are overhanging the plot should have cover recorded in parentheses (brackets), and no '1' in the first column of the recording form.
- 8.12 "Bare ground" includes bare rock, but not litter.

Permanent marking and photography

- 8.13 Although time-consuming, the permanent marking of quadrats is essential if these plots are to be resurveyed at a future date. It cannot be emphasised enough how important it is to ensure that future field survey teams are given every assistance in locating quadrats.
- 8.14 The quadrat should be marked with two metal plates in diagonally opposite corners (always being the south-east and north-west corners). The plate should not be within the quadrat itself; it should be driven into the ground at an angle of <45 degrees with the ground surface, until the top edge is just below ground level (aligned to give maximum likelihood of easy relocation with a metal detector). The plates should be sloped away from the plot so that any contaminated water running across the plate will be shed away from the quadrat. Wooden stakes may be suitable in woodlands and scrub situations as an extra aid to quadrat location.
- 8.15 In all cases, the position of the quadrat, and marker plates should be sketched on the reverse of the recording sheet, and annotated with distances (measured with a tape) and compass bearings. All distances should be measured from the plate at the south-east corner to easily recognisable, and permanent, features in the surrounding landscape. Compass bearings should be given according to magnetic north (note contrast with plot location on a transect where grid north is used), and an indication as to which direction the bearing was taken from should be included in the sketch map.
- 8.16 Print films should be used to photograph every vegetation plot in order to show its general appearance and its position relevant to local landmarks or features.
- 8.17 The plot number (A6/H, G4/Y) etc should be written on the dry-board provided and should be placed in a prominent position at the edge of plot, preferably covering the position of the marker plate at the south-east corner of the quadrat.

- 8.18 The position from which the photograph was taken, and the direction of the shot, must be clearly shown on the sketch map showing the plot layout and position.

Guidelines on species identification

- 8.19 Using the same criteria as were used in the 1978 and 1990 surveys, the following section gives some guidelines on species identification.
- 8.20 Surveyors are expected to record to the species level wherever possible and, where unable to do so, should identify to the nearest taxon (with notes). However, there are certain species which are notoriously difficult to separate out from closely related examples of the same genus. It is therefore necessary, in order to remain consistent with previous surveys, to allow certain combinations to be recorded.
- 8.21 The combinations were determined on the basis of experience, where it is considered that unless good specimens are available it is not possible to identify the species accurately. A number of the species combinations have similar ecological amplitudes e.g. *Cardamine hirsuta/flexuosa*. The following list shows the combinations that were accepted in the CS1990 survey:

Arctium sp
Betula sp
Callitriche sp.
Cardamine hirsuta/flexuosa
Epilobium tetragonum/obscurum
Small *Euphorbia* sp
Euphrasia sp
Hieracium sp (except *pilosella*)
Juncus articulatus/acutiflorus
Luzula multiflora/campestris
Mentha sp
Myosotis sp
Poa trivialis/nemoralis
Polygala serphyllifolia/vulgaris
Quercus sp
Rhinanthus sp
Rosa sp (except *R. arvensis*, *R. pimpinellifolia*)
Rumex conglomeratus/sanguineus
Sagina sp
Taraxacum sp
Viola riviniana/reichenbachiana
Viola hirta/odorata
Non suckering elms (*U. glabra*)
Suckering elms (*U. procera*)

- 8.22 A list of the 200 species which were most common in the ITE 1977/78 survey has been modified for use in lowland heaths and is listed on the field recording sheets; species names are abbreviated and their full names are as follows (listed in the same order as they appear on the recording sheets):

887 Bare ground

GRASSES :

758	Agro cur	Agrostis curtisii
10	Agro can	Agrostis canina
11	Agro sto	Agrostis stolonifera
12	Agro ten	Agrostis capillaris (tenuis)
867	Agro vin	Agrostis vinealii
28	Anth odo	Anthoxanthum odoratum
37	Arrh ela	Arrhenathrum elatius
123	Cyno cri	Cynosurus cristatus
124	Dact glo	Dactylis glomerata
404	Dant dec	Danthonia decumbens
129	Desc ces	Deschampsia cespitosa
130	Desc fle	Deschampsia flexuosa
8	Elym rep	Elymus repens
165	Fest ovi	Festuca ovina
166	Fest rub	Festuca rubra
209	Holc lan	Holcus lanatus
210	Holc mol	Holcus mollis
254	Loli per	Lolium perenne
283	Moli cae	Molinia caerulea
287	Nard str	Nardus stricta
304	Phle pra	Phleum pratense
319	Poa ann	Poa annua
321	Poa pra	Poa pratensis
847	Poa triv	Poa trivialis

FORBS, WOODY SP, SEDGES, RUSHES & FERNS:

2	Acer pse	Acer pseudoplatanus
4	Achi mil	Achillea millefolium
5	Achi pta	Achillea ptarmica
26	Ange syl	Angelica sylvestris
29	Anth syl	Anthriscus sylvestris
47	Bell per	Bellis perennis
1341	Betu pen	Betula pedula
1342	Betu pub	Betula pubescens
53	Blec spi	Blechnum spicant
64	Call vul	Calluna vulgaris
68	Camp rot	Campanula rotundifolia
70	Card h/f	Cardamine hirsuta/flexuosa
71	Card pra	Cardamine pratensis
74	Care bin	Carex binervis
76	Care dem	Carex demissa
78	Care ech	Carex echinata
509	Care fla	Carex flacca
81	Care nig	Carex nigra
85	Care pan	Carex panicea
86	Care pil	Carex pilulifera
92	Cent nig	Centaurea nigra
96	Cera fon	Cerastium fontanum)
97	Cham ang	Chamaenerion angustifolium (Epilobium angustifolium)
101	Chry opp	Chrysosplenium oppositifolium

103	Cirs arv	Cirsium arvense
104	Cirs pal	Cirsium palustre
105	Cirs vul	Cirsium vulgare
113	Cono maj	Conopodium majus
117	Cory ave	Corylus avellana
118	Crat mon	Crataegus monogyna
590	Dact mac	Dactylorhiza maculata agg.
132	Digi pur	Digitalis purpurea
136	Dros rot	Drosera rotundifolia
137	Dryo dil	Dryopteris dilatata
138	Dryo fil	Dryopteris filix-mas
140	Empe nig	Empetrum nigrum
141	Endy non	Endymion non-scriptus (Hyacinthoides n-s)
747	Epil mon	Epilobium montanum
144	Epil pal	Epilobium palustre
1343	Eric cil	Erica ciliaris
150	Eric cin	Erica cinerea
151	Eric tet	Erica tetralix
152	Erio ang	Eriophorum angustifolium
153	Erio vag	Eriophorum vaginatum
168	Fili ulm	Filipendula ulmaria
170	Frax exc	Fraxinus excelsior
177	Gali apa	Galium aparine
182	Gali pal	Galium palustre
183	Gali sax	Galium saxatile
190	Gera mol	Geranium molle
193	Gera rob	Geranium robertianum
195	Geum urb	Geum urbanum
197	Glec hed	Glechoma hederacea
204	Hede hel	Hedera helix
206	Hera sph	Heracleum sphondylium
207	Hier pil	Hieracium pilosella
220	Hype pul	Hypericum pulchrum
836	Junc acu	Juncus acutiflorus
835	Junc art	Juncus articulatus
230	Junc bul	Juncus bulbosus
231	Junc con	Juncus conglomeratus
232	Junc eff	Juncus effusus
235	Junc squ	Juncus squarrosus
243	Lath pra	Lathyrus pratensis
255	Loni per	Lonicera periclymenum
256	Lotu cor	Lotus corniculatus
832	Luzu cam	Luzula campestris
831	Luzu mul	Luzula multiflora
277	Merc per	Mercurialis perennis
286	Myri gal	Myrica gale
288	Nart oss	Narthecium ossifragum
296	Oxal ace	Oxalis acetosella
302	Pedi syl	Pedicularis sylvatica
311	Ping vul	Pinguicula vulgaris
313	Pinu syl	Pinus sylvestris
315	Plan lan	Plantago lanceolata
316	Plan maj	Plantago major
833	Poly vul	Polygala vulgaris
336	Pote ans	Potentilla anserina
337	Pote ere	Potentilla erecta

339	Pote rep	Potentilla reptans
342	Prim vul	Primula vulgaris
343	Prun vul	Prunella vulgaris
346	Prun spi	Prunus spinosa
348	Pter aqu	Pteridium aquilinum
1344	Quer pet	Quercus petraea
1345	Quer rob	Quercus robur
351	Ranu acr	Ranunculus acris
354	Ranu fic	Ranunculus ficaria
355	Ranu fla	Ranunculus flammula
357	Ranu rep	Ranunculus repens
373	Rubu fru	Rubus fruticosus
375	Rum a'sa	Rumex acetosa
376	Rum a'la	Rumex acetosella
378	Rume cri	Rumex crispus
380	Rume obt	Rumex obtusifolius
386	Samb nig	Sambucus nigra
401	Sene jac	Senecio jacobea
1026	Sene syl	Senecio sylvatica
405	Sile dio	Silene dioica
413	Sonc asp	Sonchus asper
415	Sorb auc	Sorbus aucuparia
49	Stac off	Stachys officinalis
420	Stac syl	Stachys sylvatica
423	Stel hol	Stellaria holostea
424	Stel med	Stellaria media
427	Succ pra	Succisa pratensis
430	Tara agg	Taraxacum agg.
432	Teuc sco	Teucrium scorodonia
845	Thym pra	Thymus praecox
443	Tric cae	Trichophorum caespitosum (Scirpus caespitosus)
446	Trif dub	Trifolium dubium
448	Trif pra	Trifolium pratense
449	Trif rep	Trifolium repens
841	Trip mar	Tripleurospermum maritimum
458	Ulex eur	Ulex europaeus
459	Ulex gal	Ulex gallii
1220	Ulex min	Ulex minor
462	Urti dio	Urtica dioica
463	Vacc myr	Vaccinium myrtillus
469	Vero cha	Veronica chamaedrys
471	Vero off	Veronica officinalis
477	Vici sep	Vicia sepium
482	Viol pal	Viola palustris
849	Viol r/r	Viola riviniana/reichenbachiana

BRYOPHYTES AND LICHENS

1346	Aula pal	Aulacomnium palustre
1347	Brac alb	Brachythecium albicans
54	Brac rut	Brachythecium rutabulum
1348	Cali cus	Calliargon cuspidatum
1349	Camp bre	Campylopus brevipylyus
892	Camp int	Campylopus introflexus
917	Camp par	Campylopus paradoxus
1350	Camp pyr	Campylopus pyriformis

1351	Cera pur	Ceratodon purpurea
107	Clad arb	Cladonia arbuscula
1360	Clad coc	Cladonia coccifera
1361	Clad fim	Cladonia fimbriata
1362	Clad flo	Cladonia floerkinia
108	Clad fur	Cladonia furcata
512	Clad imp	Cladonia impexa
106	Clad pyx	Cladonia pyxidata
1363	Clad squ	Cladonia squamosus
513	Clad unc	Cladonia uncialis
519	Dicr het	Dicranella heteromalla
131	Dicr sco	Dicranum scoparium
1126	Dipl alb	Diplophyllum albicans
161	Eurh sp.	Eurhynchium spp.
911	Fuma hyg	Fumaria hygrometrica
216	Hylo spl	Hylocomium splendens
1056	Hypo phy	Hypogymnia physoides
222	Hypn cup	Hypnum cupressiforme
1156	Hypn jut	Hypnum jutlandicum
248	Leuc gla	Leucobryum glaucum
530	Loph sp.	Lophocolea spp.
280	Mniu hor	Mnium hornum
282	Mniu und	Mnium undulatum
535	Pell sp.	Pellia spp.
314	Plag und	Plagiothecium undulatum
318	Pleu sch	Pleurozium schreberi
1352	Pohl nut	Pohlia nutans
331	Poly com	Polytrichum commune
843	Poly jun	Polytrichum juniperinum
844	Poly pil	Polytrichum piliferum
279	Pseu pur	Pseudoscleropodium purum
905	Ptil cil	Ptilidium ciliare
364	Rhyt lor	Rhytidiadelphus loreus
365	Rhyt squ	Rhytidiadelphus squarrosus
1353	Spha aur	Sphagnum auriculatum
1354	Spha cap	Sphagnum capillifolium
1355	Spha com	Sphagnum compactum
1356	Spha cus	Sphagnum cuspidatum
1357	Spha pal	Sphagnum palustre
1358	Spha pap	Sphagnum papillosum
1359	Spha rec	Sphagnum recurvem
439	Thui tam	Thuidium tamariscinum

9. ARCHAEOLOGICAL FEATURES

- 9.1 A map is provided for the recording of any archaeological features which are noted in the square.
- 9.2 Any feature which might be of interest to the Archaeology Unit at Lancaster University should be marked, however crudely, on the map and a verbal description given below. Advantage should be taken of any high points within the square to observe the landscape and any excavations (eg drains, site development) should be examined.

9.3 A photograph (including a scale object) should be taken of any interesting feature.

10. PROCEDURE SUBSEQUENT TO SURVEY

10.1 At the end of a day's surveying, it is advisable to read through the data sheets and check that no feature has been omitted.

10.2 If absolutely essential, then the data may be transposed onto fresh maps and recording forms but this is inadvisable and should only be carried out in the event of damage or spoiling of the original map.

10.3 Arrangements should be made to transport FABs back to ITE Merlewood Research Stations as soon as possible.

Colin Barr
July 1992