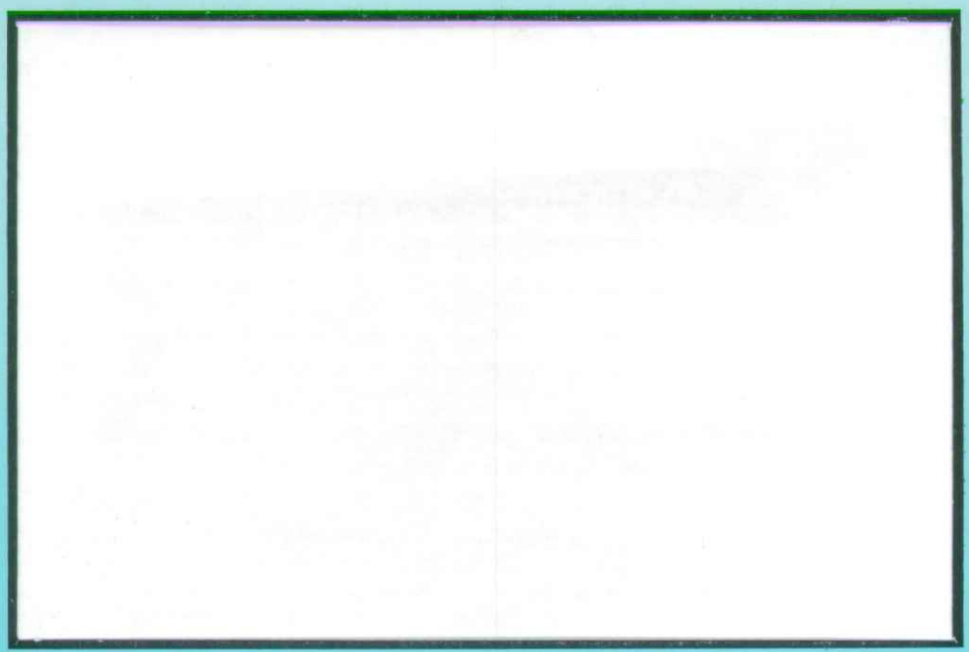
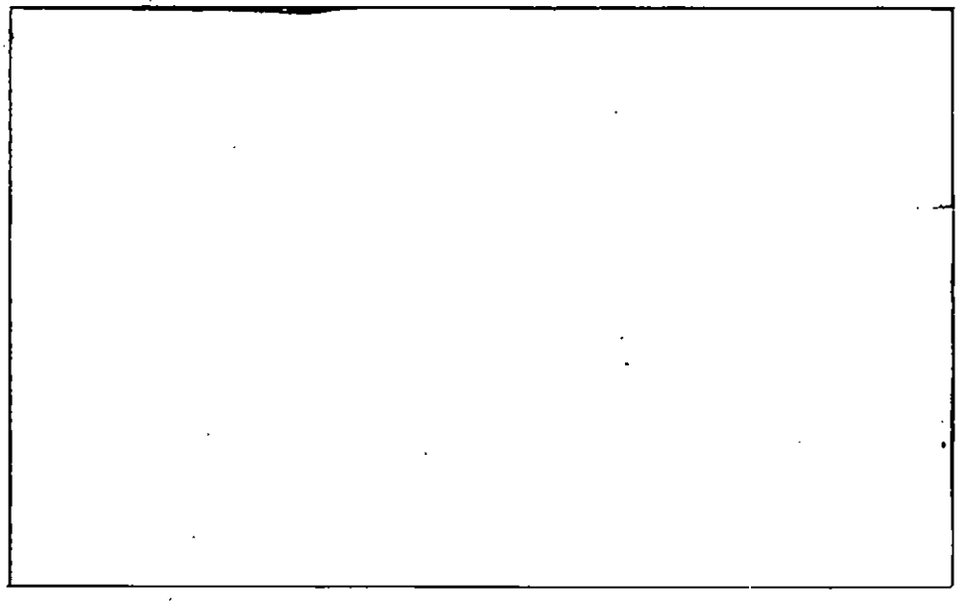


Institute of Terrestrial Ecology

Natural Environment Research Council

The **Institute of Terrestrial Ecology** is a component body of the Natural Environment Research Council. It was established in 1973, and now forms part of the Terrestrial and Freshwater Sciences Directorate of NERC.



ITE undertakes specialist ecological research on subjects ranging from micro-organisms to trees and mammals, from coastal habitats to uplands, from derelict land to air pollution. An understanding of the ecology of different species and of natural and man-made communities plays an increasingly important role in areas such as:

- monitoring ecological aspects of agriculture
- improving productivity in forestry
- controlling pests
- managing and conserving wildlife
- assessing the causes and effects of pollution
- rehabilitating disturbed sites

The staff can offer objective, impartial, advice on a wide range of topics, and can assess the impact of different land use options. ITE's applied and basic research contributes to the efficient use of the natural environment and provides information on which to base predictions of future trends.

INSTITUTE OF TERRESTRIAL ECOLOGY

(NATURAL ENVIRONMENT RESEARCH COUNCIL)

Report to the Department of the Environment

DoE / ITE Contract PECD 7/2/127

ITE Project T02071b1

COMPARISON OF LAND COVER DEFINITIONS

Final Report

B K Wyatt, N Greatorex Davies, M O Hill, R G H Bunce, R M Fuller

Monks Wood
Abbots Ripton
Huntingdon
Cambridgeshire
PE17 2LS

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- The many points of contact for the various land cover surveys referenced in this Report, whose advice and comments helped us to achieve the present degree of completeness and accuracy in the technical descriptions provided in this Report.

Notwithstanding these acknowledgements, the authors accept full responsibility for the material contained in the report and, in particular, for any errors of omission or commission that may have survived into this final report.

EXECUTIVE SUMMARY

Because land use pervades so many interests, a wide variety of different agencies compile statistics of land usage or land cover, through direct survey and by other means. Historically, these surveys have adopted radically different methods and, as a consequence, no two surveys are directly comparable. This leads to complications, for example, when it is required to compare land use in different geographical regions or in areas under different statutory designation, or when two government departments wish to use different land surveys to support different and possibly conflicting policies. Differences in survey methods or nomenclature may mean that it is difficult to separate real change in land use from the effects of procedural differences. For all these reasons, there is a strong motivation to develop systems which will allow the results of different surveys of land cover and land use to be compared with greater confidence, so extending their applicability and increasing their cost-effectiveness.

The study described in this Report sought to inter-relate land classifications and to inter-calibrate estimates of land cover from different surveys. This was achieved firstly by the analysis and documentation of survey methods and classifications used in 17 land cover surveys and classifications of regional, national or international importance. The results of this analysis are presented as a printed Dictionary of Land Cover Surveys and Classifications, which forms Annex 1 to this Report. The material contained in this Handbook is also available separately, in digital form, both as part of the Countryside Information System (CIS) and as a free-standing software package.

The digital files recording the land cover categories employed in the various surveys addressed in this study, were then used to carry out a systematic comparison of the land cover classifications. Cross-tabulations were drawn up, relating any pair of the 17 classifications considered. Examples of these cross-tabulations form Annex 2 to this Report; the software developed for this exercise is also distributed with the Report and allows any land cover category in any of the 17 surveys to be expressed in terms of its equivalent category or categories in any other survey.

In the case of four nationally-important land cover surveys, the study compared estimates of the geographical extent of the different land cover categories mapped; from these data, it was possible to measure the correspondence between overlapping classes, and to use these measures of correspondence to weight land cover statistics from different sources, so as to improve their comparability. The systems considered in this part of the study were:

- Field survey from the Countryside Survey-1990.
- the ITE Land Cover Map.
- Monitoring Landscape Change.
- the MAFF Agricultural and Horticultural Census (and regional variants).

Of the various approaches adopted, all showed strong positive correlations between estimates of land cover derived from the different sources. Overall levels of correspondence measured were as follows:

CS-1990 Field Survey *vs* ITE Land Cover Map (Paragraphs 7.4.1 and 7.4.2)	46-54%
CS-1990 Field Survey *vs* Monitoring Landscape Change (Paragraph 7.4.4)	57.8%
ITE Land Cover Map *vs* Monitoring Landscape Change (Paragraph 7.4.6)	51.4%

It is important that these estimates of correspondence are not equated to measures of absolute accuracy. There are errors inherent in any mapping operation, whether the data are collected from ground level or from space. When two surveys, each of which may carry an error of the order of 25%, are compared, the correspondence between them will inevitably be low: the values of 50% to 60% encountered in this study are not unreasonable. Quality control checks carried out as part of the CS-1990 field survey indicated that the recording accuracy of the field surveyors fell in the range 74-83% (Barr *et al*, 1993). Correspondence between two surveys, each operating at this level of accuracy, could easily be in the range 55-70%, since the different surveys are likely to propagate different errors. Other factors which may further reduce the correspondence include:

- differences in timing, which mean that the different surveys may be recording actual change on the ground;
- differences in spatial resolution, which may mean that one survey is recording features that are below the limits of resolution of the second;
- differences in nomenclature, definition and interpretation (explored in depth in the course of this study) which often mean that nominally equivalent land categories only partially match and that there is legitimate overlap between nominally different classes.

Taking all these factors into account, the data collected in this study suggests that land cover can be mapped from space, from aerial photography or from a stratified ground sampling network, with overall errors of the order of 20 - 30%. (Clearly, estimates for certain land cover classes will be much better than this). The separate analysis of correspondence between field survey and aerial photo-interpretation in the mapping of linear features indicates a level of correspondence that is of the same order as in the case of areal features.

It is self-evident that the desire for 'accurate' (ie error-free) measurement must be tempered by considerations of cost and feasibility. Bearing this point in mind, the performance of all three national surveys indicated by the above results is adequate for mapping and compilation of statistics at the broader regional and national scales. However, the results also emphasize the need for caution in using datasets of this sort at the local scale (for example, to investigate environmental impacts on specific land parcels).

The final stage of the study was to develop, on the basis of the descriptive material presented in Annex 1, a single integrating classification scheme that could serve as a baseline to ensure improved compatibility and inter-conversion between future national land cover surveys and classifications.

1 OBJECTIVES OF THE STUDY

Land, considered as a resource, has social, economic and environmental significance, and the ways in which we use it are of relevance for a wide range of interest groups. Land has economic value. It is the medium which supports agriculture and forestry, it is the origin of many mineral resources (including fresh water) and it defines the geographical framework for most other human activities. Many of the natural systems which contribute to the quality of life must compete with human land uses in order to survive.

Because of the diversity of interests in exploiting, protecting and managing the land, it is not surprising that there is a correspondingly large number of different systems in common use to describe and map the land surface of Britain. While there is justification for this diversity (nomenclatures and classifications are tuned to serve the precise requirements of their users), there are also disadvantages. It inhibits communication between sectors, it constrains the use of land surveys and inventories for purposes other than those for which they were specifically intended and, in particular, it often prevents the detection or measurement of changes in land use by comparing data from different surveys, because differences in terminology may mask actual change on the ground.

The study described in this Report was commissioned by the Directorate of Rural Affairs, of the Department of the Environment, in order to address some of the technical issues which lie at the root of these difficulties. The objectives of the study, as laid out in the Research Specification, were as follows:

1 To review and compare the definitions of land use and land cover types used in national surveys within the UK and produce a dictionary of definitions and survey methodologies.

2 To determine methodologies for comparing results from different surveys and to derive adjustment factors to enable direct comparisons between estimates of similar land cover categories (including linear features) from different surveys.

3 To recommend standard definitions of land cover categories of national importance and recommend how these should be used as a basis for comparing results from existing local and national land cover surveys.

2 OUTPUTS FROM THE STUDY

The results of the study comprise four related output packages, as follows:

- the Dictionary of Surveys and Classifications of Land Use and Land Cover, which forms Annex 1 to this Report.

- the results of the inter-comparison of land use / land cover categories from different surveys and classifications. Key examples of these inter-comparisons are included as Annex 2 to this Report. However, it was not our intention to present an exhaustive paper record of all possible comparisons, since this would be both bulky and unwieldy. Rather, the principal output from this part of the study is the software and the basic data files described in Paragraph 6.2.4 which allow such inter-comparisons to be carried out on demand. This software and data package comprises:

  i) the files which describe the relationships between individual classifications and a common reference (baseline) classification;

  ii) software which allows the relationships between any pair of the classifications to be inferred from the reference baseline connections;

  iii) dictionaries to permit results to be displayed with meaningful text annotation.

  A detailed description of the algorithm used in the above programme is provided in Paragraph 6.2.4 of this Report.

- the results of quantitative inter-calibration of four of the land surveys, as requested by the Department. These results are presented in the form of correspondence matrices in Section 7 of the Report; the data contained in these matrices can be used to weight land cover statistics from any individual survey so as to present its data in the framework of each of the alternative classifications.

- a recommended baseline classification of land cover, together with definitions of the categories proposed. This is intended for use as a reference against which other systems can be compared and as a common starting-point for the development of future specialist classifications, which will ensure consistency of approach at the broad level of land cover recording.

The digital versions of the above outputs are offered in the following forms:

- the Dictionaries from Annex 1 are available as a WordPerfect 5.1 document in MS-DOS format on 3½" diskette;

- the same Dictionaries are also provided as on-line reference files within the Countryside Information System (Department of the Environment, 1993);

- the programme which performs the inter-comparison between selected pairs of classifications is offered in three forms:

  i) as FORTRAN source code, together with ASCII text versions of the data relating each of the 17 classification to the baseline; this version is distributed in MS-DOS format on 3½" diskette; in this version, the code takes any specified pairs of classifications and generates a file recording all relevant cross-references, in a form suitable for subsequent display, for example, using a word processing package;

  ii) as a free-standing programme, running under Microsoft Windows, which provides, through an interactive menu, the facility to inter-relate any chosen category within a selected classification to its equivalent(s) in any other classification system.

  iii) as a feature within the Countryside Information System;

3 LAND USE *vs* LAND COVER *vs* VEGETATION TYPE

The research specifications recognised and required inter-comparisons between three broad groups of land surveys and classifications. First, were those concerned with recording land use, secondly, those concerned with characterising land cover, and finally, those concerned with more detailed descriptions of vegetation type, for example, identified by the presence of individual species or plant communities. These three types of survey and the classifications which underpin them, have very different characteristics and it is important to appreciate these differences, so as to determine how (or indeed whether) land survey data can be inter-compared and to understand some of the compromises that may be necessary in order to establish a common approach.

There are fundamental differences between land use and land cover. Land cover is a description of the physical nature of the land surface, for example, vegetation, buildings, water or bare ground. Land use describes the same features in terms of their socio-economic significance. In general, we cannot observe land use directly. However, it may be possible to infer land use from observations of land cover. For instance, a particular land use may result in a land cover which is recognisably unique; plantation forestry and some agricultural cropping are good examples. However, this is by no means always true. A single land cover category may be common to a number of land uses; a good example is provided by intensively-managed grassland, which may be indistinguishable, either from its species composition or its remotely-sensed signature, whether it occurs as agricultural pasture, as sports turf or as urban amenity grass. Conversely, a single land use (eg mining) may comprise a mosaic of different land cover categories (spoil heaps, buildings, roads and tracks, settlement ponds, etc).

Remote sensing, whether from satellites or from aerial photography, cannot be used to map land use directly (though, as suggested earlier, it may be possible to infer it, for example, by interpreting the observed spatial patterns of land cover, or by reference to complementary data). Unambiguous identification of land use normally requires the deployment of ground survey, or other methods, such as a questionnaire-based approach.

Identification of vegetation type, at the level of species and communities, demands the use of field observations, usually by qualified botanists. Because it is so labour-intensive, such detailed description of vegetation communities cannot be carried out continuously over large areas, but must be founded on a sample-based approach; this, inevitably, introduces error into estimates of the extent of the vegetation categories surveyed, because the sample data cannot be representative of the complete population. The categories described in surveys of this type are, by definition, qualitatively different from those mapped in more general surveys of land cover or land use. Although procedures exist which inter-relate different vegetation classifications (eg Hill, 1989), the extension of these techniques to include non-botanical classifications is more difficult. Nevertheless, it is important to develop the means to relate data from botanical survey to broader information on land cover. For example, although it is prohibitively expensive to observe vegetation changes over large areas directly, data on change in land use or land cover are more accessible; given a knowledge of the vegetation which is characteristic of a given land cover category, it is possible, in principle, to estimate transitions between vegetation types by observing changes in the broader land cover mosaic.

The approach adopted in this study was to focus efforts at inter-comparison in the area of broad categories of land use and land cover. At this level it was possible to establish meaningful correspondence between land use, land cover and vegetation classes in

different systems, although the correspondence was rarely 1:1. The main consequence of this approach, (the only practically feasible solution to the above issues), was that it was not possible to consider in great detail inter-relationships involving specialist land use surveys and classifications (such as the National Land Use Classification, Department of the Environment, 1975) nor to look at vegetation or habitat classifications much below broad categories corresponding to land cover units. However, equivalence between categories of British vegetation in the two vegetation classifications of principal interest to the Department of the Environment (the National Vegetation Classification and the CORINE Biotopes Habitat classification) forms the subject of an earlier contract between ITE and the Joint Nature Conservation Committee. This resulted in software to allow inter-conversion between the two systems (Hill, 1989).

Within the land cover categories considered, the emphasis was on the recording of areal features, rather than linear or point features, such as field boundaries or isolated trees. Indeed, many of the systems considered in this study only recognised areal units. However, in those cases where it was possible to make comparisons between the treatment of smaller (linear and point object) categories, this was done.

4 BACKGROUND AND RATIONALE

Because the need to describe the land surface pervades so many sectoral interests, a wide variety of different agencies compile statistics of land use, land cover or vegetation type, obtained from direct survey and by other means. Recent examples include those commissioned by the national nature conservation agencies, (Nature Conservancy Council, 1987, Wyatt, G., 1991), the Countryside Commission and the National Parks authorities (Countryside Commission, 1991), the Department of the Environment and equivalent bodies in Wales, Scotland and Northern Ireland, (Hunting Surveys and Consultants Ltd., 1986, Department of the Environment, 1975 and 1992, Aspinall, R.J., *et al*, 1991), the Ministry of Agriculture, Fisheries and Food and the individual country agriculture departments, (Ministry of Agriculture, Fisheries and Food, 1989), the Forestry Commission, (Rennolls, K. 1989) and the environmental research community, (Rodwell, J.S., 1991a & b, Wyatt, B. K., & Fuller, R. M., 1992). In addition, there are analogous international initiatives, in particular, those of the Commission of the European Communities, (Commission of the European Communities, 1991, European Environment Agency Task Force, 1992), the United Nations Economic Commission for Europe (United Nations Economic and Social Council, 1989), the United Nations Environment Programme (Murray, 1993) and the UN Food and Agriculture Organisation (Young, 1993).

Historically, these surveys have adopted radically different methods, depending, *inter alia*, on the nature of the information required, on the expertise which could be deployed and on the resources available for their execution. Because of these and other differences, no two surveys are directly comparable. This leads to complications, for example, when it is required to compare land use in different geographical regions or in areas under different statutory designation (eg National Parks *vs* Environmentally Sensitive Areas) or when two government departments wish to use different land surveys to support different and possibly conflicting policies. The detection of changes in land use over time is an important objective which clearly requires access to consistent statistics of land use and land cover. Differences in methods or nomenclature may mean that it is difficult to separate real change from the effects of methodological differences. Even when a single agency undertakes regular surveys, incremental changes are often introduced into the methods used, and these can make it difficult to interpret correctly apparent changes in land use patterns. For all these reasons, there is a strong motivation to develop systems which will allow the results of different surveys of land cover and land use to be compared with greater confidence, so extending their applicability and increasing their cost-effectiveness. This motivation is reinforced where there is a need to supply information on vegetation, land cover or land use in forms which may not be directly compatible with existing national systems. A good example of this is the requirement, within the EC Habitats Directive (European Communities, 1992), to designate *and to document* Special Protection Areas and Special Areas of Conservation.

There are a number of previous instances in which consideration has been given to the need to introduce greater consistency into the recording of land cover data. As mentioned earlier, Hill (1989) has developed software which allows inter-conversion between the CORINE Biotopes Habitats categories (Commission of the European Communities, 1991b) and the vegetation categories of the NVC (Rodwell, 1991 a & b).

In the mid-1970s, ITE developed its Land Classification System, (Bunce, *et al.*, 1981) which provides for a stratification of land in Great Britain into 32 categories on the basis of their topographic, climatic and ecological characteristics. This system has formed a framework for successive national ecological surveys in 1978, 1984 and 1990, (Barr, C.J., 1990) and the basis for the Northern Ireland Countryside Survey, undertaken from 1991-1992 (Cooper, A., 1986). However, although the system provides for 32 distinct and recognisable land classes, these do not relate directly to specific categories of land use or land cover.

A number of classification systems have been developed with the intention of introducing greater conformity and consistency into the recording of data on land use, land cover or vegetation. Examples included in the present study are the National Vegetation Classification (Rodwell, J.S., 1991a and b) the CORINE Biotopes Habitat classification (Commission of the European Communities, 1991b), the NCC Phase 1 Survey (Wyatt, G. 1991) the National Land Use Classification (Department of the Environment, 1975) and the UN/ECE Statistical Classification of Land Use (UNESCO, 1989). However, in developing these classifications, little attention was given to the need to ensure compatibility with other systems in common use. A notable exception to this general observation is provided by proposals, under the auspices of the International Geosphere-Biosphere Programme (IGBP), the World Conservation Monitoring Centre (WCMC) and the UNEP Harmonization of Environmental Measurements (HEM) programme for a common approach to the classification of global vegetation, which could serve the needs of a wide community of users (Murray, B., 1992).

However, all these initiatives (with the possible exception of the UNEP/HEM activity) focus on a particular discipline or application. The integration of land classification systems and land data to service policy requirements beyond the immediate purposes for which they were designed, as essayed in this project, is a novel initiative. Clearly, there is a need to inter-relate data on land use or land cover from different sources, for example, to allow geographical or cross-sectoral comparison, or for change detection. The task presents a formidable challenge, for which there is no established methodology. It is rendered especially demanding by the diversity of the different systems in regular use: exact correspondence of nomenclature or definition is rare, even between a single pair of classifications. And even in those cases where classification differences can be reconciled, other methodological differences are likely to influence the results obtained, whether these results take the form of maps or of quantitative statistics describing the extent of land cover or land use categories. The following factors, in particular, need to be taken into account.

4.1 DIFFERENCES IN OBJECTIVES

Mention has already been made (paragraph 3) of fundamental differences between land use, land cover and vegetation type, and hence between the nomenclatures used to describe them. Individual surveys are usually targeted at one or other of these objectives (though, as will be seen, there is frequent confusion, especially between categories of land use and land cover). Precisely because land cover is not equivalent to land use and because botanical definitions of vegetation types differ from both, inter-comparisons between the different types of survey are difficult. Even where it is possible to make meaningful comparisons, these will be error-prone because of the usually fuzzy relationships between the systems used to classify units of land use, land cover and vegetation.

The categories of land cover or land use chosen to represent the landscape will depend on the purposes for which the classification was developed. For example, surveys of natural habitats may record agricultural land in a small number of categories, such as 'arable land', 'permanent pasture', etc, while agricultural censuses will need to distinguish individual crops. Clearly, this will profoundly influence the level of detail at which it is possible to describe the land surface within any particular system.

4.2 DIFFERENCES IN DEFINITION AND NOMENCLATURE

The definitions adopted for individual categories of land use, land cover or vegetation type will clearly have a bearing on the results obtained. The effect of this is particularly important in locating boundaries between inter-gradational categories of natural and semi-natural vegetation (for example, between deciduous and mixed forest, or between different categories of grassland, heathland and bogs).

4.3 SPATIAL ASPECTS

The spatial sampling regime and the scale or resolution at which data are recorded, will determine how faithfully the survey records small or infrequent land cover categories.

4.4 SURVEY METHODS

The survey methods employed (for example, sampling *vs* complete census; field survey *vs* remote sensing) will influence the spatial resolution which it is possible to achieve, the magnitude of errors expected and the capacity of the survey to distinguish particular landscape features. For instance, automatic classification of remotely sensed multi-spectral data can only distinguish land cover categories which exhibit recognisably different spectral signatures.

5 OVERALL APPROACH

5.1 SURVEYS CONSIDERED IN THE STUDY

The study examined a total of 17 local, regional, national and international systems for surveying or classifying land use, land cover or vegetation type (see Table 1). Two of the systems addressed (the MAFF Agricultural and Horticultural Census and the Environmentally Sensitive Areas Monitoring Scheme) comprised regional schemes within an overall national framework. These required the consideration of three variations on the MAFF Census for England (covering Wales, Scotland and Northern Ireland) and 12 variations on the ESA scheme, specific to individual ESAs.

5.2 DICTIONARIES OF SURVEYS AND CLASSIFICATIONS

Any attempt to inter-relate land cover or land use classifications or to inter-calibrate estimates of land cover or land use from different surveys must be preceded by rigorous definition of the nomenclatures and methodologies used. The first step in the study was therefore to analyse and document the methods and classifications employed and to present the results of these analyses in the form of structured 'Dictionaries'. For each of the 17 schemes listed in Table 1 (and their regional variations), details were assembled in a common format, describing the background to the scheme, its objectives and the methods employed. The categories of land cover, land use and vegetation type employed in each system were also recorded, together with any definitions published in supporting documentation.

The results of this analytical phase are presented as a printed Handbook of Land Cover Surveys and Classifications, which forms Annex 1 to this Report. The material contained in this Handbook is also available separately, in digital form, both as part of the Countryside Information System (CIS) (Department of the Environment, 1993) and as a free-stand package running under MS-WINDOWS.

5.3 INTER-COMPARISON OF CLASSIFICATIONS

On the basis of the above definitions, look-up tables were constructed, recording correspondences between categories in any pair of the 17 classifications considered. Examples of these cross-tabulations form Annex 2 to this Report; the software developed for this exercise forms part of the Report package and allows any land cover category in any of the 17 surveys to be expressed in terms of its equivalent category or categories in any other survey.

5.4 INTER-CALIBRATION OF DATA FROM LAND SURVEYS

The study went on to compare estimates from different surveys of the geographical extent of the different land cover categories; from these results, it was possible to compute quantitative measures of the correspondence between overlapping classes, and to make available these measures of correspondence, for example, to weight land cover statistics from different sources, so as to improve their comparability.

This element of the study was confined to just four land surveys, on grounds of feasibility. The four surveys were selected by the Department of the Environment because of their particular significance for national land use policy and because they are the only ones which provide estimates of the extent of land use and land cover which are both geographically referenced and national in coverage.

TABLE 1

SURVEYS CONSIDERED IN THE STUDY *Primary survey methods indicated in italics*

LAND COVER

International Schemes

1 CORINE LAND COVER *(Satellite Remote Sensing)*

National Schemes

2 ITE COUNTRYSIDE SURVEY 1990 - FIELD SURVEY *(Field Survey)*

3 ITE COUNTRYSIDE SURVEY 1990 - LAND COVER MAP *(Satellite Remote Sensing)*

Regional Schemes

4 MONITORING LANDSCAPE CHANGE *(Air photo)*

5 NATIONAL COUNTRYSIDE MONITORING SCHEME (Scotland) *(Air photo)*

6 LAND COVER OF SCOTLAND *(Air photo)*

7 NORTHERN IRELAND COUNTRYSIDE SURVEY *(Field Survey)*

Schemes Covering Designated Areas

8 NATIONAL PARKS MONITORING SCHEME *(Air photo)*

9 ENVIRONMENTALLY SENSITIVE AREAS (ESAs) MONITORING *(Air photo)*

Schemes whose primary objective is not Environmental Planning / Conservation

10 MAFF AGRICULTURAL AND HORTICULTURAL CENSUS. *(Questionnaire Survey)*

Includes:
MAFF AGRICULTURAL AND HORTICULTURAL CENSUS - England
AGRICULTURAL CENSUS - Scotland
WELSH OFFICE AGRICULTURAL AND HORTICULTURAL CENSUS -Wales
AGRICULTURAL CENSUS - Northern Ireland

11 FORESTRY COMMISSION CENSUS OF WOODLANDS AND TREES *(Air photo)*

LAND USE

International Scheme

12 UN/ECE STATISTICAL CLASSIFICATION OF LAND USE *(Classification only)*

National Schemes

13 NATIONAL LAND USE CLASSIFICATION *(Classification only)*

14 DOE LAND USE CHANGE STATISTICS *(Field Survey)*

VEGETATION / HABITAT

International Scheme

15 CORINE BIOTOPES HABITAT CLASSIFICATION *(Field survey/literature)*

National Schemes

16 NATURE CONSERVANCY COUNCIL PHASE 1 SURVEY *(Field Survey)*

17 NATIONAL VEGETATION CLASSIFICATION *(Field Survey)*

The four surveys included in this quantitative evaluation were:

- ITE 'Countryside Survey 1990' Field Data
- ITE 'Countryside Survey 1990' Land Cover Map
- Monitoring of Landscape Change Project
- MAFF Agricultural and Horticultural Census.

5.5 STANDARD DEFINITIONS OF NATIONALLY IMPORTANT LAND COVER CATEGORIES

The final stage of the study was to develop, on the basis of the descriptive material presented in Annex 1, standard definitions of land cover categories of national importance. We chose to present these definitions as a single integrating classification scheme that could serve as a baseline for future national land cover surveys and classifications.

5.6 EXECUTION OF THE WORK

The work was carried out by staff of the Institute of Terrestrial Ecology at two of its sites (Monks Wood and Merlewood). Monks Wood staff were responsible for project management, for compilation of the reference material and preparation of the dictionaries, for the inter-comparison of classifications and for quantitative inter-calibrations involving the ITE Land Cover Map. Merlewood staff provided background consultancy on theoretical aspects of land survey and specifically on the use of the ITE classification: they undertook inter-calibrations involving data from Countryside Survey-1990 and Monitoring Landscape Change and, on request, provided land cover statistics from Countryside Survey for use in the other inter-calibrations. Both groups collaborated in drawing up recommendations for a standard national land cover classification.

ITE staff were guided in their tasks by a Steering Group, set up for the purpose, with membership from all the governmental bodies with an interest in land cover statistics. This Steering Group met on four occasions during the course of the study and provided helpful guidance and advice. The membership of the Steering Group is listed in Table 2.

TABLE 2

MEMBERS OF THE PROJECT STEERING GROUP

Dr T W Parr	Department of the Environment Directorate of Rural Affairs
Dr S Webster	Department of the Environment Directorate of Rural Affairs
Mrs D Salathiel	Department of the Environment Land & General Statistics
Dr A Stott	Department of the Environment (NI)
Ms L Roberts	Welsh Office Planning Services Division
Ms D Wilkinson	Scottish Office Central Research Unit
Mr A J Hooper	Ministry of Agriculture, Fisheries and Food Agricultural Development and Advisory Service
Mr B Selmes	Chief Forest Surveys Officer Forestry Commission, Edinburgh
Dr K Kirby	English Nature Habitats Branch, Science Directorate
Dr J Hopkins	Joint Nature Conservation Committee Biotopes Conservation Branch
Mr J Holbrook	Scottish Natural Heritage Environmental Audit Branch
Dr R G H Bunce	Institute of Terrestrial Ecology, Merlewood Land Use Research Group
Dr B K Wyatt	Institute of Terrestrial Ecology, Monks Wood Environmental Information Centre
Dr M O Hill	Institute of Terrestrial Ecology, Monks Wood Ecological Processes Section
Mr R M Fuller	Institute of Terrestrial Ecology, Monks Wood Environmental Information Centre
Mr J N Greatorex-Davies	Institute of Terrestrial Ecology, Monks Wood Ecological Processes Section

6 METHODS

6.1 COMPILATION OF DICTIONARIES

The research specifications, issued by the Department of the Environment, called for the preparation of 'a dictionary of definitions (of land use / land cover) and survey methodologies'. This is actually a requirement for two structurally distinct products. Accordingly, two parallel sets of documentation were prepared.

The first, **Dictionary 1**, describes the 17 recent national and regional land surveys and land classifications listed in Table 1. The Dictionary records the institutions involved in carrying out each survey, its objectives, the methodology used, the forms of data storage, its availability and further background information (eg published references). This information was recorded in a standard format, using field headings agreed in discussion with the Steering Group. The outline structure of an entry in Dictionary is reported in Table 3.

The second, **Dictionary 2**, records the classifications used in each survey to describe land cover, land use, vegetation type, linear and point features (depending on the survey), together with the published definitions of each category. In some cases, definitions were missing from the published documentation. When the interpretations were not self-evident, efforts were made to seek clarification from the appropriate points of contact. Once again, the data are held in a standard format; in Dictionary 2, a decimal code and tabulated layouts were used, where appropriate, to represent hierarchical structure within the classifications. As far as possible, the codes published by the originators were used. Sometimes it was necessary to make minor modifications (typically, by inserting decimal points to indicate hierarchies that were not explicit in the original). These changes are noted in the Dictionary entries. Categories relating to differences in land management (eg intensity of use) were omitted, as were descriptive codes used to qualify the principal categories and categories of minor point and linear features, especially where these did not coincide with categories recognised in other surveys.

Two classifications recorded land features in great detail. The National Vegetation Classification (Rodwell, 1991 a & b) describes habitats in terms of phyto-sociologic units, recognising subtleties that are absent from many of the other systems considered. Similarly, the National Land Use Classification (Department of the Environment, 1975) recognises land uses to the level of individual buildings. In both cases, the lowest levels of the hierarchy were only included in the Dictionary where there were equivalents in another survey. In addition, many of the CORINE Biotopes categories referred to continental European habitats not represented in Britain. These were also excluded.

TABLE 3

STRUCTURE OF AN ENTRY IN THE DICTIONARY OF SURVEYS

SURVEY NUMBER

NAME OF SURVEY

COMMISSIONING AGENTS

EXECUTING AGENT

CONTACT

OBJECTIVES

PERIOD OF FIELD SURVEY
- Start
- End

WORK CARRIED OUT

SURVEY METHOD

GEOGRAPHICAL CHARACTERISTICS
- Area of survey
- Sampling frame
- Sampling unit
- Recording unit
- Scale of input data
- Scale of output
- Resolution
- Accuracy and error

DATA STORAGE/ANALYSIS

DATA AVAILABILITY

FORMS OF OUTPUT

PUBLICATION DATE(S)

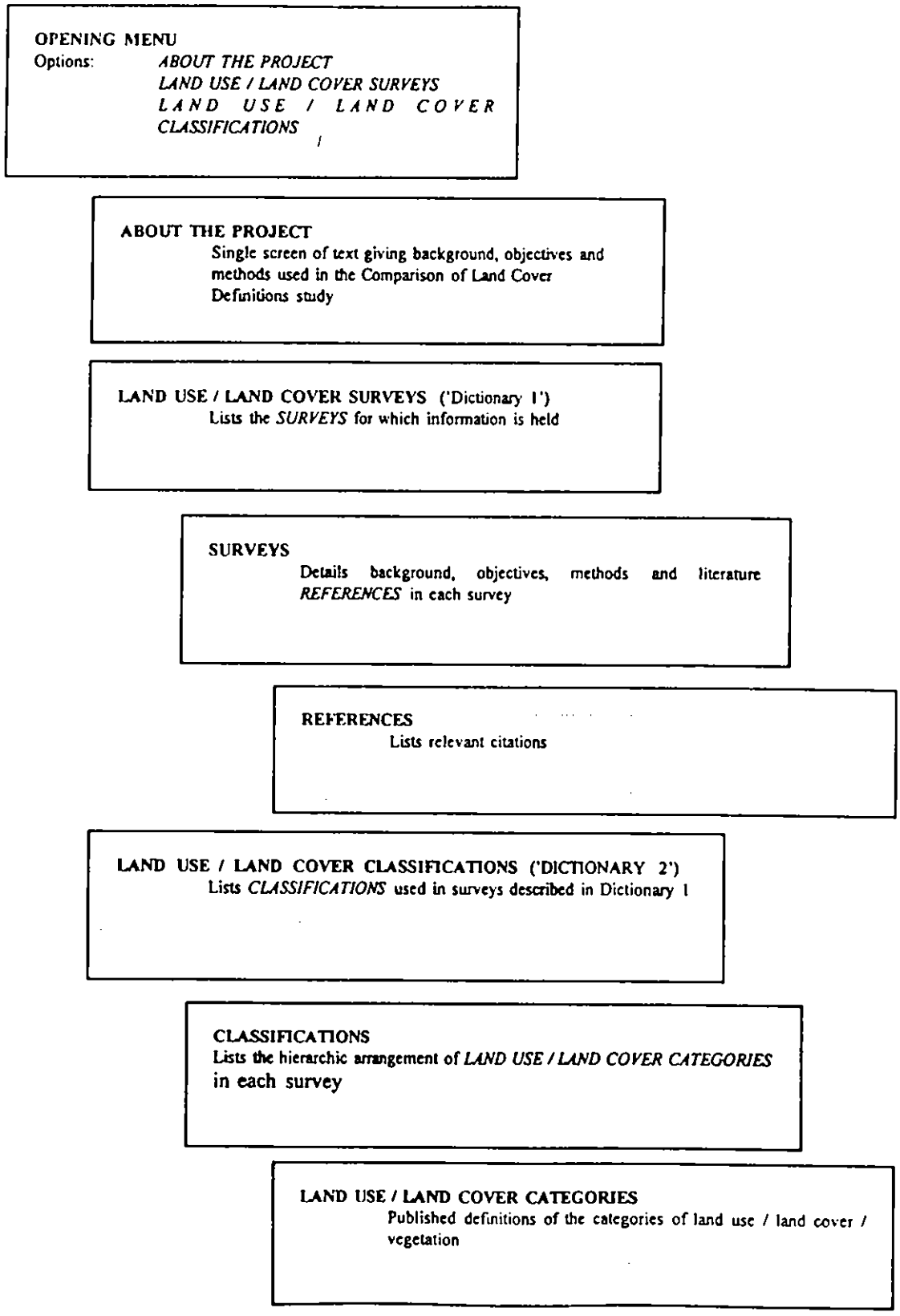
REFERENCES

Separate classifications exist for each of the ten Environmentally Sensitive Areas in England and two in Wales. These were recorded individually in Dictionary 2; however, the effort of comparing 12 separate ESA classifications with each other and with the other 16 systems would have been prohibitive. Instead, a composite classification was developed from the twelve individual systems and was taken as representative of the individual ESA classifications in the inter-comparison exercise. The manner in which the composite classification corresponds to the separate ESA systems is recorded as Appendix 1 to this volume of the Report. The composite classification itself has been included in Dictionary 2.

Information for the compilation of the dictionaries was obtained, in the first instance, from published documentation and by direct contact with representatives of the agencies responsible for the different surveys. The references used in compiling the dictionaries, together with other background publications, are cited as part of the Dictionary record itself (Annex 1). When the first draft of the dictionaries was complete, copies were sent for comment to members of the Steering Group and to points of contact in the appropriate agencies. From replies received, additions and amendments were made to the dictionary entries as appropriate.

For ease of reference, the two dictionaries are presented in Annex 1 as a single output, in which the complete documentation for each survey is held contiguously. The same information is available digitally (as WordPerfect 5.1 files and as structured on-line text within the Countryside Information System, see Figure 1).

FIGURE 1
SCHEMATIC OUTLINE OF THE STRUCTURE OF DICTIONARY RECORDS IN THE COUNTRYSIDE INFORMATION SYSTEM



6.2 CROSS-LINKING THROUGH A BASELINE CLASSIFICATION

6.2.1 **Too many possible cross-classifications.** The Research Specifications suggested that comparisons between the classifications used in each survey should be carried out by direct comparison of the categories of one survey with every other one. Given a series of n classifications of land cover, each can be specified by a dictionary and a series of definitions. Cross-comparisons between the classifications are harder to define, but, given time and effort, can be made. In principle, the equivalences can be specified for each pair of classifications. However, comparing all pairs means that n(n-1)/2 comparisons are necessary. With the 17 classifications presented in this report, this means that 136 cross-comparisons would be required. If new classifications are to be added in future, then the 18th would have to be compared with the 17 existing ones, and so on upwards with increasing difficulty. This large number of cross-comparisons cannot be made practicably in the time available to this project. Even if it were possible, it would result in an enormous amount of paper, for perhaps rather little benefit.

6.2.2 **The Baseline Classification.** A more feasible approach - and one that is much more adaptive to future requirements - is to relate each classification to a **baseline** and then link individual systems by reference to it. This approach was adopted in the present study. For a land use / land cover classification system to be used in this way as a baseline or reference, it must satisfy certain fundamental criteria:

- it must be **exhaustive** - that is, it must provide categories equivalent to the complete population of categories encountered in all the surveys to be addressed.

- it must be **exclusive** - that is, no category in the classification shall overlap with another (unless they comprise a parent-child pair).

- it must be **structured,** both for ease of use and also so that equivalent categories can be selected at the appropriate hierarchical level when the system is used to reference widely different target classifications.

A further practical requirement is that the system should be easily related to land cover categories used for field survey and reporting in the Countryside Survey-1990, since one of the immediate applications for this study concerns evaluation of the results of CS-1990 in relation to other recent landscape studies.

However, the CS-1990 field recording system is essentially open-ended in that it allows surveyors to select descriptive keywords from an extensive vocabulary. By combination of primary terms and secondary qualifiers, the number of categories potentially available to surveyors for recording land use or land cover in the CS-1990 system is therefore very large.

For these reasons, the CS-1990 field survey categories did not lend themselves to direct use as a baseline for purposes of inter-comparison. Instead, as a first step, 59 exclusive classes were designated (Table 4); these formed a finite set of categories to which the land use / land cover observations from CS-1990 could be unambiguously related. We shall call this set of 59 land use / land cover categories the **CS-1990 REPORTING CLASSES.**

Compliance with the further criteria of **exhaustivity** and **structure** was achieved by building the 59-class reporting classes into a hierarchical classification and introducing supplementary terminology in those areas which were poorly represented by the initial 59 classes. The result of this procedure was the **Baseline Classification**, listed in Table 5. It was this Baseline Classification which was used in the subsequent inter-comparison of the 17 target systems.

6.2.3 **Inter-comparison with the Baseline Classification.** Each of the 17 classifications was compared, category-by-category, with the baseline classification and the equivalent class or classes in the baseline classification were identified, bearing in mind the definitions recorded in Dictionary 2. Survey categories were only linked to those baseline categories where, on the basis of the available definitions, significant overlap might reasonably be inferred. If the probable overlap was small, the linkages were ignored. Point features and some minor linear features (eg internal woodland boundaries, streams etc) were ignored.

It should be noted that some surveys cover only certain parts or types of land. For example, the MAFF Agricultural Census only covers land within farm holdings, whereas the Forestry Commission Trees and Woodlands Census refers only to tree covered land. As a consequence, some land cover types that are important in one type of survey are absent from others. For example, urban land cover and common land are not included in the agricultural census, but feature strongly in the DOE Land Use Change Statistics and in the National Parks Monitoring Scheme, respectively.

TABLE 4

CS-1990 REPORTING CLASSES

Category Number	Category Name
1	Wheat
2	Barley
3	Oats
4	Mixed and other cereals
5	Maize
6	Turnips / swedes
7	Kale
8	Oil-seed rape
9	Crucifer crops (not oil-seed rape)
10	Peas
11	Field beans
12	Legumes (not peas or field beans)
13	Sugar beet
14	Potatoes
15	Root crops (not turnip / swede / beet / potatoes)
16	Other field crops
17	Horticulture
18	Non-cropped arable (ploughed / fallow)
19	Perennial crops
20	Recreational (mown) grass
21	Recently sown grass
22	Pure rye-grass
23	Well-managed grass
24	Weedy swards with >25% rye-grass
25	Non-agriculturally improved grass
26	Calcareous grass
27	Upland grass
28	Dense bracken
29	Purple moorgrass-dominated moorland
30	Moorland grass (not purple moorgrass)
31	Unmanaged grassland and tall herb
32	Dense heath
33	Open-canopy heath
34	Berry-bush heath
35	Drier northern bogs
36	Wet heaths/saturated bogs
37	Conifer woodland
38	Mixed woodland
39	Broadleaved woodland
40	Shrub
41	Felled woodland
42	Inland rocks and scree
43	Still water
44	Running water
45	Wetland
46	Inter-tidal coast without vegetation
47	Saltmarsh
48	Dune
49	Hard coast without vegetation
50	Maritime vegetation
51	Railway
52	Road
53	Agricultural buildings
54	Residential buildings
55	Continuously Built Land
56	Waste and derelict land
57	Hard areas without buildings
58	Quarries and extractive industries
59	Sea

TABLE 5

BASELINE CLASSIFICATION OF LAND USE, LAND COVER AND VEGETATION TYPE (*Italicized categories are the 59 CS-1990 Reporting Classes*)

1 TILLED AND FALLOW LAND

- 1.1 CEREALS
  - 1.1.1 *Maize*
  - 1.1.2 *Wheat*
  - 1.1.3 *Barley*
    - 1.1.3.1 Winter barley
    - 1.1.3.2 Spring barley
  - 1.1.4 *Oats*
  - 1.1.5 *Other cereals*
    - 1.1.5.1 Rye
    - 1.1.5.2 Triticale
    - 1.1.5.3 Mixed corn
- 1.2 BRASSICACEAE (NOT HORTICULTURE)
  - 1.2.1 *Turnips/swedes*
  - 1.2.2 *Kale*
  - 1.2.3 *Oil-seed rape*
  - 1.2.4 *Other crucifer*
- 1.3 LEGUMES
  - 1.3.1 *Peas*
  - 1.3.2 *Field beans*
  - 1.3.3 *Other legumes*
    - 1.3.3.1 Sainfoin
    - 1.3.3.2 Lucerne
    - 1.3.3.3 Lupin
- 1.4 ROOTS AND ALLIES (NON-BRASSICA)
  - 1.4.1 *Sugar beet*
  - 1.4.2 *Potatoes*
  - 1.4.3 *Other roots and beets*
- 1.5 *OTHER NON-HORTICULTURAL FIELD CROPS*
  - 1.5.1 Linseed
  - 1.5.2 Sunflower
  - 1.5.3 Other
- 1.6 *HORTICULTURE*
  - 1.6.1 Flowers
  - 1.6.2 Other Horticultural Crops
- 1.7 *NON-CROPPED*
  - 1.7.1 Ploughed
  - 1.7.2 Neglected Land
  - 1.7.3 Fallow Land

2 *WOODY PERENNIAL CROPS*

- 2.1 ORCHARD
- 2.2 VINEYARD
- 2.3 HOPS
- 2.4 SOFT FRUIT
- 2.5 TREES & SHRUBS - NURSERY STOCK

3 GRASS

- 3.1 *NON-AGRIC. MOWN GRASS*
  - 3.1.1 Amenity Grass >1 ha
  - 3.1.2 Playing Fields
  - 3.1.3 Golf Course
  - 3.1.4 Touring Caravan park
  - 3.1.5 Camp Site
  - 3.1.6 Other Non-Agricultural Mown Grass
- 3.2 INTENSIVE (AGRICULTURALLY IMPROVED) GRASS
  - 3.2.1 *Recently Sown Grass*
    - 3.2.1.1 Perennial Ryegrass >95% cover
    - 3.2.1.2 Italian Ryegrass >95% cover
    - 3.2.1.3 Tall Fescue >95% cover
    - 3.2.1.4 Other leys & newly sown swards
  - 3.2.2 *Established Perennial Ryegrass Swards*
  - 3.2.3 *Well managed Perennial Ryegrass Mixtures and other Sown Grasses*
    - 3.2.3.1 Ryegrass 25-50% + white clover >25%
    - 3.2.3.2 Ryegrass 25-50%
    - 3.2.3.3 Cocksfoot 50-100%
    - 3.2.3.4 Timothy 50-100%
  - 3.2.4 *Weedy Swards with Perennial Ryegrass 25-50%*
    - 3.2.4.1 Ryegrass/non-sown grasses
    - 3.2.4.2 Ryegrass + broadleaved weeds or rushes

TABLE 5

BASELINE CLASSIFICATION OF LAND USE, LAND COVER AND VEGETATION TYPE (*Italicized categories are the 59 CS-1990 Reporting Classes*)

- 3.3 *PERMANENT NON-INTENSIVE GRASS*
  - 3.3.1 Lowland Grass, non-sown Grasses >25%
  - 3.3.2 Lowland Grass, 10-25% cover of non-weedy Forbs
  - 3.3.3 Lowland Grass, >25% cover of non-weedy Forbs
- 3.4 *SEMI-NATURAL CALCAREOUS GRASS*
- 3.5 ACID GRASS (NON-MOORLAND) & BRACKEN
  - 3.5.1 *Upland Grass*
  - 3.5.2 *Bracken* (>50% cover)
- 3.6 MOORLAND AND MOUNTAIN GRASS
  - 3.6.1 *Molinia Moor*
  - 3.6.2 *Non-Molinia moorland & mountain grass*
    - 3.6.2.1 Low & medium altitude moorland grass
    - 3.6.2.2 Alpine & Subalpine Grass & allied vegetation
      - 3.6.2.2.1 *Carex bigelowii* communities
      - 3.6.2.2.2 *Juncus trifidus* communities
      - 3.6.2.2.3 *Racomitrium* "heath"
      - 3.6.2.2.4 *Salix herbacea* communities
      - 3.6.2.2.5 Other alpine non-shrubby vegetation
- 3.7 *UNMANAGED LOWLAND GRASSLAND AND TALL HERBS*
  - 3.7.1 False Oat Grass + Couch
  - 3.7.2 Tall herbs
  - 3.7.3 Non Aquatic Riparian vegetation

4 HEATHLAND AND BOG

- 4.1 HEATHLAND
  - 4.1.1 *Dense Heath*
    - 4.1.1.1 Lowland Dense Heath
    - 4.1.1.2 Upland Dense Heath
  - 4.1.2 *Open-Canopy Heath*
    - 4.1.2.1 Lowland Open-Canopy Heath
    - 4.1.2.2 Upland Open-Canopy Heath
  - 4.1.3 *Berry-Bush Heath*
    - 4.1.3.1 Non-Alpine Berry-Bush Heath
    - 4.1.3.2 Alpine and Sub-Alpine Heath
      - 4.1.3.2.1 *Arctostaphylos alpinus* Heath
      - 4.1.3.2.2 *Loiseleuria* Heath
      - 4.1.3.2.3 Other Sub-Alpine Heath
- 4.2 BOGS
  - 4.2.1 *Drier northern bogs*
  - 4.2.2 *Saturated bogs*

5 WOODLAND AND SHRUBLAND

- 5.1 WOODLAND
  - 5.1.1 *Conifer Woodland*
    - 5.1.1.1 Deciduous Conifer Woodland
    - 5.1.1.2 Evergreen Conifer Woodland
      - 5.1.1.2.1 Evergreen conifer plantation
      - 5.1.1.2.2 S-Natural Evergreen Conifer Woodland
  - 5.1.2 *Mixed woodland*
  - 5.1.3 *Broadleaved woodland*
    - 5.1.3.1 Deciduous Broadleaved Woodland
      - 5.1.3.1.1 Plantation Decid. Brdleaved Woodland
      - 5.1.3.1.2 S-Natural Deciduous Brdleaved Woodland
    - 5.1.3.2 Evergreen Broadleaved Woodland

TABLE 5

BASELINE CLASSIFICATION OF LAND USE, LAND COVER AND VEGETATION TYPE (*Italicized categories are the 59 CS-1990 Reporting Classes*)

- 5.2 MANAGED COPPICE
  - 5.2.1 Coppice-with-Standards
  - 5.2.2 Pure Coppice
    - 5.2.2.1 Chestnut Coppice
    - 5.2.2.2 Traditional Semi-Natural Coppice
    - 5.2.2.3 Short-Rotation Coppice
- 5.3 *SHRUB*
  - 5.3.1 Shrub on Dry or Moist Ground
  - 5.3.2 Swampy Shrub and Carr
- 5.4 *FELLED WOODLAND*
- 5.5 LAND PLOUGHED FOR AFFORESTATION

6 *INLAND ROCKS AND SCREES*

- 6.1 STABLE ROCK
  - 6.1.1 Inland Cliff
  - 6.1.2 Rock Outcrop
  - 6.1.3 Limestone Pavement
- 6.2 LOOSE ROCK
  - 6.2.1 Scree
  - 6.2.2 Block Litter and Mountain-Top Debris

7 WETLAND AND WATER

- 7.1 *STILL WATER*
  - 7.1.1 Lake
    - 7.1.1.1 Open Water in Lake
    - 7.1.1.2 Emergent Macrophytes in Lake
  - 7.1.2 Reservoir
    - 7.1.2.1 Open Water in Reservoir
    - 7.1.2.2 Emergent Macrophytes in Reservoir
  - 7.1.3 Pond
    - 7.1.3.1 Open Water in Pond
    - 7.1.3.2 Emergent Macrophytes in Pond
- 7.2 *RUNNING WATER*
  - 7.2.1 River
    - 7.2.1.1 Open Water in River
    - 7.2.1.2 Emergent macrophytes in river
  - 7.2.2 Canal
    - 7.2.2.1 Open water in canal
    - 7.2.2.2 Emergent macrophytes in canal
- 7.3 *WETLAND*
  - 7.3.1 Fen and marsh
  - 7.3.2 Flush

8 COASTAL FEATURES

- 8.0 *SEA/ESTUARY*
- 8.1 *INTERTIDAL SOFT COAST WITHOUT VEGETATION*
  - 8.1.1 Intertidal Mud Flats
  - 8.1.2 Intertidal Sand Flats
  - 8.1.3 Sandy Shore.
  - 8.1.4 Pebble/Gravel Shore
- 8.2 VEGETATED SOFT COAST
  - 8.2.1 *Salt marsh*
  - 8.2.2 *Dune*
    - 8.2.2.1 Dune, <75% Vegetation
    - 8.2.2.2 Dune, >75% Vegetation
    - 8.2.2.3 Stabilized Dune Grassland
- 8.3 *UNVEGETATED HARD COAST*
  - 8.3.1 Intertidal seaweed-covered boulders
  - 8.3.2 Rocky/boulder shore (not vegetated)
  - 8.3.3 Rocks and cliffs
- 8.4 *MARITIME VEGETATION*

9 TRANSPORT, BUILT, URBAN & INDUSTRIAL

- 9.1 TRANSPORT
  - 9.1.1 *Railway*
  - 9.1.2 *Road*

TABLE 5

BASELINE CLASSIFICATION OF LAND USE, LAND COVER AND VEGETATION TYPE (*Italicized categories are the 59 CS-1990 Reporting Classes*)

9.2 DISCONTINUOUSLY BUILT LAND
- 9.2.1 *Agricultural Buildings*
  - 9.2.1.1 Sheds, Barns, Silos
  - 9.2.1.2 Glasshouses
- 9.2.2 Residential Buildings with Gardens
- 9.2.3 Commercial and Industrial Buildings
- 9.2.4 Public Services and Facilities
  - 9.2.4.1 Institutional
  - 9.2.4.2 Education and Cultural
  - 9.2.4.3 Religious
  - 9.2.4.4 Sporting and Recreational

9.3 *CONTINUOUSLY BUILT LAND*
- 9.3.1 Residential Buildings without Gardens
- 9.3.2 Commercial and Industrial Buildings
- 9.3.3 Public Services and Facilities
  - 9.3.3.1 Institutional
  - 9.3.3.2 Education and Cultural
  - 9.3.3.3 Religious
  - 9.3.3.4 Sporting and Recreational

9.4 *VEGETATED WASTE LAND, DERELICT LAND & ALLOTMENTS*
- 9.4.1 Domestic and Industrial Waste Land
- 9.4.2 Derelict Urban Land
- 9.4.3 Allotments

9.5 *HARD AREAS WITHOUT BUILDINGS*
- 9.5.1 Unvegetated Derelict Land, Building Sites
- 9.5.2 Car Park
- 9.5.3 Ungrassed Recreational Grounds and Public Spaces
- 9.5.4 Other

9.6 *QUARRIES AND OTHER EXTRACTIVE INDUSTRIES*
- 9.6.1 Gravel pit
- 9.6.2 Quarry
- 9.6.3 Open-cast Mine

10 LINEAR FEATURES

10.1 TREE-LINES AND HEDGES
- 10.1.1 Line of Trees
- 10.1.2 Line of Shrub
- 10.1.3 Hedge
  - 10.1.3.1 Hedge, >50% Hawthorn
  - 10.1.3.2 Mixed Hedge
  - 10.1.3.3 Hedge, >50% species other than Hawthorn

10.2 WALLS
- 10.2.1 Dry Stone Walls
- 10.2.2 Mortared Walls

10.3 FENCES
- 10.3.1 Wood only
- 10.3.2 Iron only
- 10.3.3 Wire on posts

10.4 BANKS AND DITCHES
- 10.4.1 Stone bank
- 10.4.2 Earth bank
- 10.4.3 Ditches
- 10.4.4 Embankments

10.5 GRASS STRIP

10.6 TRACK
- 10.6.1 Constructed Track
- 10.6.2 Unconstructed Track

10.7 STREAM

6.2.4 **Automatic inter-comparison of classifications by inference.** A computer program allows automatic identification of equivalent categories in any pair of classifications by inference from the explicit connections between each classification and the baseline. In the interests of portability, the program, CROSSLNK, was written in FORTRAN; in this form, it gives acceptable performance in both PC and mainframe environments. The algorithm is given here, and the source coding is offered as one of the outputs from this study.

Data

The data required by CROSSLNK are as follows:

1 A dictionary for classification A
2 A dictionary for classification B
3 A dictionary for classification 0 (the baseline).
4 A cross-reference file, explicitly linking categories in classification A with equivalent categories in the baseline.
5 A similar cross-reference file, linking categories in classification B with equivalent categories in the baseline.

The dictionaries hold approved names and codes for each classification. The names comprise the text used in Annex 2, edited to a maximum length of 40 characters so as to avoid formatting problems when displaying program output.

The codes are used both as unique identifiers of a given category within a particular classification and also to indicate the hierarchical structure of the classification. For example, if a category 1.2 is defined, then 1.2.2 is, by inference, a sub-category of 1.2. Many of the classifications considered were hierarchical in structure and with an explicit system of hierarchical codes already defined. In other cases, it was necessary to modify the given codes so that the hierarchy was made explicit. A common, and therefore tiresome problem resulted from ambiguity in the coding systems used by some classifications. For example, a class with code 10 might appear to be a sub-category of class 1. However, it might equally be the tenth class. This problem, where it arose, was solved by the use of dots as punctuation. Thus, 11.n would denote the 11th class, while 1.1 denotes the first subcategory of the first class. Dictionary 2 records the situations where these actions were necessary.

The cross-reference files consist of a series of ordered pairs, structured as follows for classification A:

(1.1 3.4)
(1.2 3.52)
(1.2 3.53)
...

where the first element of the pair (eg. 1.1) is the code for a class in classification A and the second is the equivalent code in the baseline.

Often, several baseline categories may correspond to a broader unit in classification A. This is the case in the example given above. The cross-classifications do not require that the classes 1.1 etc. be given names. However, for ease of working when inspecting the cross-reference files, we have included the category names, which are added by automatic look-up using the dictionary files.

Algorithm

The algorithm for linking the classifications A and B relates each of them individually to the baseline. This is shown in the example that follows. The only real complication lies in the application of the hierarchy. This is apparent in the formal definition below, but is easily understood by the following example. This is that if a class X, in A, corresponds to baseline element 3.5 and another class Y, in B, corresponds to baseline element 3.5.2, then X should be linked to Y.

This fact is basically quite obvious but it is easy nonetheless to be confused. The confusion arises because the user naturally assumes that the classifications should be reduced to their simplest terms. This assumption is correct but easily forgotten. In terms of the example given above, X corresponds to Y because the linkages to baseline

(X 3.5)
(Y 3.5.2)

have been made. This means that X corresponds to the whole of baseline category 3.5 and therefore, *a fortiori,* to baseline category 3.5.2. Therefore X corresponds to Y in the sense that Y corresponds to a part of X. However, Y does not correspond to the whole of X.

Example

As an example of how a linkage can be made, consider the matrices of cross-classification below. Rows correspond to baseline categories, columns to categories in classifications A and B. Subscripts are used to denote categories according to their row and column numbers. Thus A_3 denotes the third category of A, specified by column 3 in the first matrix. C_2 denotes the second category of C (the baseline), specified by row 2 in the matrix.

Baseline	Classification A								Classification B							
C	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
1					x								x			
1.2				x										x		
1.3						x			x							

Formal specification of algorithm

The above considerations allow us to give a formal specification of the algorithm. This is that (in the notation of the example):

A_i corresponds to B_j **if and only if**:-
There exist baseline elements C_k and C_l **such that**:-
A_i corresponds to C_k **and**
B_j corresponds to C_l **and**
either $C_k = C_l$
or C_k is above C_l in the hierarchy
or C_l is above C_k in the hierarchy.

Thus, in the example, both A_5 and B_5 correspond to C_1, so A_5 must correspond to B_5. A_4 and B_6 correspond to $C_{1.2}$, and therefore to each other; however, B_6 must also correspond to A_5, since C_1 is above $C_{1.2}$ in the hierarchy. Similarly, A_4 corresponds to B_5. B_1 corresponds to A_6 and A_5, but not to A_4; A_6 corresponds to B_1 and B_5, but not to B_6.

This definition is a complete specification of the algorithm. In practice, CROSSLNK makes various other reports such as specifying those elements of A that cannot be related in any way to elements of B and *vice-versa*.

6.2.5 **Inter-comparison of classifications.** Given the cross-comparisons described in Section 4.2.3 between each classification and the baseline and given the existence of CROSSLNK, generation of pairwise inter-comparisons between the 17 classifications listed in Table 1 becomes a mechanical task. Because of the volume of paper that would be generated if every combination was exercised and reported here, it was decided (with the agreement of the Steering Group) that exemplars only should be included in the Report. Certain other examples, of particular interest to individual members of the Steering Group, were produced and circulated.

6.3 INTER-CALIBRATION OF LAND COVER CLASSIFICATIONS

The Research Specifications for the study required that quantitative comparisons be undertaken between the estimates of land cover generated by the Countryside Survey - 1990 and estimates of corresponding land cover categories from:

- the ITE Land Cover Map, compiled by automatic classification of Landsat Thematic Mapper data;
- the Monitoring Landscape Change Project;
- MAFF Agricultural and Horticultural Census data.

The purpose of this activity was to compute 'adjustment factors', which would allow statistics generated from any one survey to be converted to the values which would be expected, had one of the other methods been employed. There are assumptions implicit in this approach (for example, that the correspondences between the various systems is stable over time) that we were not required to test, nor would it have been possible to do so.

The results of the inter-calibrations are presented in Section 7 later in this Report.

6.3.1 **Methodological implications**. Although it would be possible to base these 'adjustment factors' on estimates of land cover over large areas (eg national statistics), such a coarse approach would be of little use at more local scales. In particular, it would offer no insights into specific differences in nomenclature or interpretation within individual land units. In order to achieve this aim, it is necessary to make direct comparisons of the way in which the different systems assign individual land parcels to different categories.

For various reasons, this aim (of 'per-parcel' comparison of land cover class assignments between different surveys and classifications) was realised to differing degrees in the four different inter-calibrations described in the following paragraphs.

6.3.2 **Countryside Survey 1990 *vs* ITE Land Cover Map.** From its inception, the ITE Land Cover Mapping element of the Countryside Survey 1990 envisaged that use would be made of data from the field survey component of Countryside Survey 1990 to provide an independent dataset, against which to assess the degree of correspondence between the two surveys. The results of this inter-calibration, originally intended to form part of the Countryside Survey 1990 Report, are also needed to fulfil the contractual requirements of this study and are presented here instead. It should be recognised that the purpose of the present study is to make an objective assessment of correspondences between land cover surveys. A critique of any differences of interpretation which the inter-calibration exposes, is more properly addressed within the context of the main Countryside Survey 1990 reports, though the definitions provided in Annex 1 of this report give evidence to identify situations where differences in terminology are the main factor.

For practical and other reasons, the inter-calibration has been carried out using three different methods; each method provides a slightly different perspective on the correspondence between the two survey approaches.

Inter-calibration at full spatial resolution.
Land cover assignments from 508 1km x 1km survey squares in Countryside Survey 1990 are held as attributes in a vector cartographic dataset, digitised at a scale of 1:10 000 in ARC/INFO. In principle, it was therefore possible to overlay these data directly on the digital land cover map and to compare the categories assigned to each land unit (either vector parcels in the digitised field data or individual pixels of the Land Cover Map). For two reasons, it was decided that the comparison should be carried out per pixel in raster format. Firstly, this would ensure a large number of reference points (1600 per $1km^2$ for a raster resolution of 25m), which would make subsequent statistical analysis more robust; secondly, at a time when the vector processing systems in ITE were under great pressure, there was free capacity on the raster-based systems.

As explained previously (paragraph 6.2.2), the Countryside Survey 1990 field survey did not assign land cover to a finite number of categories; instead, surveyors chose from a vocabulary of attributes, selected from lists of keywords in field handbooks using rather flexible guidelines. As a result, broad land cover types, such as semi-natural grassland, could be described in a variety of different ways, depending, *inter alia*, on their species composition, past management history, etc. This provided a powerful means of recording subtle differences in land cover, but it presented insuperable difficulties for the inter-calibration, because of the problems of defining equivalent classes in the two systems. The establishment of the CS-1990 Reporting Classes during the present study was intended to overcome this problem, and to permit attributes recorded in the Countryside Survey 1990 field survey to be assigned unambiguously to specific categories in the Reporting Classification (see paragraph 6.2.2). For the pixel-by-pixel inter-calibration, the Reporting Classes from the field survey were further simplified to a set of 17 categories, judged empirically to be equivalent to the 17 Land Cover Map classes. The relationship between the CS-1990 Reporting Classes and the 17 Land Cover Map classes is shown in Table 6.

The polygon representations of land parcels in the ARC/INFO files were re-labelled according to this scheme and, after further cartographic processing to merge adjacent parcels with the same class assignment and to resolve remaining topological anomalies in the vector files, an automatic conversion was carried out from vector to raster format, resulting in a 25m raster representation of the field data, co-registered to the remotely-sensed land cover map. The inter-calibration was carried out using a sub-set of 128 1km x 1km squares; for each square, the field survey dataset was compared with the land cover map, pixel-by-pixel, to generate 1600 paired values, recording the class assignment of each pixel in the two surveys.

The results are presented in paragraph 7.4.1 as a correspondence matrix, showing the relationship between the 17 Land Cover Map categories and the 17 equivalent land cover classes from the field survey.

Inter-calibration by spatial sub-sampling.

The above inter-calibration obviously falls short of the full technical specifications for this study, since it fails to provide adequate information on how the 17 categories of the Land Cover Map relate to the categories recorded in the field during Countryside Survey 1990. This objective was realised by reference to the CS-1990 Reporting Classes (see paragraph 6.2.2 and Table 4). The inter-calibration was carried out using a spatially sampled population of data points,

created by superimposing a regular 5 x 5 grid on each 1km x 1km square and recording the land cover under each of the 25 points at the intersections of the grid, firstly in the digitised field survey maps and then in corresponding windows of the Land Cover Map. The inter-calibration was undertaken using data from a total of 498 squares to ensure adequate geographical coverage. In practice, some squares were absent from one or other survey, so the number of data points available for any particular analysis fell slightly short of the potential maximum of 12450. The method was based on the approach, successfully tested and subsequently adopted as the means of estimating land cover within the study 'Changes in Key Habitat', currently being undertaken by ITE under contract to the Department of the Environment (Barr, C.J., 1992).

Land cover categories were identified automatically from the ARC/INFO files using a point-in-polygon macro and in the Land Cover Map by inspection, within the System-600 image processing software, of the contents of the pixels corresponding to the 25 grid intersections. The results of this inter-calibration are presented in paragraph 7.4.2.

Inter-calibration against summary data per 1km x 1km square.
Finally, summary statistics of land cover derived from the complete population of 508 field sample squares were generated from the field survey data for all 59 CS-1990 Reporting Classes and were compared with equivalent estimates for the 17 Land Cover Map classes. These results are given in paragraph 7.4.3.

6.3.3 **Countryside Survey 1990 *vs* Monitoring Landscape Change.** Monitoring Landscape Change was carried out in 1984 by Huntings Technical Services Ltd, under contract to the Department of the Environment and the Countryside Commission (Huntings Surveys & Consultants Ltd., 1986). The principal method of land survey was by aerial photography within a national sampling framework, using conventional photo-interpretation techniques (see Survey 4, Annex 1). Although a national land survey was also carried out by ITE in 1984, using techniques similar to those employed in Countryside Survey 1990, it was not a practical proposition to compare the two 1984 datasets, since very few survey squares were coincident in both schemes.

The approach taken was therefore to replicate the photo-interpretation procedures employed by Huntings in 1984, using aerial photography contemporary with Countryside Survey 1990. This was feasible, since most of the ITE survey squares had been flown in 1989-1990, as a preliminary to the Countryside Survey 1990 field survey campaign in the summer of 1990.

TABLE 6

EMPIRICAL RELATIONSHIP BETWEEN CS-1990 REPORTING CLASSES AND LAND COVER MAP CATEGORIES

LAND COVER MAP		CS-1990 REPORTING CLASSES							
A	Sea / Estuary	59	Sea						
B	Inland Water	43	Still water	44	Running water				
C	Beach / Mudflat / Cliffs	46	Inter-tidal soft coast without vegetation	49	Hard coast without vegetation				
D	Saltmarsh	47	Saltmarsh						
E	Moorland / Heathland Grass (incl. Dunes)	29	Molinia moorland	30	Other grass moorland	48	Dune		
F	Managed Grasslands (Evergreen)	20	Recreational (mown) grass	21	Recently-sown grass	22	Pure rye-grass	23	Well-managed grass
		24	Weedy rye-grass swards	25	Non-agric. improved grass	26	Calcareous grass	27	Upland grass
		50	Maritime vegetation						
G	Marsh / Rough Grass / Herbaceous Weeds	18	Non-cropped arable	31	Unmanaged grass/tall herb	41	Felled woodland	45	Wetland
		56	Waste and derelict land						
H	Open Canopy Shrub Heath / Moor	33	Open-canopy heath	34	Berry-bush heath	35	Drier northern bogs		
I	Dense Shrub Heath / Moor	32	Dense heath						
J	Bracken	28	Dense bracken						
K	Broadleaved Deciduous Wood (incl. Mixed Stands)	19	Woody perennial crops	38	Mixed woodland	39	Broadleaved woodland	40	Shrub
L	Coniferous & Broadleaved Evergreen Wood (incl. Larch)	37	Conifer woodland						
M	Bogs & Flushes	36	Wet heaths / bogs						
N	Tilled Land	1	Wheat	2	Barley	3	Oats	4	Mixed cereals
		5	Maize	6	Turnips/swedes	7	Kale	8	Oil-seed rape
		9	Other crucifers	10	Peas	11	Field beans	12	Other legumes
		13	Sugar beet	14	Potatoes	15	Other root crops	16	Other field crops
		17	Horticulture						
O	Suburban, Discontinuous Urban, Rural Buildings	51	Railway	52	Road	53	Agricultural buildings	54	Residential buildings
P	Continuous Urban	55	Continuously built land						
Q	Inland Bare Ground	42	Inland rocks and scree	57	Hard areas without buildings	58	Quarries & extractive industries		

Huntings Technical Services Ltd were sub-contracted to undertake the photo-interpretation, using methods identical to those used in 1984 and mapping the photography to the same land cover categories. Land cover interpretations were traced from the photographs on to transparent overlays. A regular 25-point sampling grid, identical to the one used in the Countryside Survey 1990 *vs* Land Cover Map comparison (paragraph 6.3.2 above), was used to collect calibration data.

Staff at ITE, Merlewood identified the location of the grid points on each photograph by visual inspection, extracted the land cover class assigned by the Huntings photo-interpreters and cross-referenced these records to the Countryside Survey 1990 field data class, extracted automatically from the ARC/INFO database as indicated in 6.3.2 above. The results are presented in Paragraph 7.4.4.

6.3.4 **Countryside Survey 1990 *vs* MAFF Agricultural Census.** Inter-calibrations involving the MAFF Agricultural Census present greater difficulty, because it is not possible to attribute precise geographical references to the MAFF data. Although the recording unit is the individual farm, the data are aggregated and referenced to parishes, even in cases where much of the farm lies outside the parish concerned. Perhaps more significantly, the MAFF Census deals only with land under cultivation; much of the land documented in Countryside Survey 1990, particularly upland commons, is not considered in the MAFF Census.

Several possible approaches were considered and discussed with the Steering Group:

- Simulation of MAFF Census data for Countryside Survey 1990 field survey squares by re-working field survey from Countryside Survey 1990, using MAFF Census guidelines. This was rejected from practical considerations. The effort would have been excessive at a time when the field survey experts were heavily committed to completing and writing up Countryside Survey 1990 results; the geographical referencing problem would have required the identification of the extent of every agricultural holding in each 1km x 1km square to be mapped and referenced to the appropriate parish unit; the MAFF returns could not have been completed on the evidence of the field survey sheets alone; while the prospects of emulating farmers' responses to a MAFF circular were considered to be poor.

- Use of data from the proposed Farm Business Survey by relating the holdings surveyed to the ITE Land Classification. This proposal was rejected because the sample size provided by the Farm Business Survey would have been too small for meaningful results and, crucially, because the Survey was not completed in time to make use of it in this study.

- Comparison of estimates of land cover from Countryside Survey 1990 with those from the MAFF Census at the national and sub-national level only. There are obvious limitations in this approach - it allows only estimation of overall correspondence at these levels and does not permit diagnosis of the precise nature of any mis-classification or non-correspondence. Further, because the two surveys measure different entities (Countryside Survey 1990 records all rural land; MAFF records only land in agricultural production), there are likely to be serious problems in interpreting observed differences. Nevertheless, this approach was chosen, since it appeared to offer the best prospects of success. Results are presented in paragraph 7.4.5.

6.3.5 **ITE Land Cover Map *vs* Monitoring Landscape Change.** This inter-calibration was not contractually required. However, since both surveys (the Land Cover Map and Monitoring Landscape Change) had each been compared with Countryside Survey 1990, using identical methods (25-point grid sampling within 1km x 1km grid cells), the task of comparing them was a trivial computational exercise, which we undertook in the interests of completeness. The results appear in Paragraph 7.4.6.

6.4 INTER-CALIBRATION OF ESTIMATES OF LINEAR FEATURES

For reasons largely connected with the issue of hedgerow depletion, the Contract required comparison of the treatment of linear features and of estimates of their frequency and extent. Of the surveys considered, only Countryside Survey 1990 and Monitoring Landscape Change record linear features. This analysis was therefore necessarily restricted to the Countryside Survey 1990 *vs* Monitoring Landscape Change inter-comparison. Aerial photographs were available and hedgerows were present in 298 1km squares. In each of the 298 squares, every hedgerow was examined, and its attribution in the two surveys was compared. Table 7 lists the linear features mapped. It was then possible to examine in turn a) how linear features mapped as hedgerow in the CS-1990 field survey were recorded in Monitoring Landscape Change and b) how features mapped as hedgerow in Monitoring Landscape Change were treated in CS-1990. From these data, the correspondence between linear features recorded in the two surveys was computed and differences in interpretation were quantified. The results of this analysis are presented in paragraph 7.4.7.

TABLE 7

CATEGORIES OF LINEAR FEATURE CONSIDERED IN THE INTER-CALIBRATION OF COUNTRYSIDE SURVEY-1990 *vs* MONITORING LANDSCAPE CHANGE

MLC	CS-1990
Hedge	Hedgerow
Wall	Wall
Fence	Fence
Ditch	Ditch / roadside ditch
Bank	Earth or stone bank
Woodland fringe	Woodland fringe
Urban boundary	Urban boundary
No linear evident	Line of trees
	Line of scrub
	Belt of trees
	Scattered trees
	Stream
	River
	Canalized river
	Drainage canal
	Levée
	Road
	Track
	Footpath
	Grass strip
	Pond
	Artificial lake
	Boundary no longer present
	No linear evident

6.5 STANDARD DEFINITIONS OF LAND COVER CATEGORIES OF NATIONAL IMPORTANCE

The final contract requirement was for the development of standard definitions of land cover categories, corresponding to features of national importance and drawing upon the sum of experience gained in the course of the inter-comparisons carried out at earlier stages of the study.

As indicated earlier (Paragraph 6.2), we chose to develop a 'Baseline Classification' (see Table 5) in order to facilitate inter-comparisons between the target classifications. By definition, this Baseline Classification needed to be exhaustive (ie to cover the subject content of all the target systems) and consistent. The terminology used in the Baseline Classification also needed to be defined unambiguously. These definitions were drawn up as far as possible to conform with definitions of similar land use / land cover categories used in the target classifications, as recorded in Dictionary 2 (Paragraph 6.1). The definitions of the Baseline categories are included with those of the target classifications in Annex 1.

As a consequence of the above criteria, the Baseline Classification meets many of the requirements of a national standard. Further, the application of the Baseline Classification as a reference for all the individual systems, as described in Section 6.2, provided a uniquely extensive test of its suitability for this purpose. It was therefore concluded that the Baseline Classification should form the foundation for a proposed national standard land cover nomenclature.

However, because of the need to be exhaustive, the Baseline Classification sometimes breaks down categories of land use, land cover and vegetation into very fine detail. The level of detail is not uniform across the entire subject coverage of the system, since it was largely determined by the structure of the target classifications considered. The uneven detail and the length and complexity of the Baseline Classification alone make it less than ideal for general promulgation. Therefore, a reduced version of the Baseline has been proposed as the nucleus of a nationally-acceptable classification of land use and land cover. This proposed National Standard is presented in Paragraph 7.5.

7 RESULTS

7.1 DICTIONARIES OF SURVEYS AND CLASSIFICATIONS OF LAND COVER, LAND USE AND VEGETATION TYPE

An important output of the study comprised descriptions of land cover and land use surveys and classifications, in the form of 'Dictionaries' which define their objectives, organisation and methods ('Dictionary 1') and the nomenclature used ('Dictionary 2'). An example of these Dictionaries for one of the surveys addressed in the study is presented as Table 8. Dictionaries for all the surveys considered are published in full as Annex 1 to this Report. This material also forms a module within the Countryside Information System, as described in Paragraph 6.1. In documenting the 17 schemes listed in Table 1, the Dictionaries cover 31 distinct classification systems (the Environmentally Sensitive Areas Monitoring Scheme comprises 12 regional variants, while separate classifications are used in the Agricultural and Horticultural Censuses in England, Scotland, Wales and Northern Ireland). In total, definitions have been recorded for more than 2000 distinct categories of land use, land cover or vegetation type.

7.2 OVERVIEW OF SURVEYS REVIEWED IN THE STUDY

7.2.1 **Objectives of the Surveys.** (See Table 1) Of the 17 systems considered, 11 were broadly concerned with recording land cover, 3 explicitly addressed land use, and 3 were principally directed at the survey or classification of vegetation and habitat.

Of the schemes concerned with land cover, one (CORINE Land Cover) covers the European Community and beyond, four (the ITE Countryside Surveys, the Agricultural and Horticultural and the Forestry Censuses) are national in extent, four are regional and two (National Parks Monitoring Scheme and Environmentally Sensitive Areas Monitoring) are concerned with designated areas.

One of the Land Use systems (the UN/ECE Statistical Classification) was international and the remaining two were national schemes. The systems for vegetation classification and survey also comprised one international scheme (CORINE Biotopes) and two national ones.

7.2.2 **Methods Adopted.** Two schemes (UN/ECE Statistical Classification of Land Use and the National Land Use Classification) are classifications which have not yet been employed for the large-scale collection of data. Those systems which did actively involve the acquisition of data on land use, land cover or vegetation, employed a variety of primary survey techniques, including aerial photography (six cases), satellite remote sensing (two cases), sample-based field survey (six cases) and questionnaire survey (MAFF Census only).

TABLE 8

EXAMPLE OF AN ENTRY IN THE DICTIONARY OF LAND COVER SURVEYS AND DEFINITIONS (See Annex 1 for a complete listing of the Dictionary compilation).

SURVEY NUMBER	6
NAME OF SURVEY	FORESTRY COMMISSION CENSUS OF WOODLANDS AND TREES
COMMISSIONING AGENT	FORESTRY COMMISSION
EXECUTING AGENT	FORESTRY COMMISSION
CONTACT	Forestry Commission 231 Corstorphine Road EDINBURGH EH12 7AT Tel: Edinburgh (031) 334 0303 Fax: .. .. .. 3047 Present contact: Mr. R. Selmes
OBJECTIVES	To meet the statutory requirement of the Forest Act of 1919 to collect statistics on the country's stock of woodlands and trees. To provide up-to-date information on trees and woodlands for such organisations as the Home Timber Merchants' Association, Department of the Environment, Nature Conservancy Council, Countryside Commission, local authorities and other appropriate bodies as well as the Forestry Commission itself. To provide information for the general public on the state of trees in the British countryside.
PERIOD OF SURVEY	The first census was in 1924, subsequently in 1938, 1947, 1951 and 1965. Another survey is about to begin.
Start	Most recent started in 1979.
End	1982.
SURVEY METHOD	Based on air photo interpretation (API) to include all trees (including isolated trees) in Great Britain except those in Forestry Commission forests and those covered by the Dedication and Approved Woodlands scheme (for which data were already available). Some islands were omitted where tree density is very low. Also excluded were trees in towns that were not readily accessible. Total woodland area was calculated by digitising all non FC, Dedicated or Approved woodland blocks represented on the 190 1:50,000 Ordnance Survey maps for mainland Britain. This estimate was refined from aerial and ground survey samples. Woodland was considered to be any block of trees of >0.25 ha in extent. Other trees, such as clumps, lines, hedgerow trees, isolated trees and parkland trees were considered as non-woodland trees and surveyed as a separate exercise. A range of features was assessed for woodland and non-woodland trees as appropriate such as: location, area, forest type, species, age, diameter, height, volume and health.

TABLE 8

EXAMPLE OF AN ENTRY IN THE DICTIONARY OF LAND COVER SURVEYS AND DEFINITIONS (See Annex 1 for a complete listing of the Dictionary compilation).

GEOGRAPHICAL CHARACTERISTICS

Area of survey	Great Britain (excluding many islands).
Sampling frame	Stratified random sampling within counties/districts, (counties in England and Wales and Forestry Commission Conservancies in Scotland) and soil groups. For woodlands, samples were further stratified into six size categories.
Sampling unit	Individual woodland blocks.
Recording unit	Land parcels, linear and point features.
Scale of input data	1:10,000, 1:50,000 & 1:100,000.
Scale of output	Output takes the form of statistics, eg. nationally, by county or by Conservancy in Scotland
Resolution	Minimum parcel size considered 0.25 ha (as woodland).
Accuracy and error	Precision of the estimate of woodland area at county (or Conservancy in Scotland where there were four Conservancies at the time) level to be within ±5%. Precision of the estimate of the predominant forest type to be ±15%. Standard errors were set not to exceed ±25% and ±30% at county or Conservancy level for the number of measurable isolated trees and the number of trees of the most widely represented species of isolated tree respectively.

DATA STORAGE/ANALYSIS

Data are mainly presented as tables by county/Region. Summary reports are available from the Forestry Commission. In Scotland unpublished tables are also held by the Forestry Commission for Local Authority Districts. See also output below.

DATA AVAILABILITY

FORMS OF OUTPUT Estimates of recorded elements summarised by counties in England and Wales and by Districts and by Regions in Scotland, Conservancies, countries and for Great Britain as a whole, and for special areas such as National Parks.

PUBLICATION DATE(S) 1987.

REFERENCES

Locke G.M.L. (1987). Census of woodlands and trees 1979-1982. *Forestry Commission Bulletin 63*. Her Majesty's Stationary Office, London.

Rennolls, K. (1989). *Design of the census of woodlands and trees 1979-82. (Occasional Paper 18)*. Forestry Commission, Farnham.

TABLE 8

EXAMPLE OF AN ENTRY IN THE DICTIONARY OF LAND COVER SURVEYS AND DEFINITIONS (See Annex 1 for a complete listing of the Dictionary compilation).

6 **Forestry Commission Census of Woodlands and Trees - 1979-82**

Land cover/use categories and definitions

1 **CONIFEROUS HIGH FOREST**

High forest containing more than 50% by area of coniferous species. High forest is defined as stands of trees having a canopy of 20% or more, or, in the case of young stands which have not closed canopy, occupying 20% or more of the ground at normal spacing. More than half of the crops should be capable of producing 3 m timber lengths of good form and be of merchantable species.

2 **BROADLEAVED HIGH FOREST**

High forest (q.v.) containing 50% or more by area of broadleaved species.

3 **BROADLEAVED HIGH FOREST OF COPPICE ORIGIN**

Crops of coppice origin which have a mean breast height diameter of more than 15 cm and are assessed by the same criteria as broadleaved high forest.

4 **MIXED HIGH FOREST**

Data was collected under this heading but was allocated prior to publication of the reports to either "coniferous high forest" or "broadleaved high forest" depending on which type was in the majority.

5 **MIXED HIGH FOREST OF COPPICE ORIGIN**

Data was collected under this heading but was allocated prior to publication of the reports to either "coniferous high forest" or "broadleaved high forest" depending on which type was in the majority.

6 **COPPICE**

Crops of marketable broadleaved species that have at least two stems per stool and are either being worked or are capable of being worked on rotation. With the exception of hazel coppice, more than half the stems should be capable of producing 3 m timber lengths of good form. Coppice crops with a mean breast height diameter greater >15 cm are assessed as Broadleaved high forest of coppice origin.

7 **COPPICE WITH STANDARDS**

Two-storey stands where the overstorey consists of at least 25 stems per hectare that are older than the understorey of worked Coppice by at least one Coppice rotation.

8 **SCRUB**

All inferior crops where more than half the trees are of poor form, poor timber potential or composed of unmarketable species and so do not qualify as either High Forest or Coppice.

9 **CLEARED**

Woodland areas which are marked green on the OS 1:50 000 map. Woodland crops that have been felled and also areas where the canopy stocking was found to be <20% at the time of the survey. No evidence of conversion to another land use.

10 **DEFORESTED**

Woodland areas which are marked green on the OS 1:50 000 map, but at the time of survey were found to be under another land use, eg agricultural, buildings.

7.3 INTER-COMPARISON OF LAND COVER CLASSIFICATIONS

Table 9 summarises the results of the inter-comparisons between the 17 classifications considered in the study. The Reporting Categories from the CS-1990 Field Survey are indicated by shading in the column which records the Baseline categories. Cross-comparisons between selected examples of the 17 target classifications, generated using the software described in Section 6.2, are shown in Table 10 with class names included. Inter-comparisons between each of the 17 target classifications and the Baseline are reproduced in Annex 2, in the same format.

TABLE 9 **INTERCOMPARISON OF TARGET CLASSIFICATIONS AND BASELINE**

Shaded entries in the Baseline Column are the CS-1990 Reporting Categories

BASE LINE	CS-1990 Land Cover	NCMS	MLC	MAFF Agric Census	FC Woodland Census	Land Cover Scotland	NI CS Survey	DoE Land Use Change	CORINE Land Cover	NCC Phase 1	Nat Parks Monitor	ESA Monitor	NVC	CORINE Biotopes	National Land Use Classe	UN/ECE
1		2 1 2				5 2		1 1 1	2 1 1	10 1 1	5 1	1				
1 1	N		EIA				8 1							8 2 1 1	AG06A-A	1 1
1.1.1				4 1 7												
1.1.2				4 1 1												
1.1.3																
1 1 3 1				4 1 2												
1 1 3 2				4 1 3												
1 1 4				4 1 4												
1.1.5																
1 1 5 1				4 1 6												
1 1 5 2				4 3 3												
1 1 5 3				4 1 5												
1 2	N		EIA				8 1							8 2 1 1		1 2
1.2.1				4 2 4											AG06A-B	
1.2.2				4 2 6											AG06A-C	
1.2.3				4 2 6, 4 2 9											AG06A-C	
1.2.4				4 2 6											AG06A-C, AG06B-K	
1 3	N		EIA				8 1							8 2 1 1		1 1
1.3.1				4 2 7											AG06A-D	
1.3.2				4 2 3											AG06A-D	
1.3.3				4 2 8											AG06A-C	
1 3 3 1																
1 3 3 2																
1 3 3 3				4 3 1											AG06A-D	

TABLE 9 INTERCOMPARISON OF TARGET CLASSIFICATIONS AND BASELINE

Shaded entries in the Baseline Column are the CS-1990 Reporting Categories

BASE LINE	CS-1990 Land Cover	NCMS	MLC	MAFP Agric Census	FC Woodland Census	Land Cover Scotland	NI CS Survey	DoE Land Use Change	CORINE Land Cover	NCC Phase 1	Nat Parks Monitor	ESA Monitor	NVC	CORINE Biotopes	National Land Use Class	UNECE
1.4	N		EIA				8.1							8.2.1.1		1.1
1.4.1				4.20											AG06A-E	
1.4.2				4.19											AG06B-K	
1.4.3				4.25											AG06A-E	
1.5	N		EIA				8.1							8.2.1.1		1.1
1.5.1				4.30												
1.5.2				4.31												
1.5.3				4.28, 4.31												
1.6	N		EIB				8.7							8.2.1.2		1.1
1.6.1				4.22.5.234, 4.22.5.235, 4.22.6.240, 4.22.6.241, 4.22.6.242, 4.22.6.243											AG06B-B	
1.6.2				4.22.1.170, 4.22.1.171, 4.22.1.172, 4.22.1.173, 4.22.1.174, 4.22.1.175, 4.22.1.178, 4.22.1.181, 4.22.1.182, 4.22.1.185, 4.22.1.186, 4.22.1.187, 4.22.1.189, 4.22.1.190, 4.22.1.192, 4.22.1.195, 4.22.1.196, 4.22.1.197, 4.22.1.198, 4.22.1.199, 4.22.1.200, 4.22.1.218, 4.22.1.219											AG06B-E, AG06B-F, AG06B-L, AG06B-J, AG08B-F	
1.7	Q		EIA													
1.7.1							8.5							8.2.1.2		1.1
1.7.2				4.34			6.3							8.7	UL01A-C	1.5
1.7.3				4.32, 4.34			6.3, 8.5							8.7	AG06A-B	1.5

TABLE 9 INTERCOMPARISON OF TARGET CLASSIFICATIONS AND BASELINE

Shaded entries in the Baseline Column are the CS-1990 Reporting Categories

BASE LINE	CS-1990 Land Cover	NCMS	MLC	MAFF Agric Census	FC Woodland Census	Land Cover Scotland	NI CS Survey	DoE Land Use Change	CORINE Land Cover	NCC Phase 1	Nat Parks Monitor	ESA Monitor	NVC	CORINE Biotopes	National Land Use Class	UN/ECE
2	K						8.7	1.1.1			5.1					1.2
2.1		2.3	EIC	4.22.3.207, 4.22.3.208, 4.22.3.209, 4.22.3.210, 4.22.3.211, 4.22.3.212, 4.22.3.213, 4.22.3.214, 4.22.3.215, 4.22.3.216		4.2			2.2.2	1.1.1.2		5.4		83.1	AG06B-G, AG06B-H, AG06B-I	
2.2				4.22.4.224					2.2.1			1		83.2		
2.3			EIC	4.21					2.2.2					83.2	AG06B-D	
2.4		2.12	EIB	4.22.4.220, 4.22.4.221, 4.22.4.222, 4.22.4.223, 4.22.4.225		5.2			2.2.2					83.2	AG06B-J	
2.5				4.22.5.230, 4.22.5.231, 4.22.5.232, 4.22.5.233												
3																
3.1	F	2.15	G4B	9		3.1	13	1.4	1.4.2	10.1.2	8.1.1	2.1		8.1	LE01	
3.1.1		2.14, 2.2				1.2.5	1.9		1.4.1	1.3.1, 1.3.2, 1.3.3, 2.1.2, 2.2.2, 2.3.2		4.1				3.9.1
3.1.2		2.14				1.2.5									LE03	3.9.1
3.1.3		2.14				1.2.3				2.1.2, 2.2.2, 2.3.2					LE03	3.9.5
3.1.4						1.2.5				2.1.2, 2.2.2, 2.3.2, 10.3.4					LE05	3.9.2
3.1.5						1.2.5				2.1.2, 2.2.2, 2.3.2					LE05	3.9.2
3.1.6		2.14	G4C			1.2.2, 1.2.4, 1.2.5		2.2.2		2.1.2, 2.2.2, 2.3.2					LE03	3.7.3, 3.9.5

TABLE 9 INTERCOMPARISON OF TARGET CLASSIFICATIONS AND BASELINE

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BASE LINE	CS-1990 Land Cover	NCMS	MLC	MAFF Agric Census	FC Woodland Census	Land Cover Scotland	NI CS Survey	DoE Land Use Change	CORINE Land Cover	NCC Phase 1	Nat Parks Monitor	ESA Monitor	NVC	CORINE Biotopes	National Land Use Classn	UN/ECE
3.2	F							1.1.1						8.1		
3.2.1		2.12	E1A	5		5.2			2.3.1	10 1.1	5.1				AG06A-C	1.1
3.2.1.1							8.3									
3.2.1.2							8.2									
3.2.1.3																
3.2.1.4																
3.2.2		2.11.3	E3A	6		5.1	1.9, 8.3		2.3.1	2.4	5.2.1	2.2		3.8.1.1, 3.8.1.2	AG08A-A	1.3
3.2.3		2.11.3	E2A	6		5.1			2.3.1	2.4	5.2.1	2.2		3.8.1.1, 3.8.1.2	AG08A-A	1.3
3.2.3.1							1.9, 8.3									
3.2.3.2							1.9, 8.3									
3.2.3.3																
3.2.3.4																
3.2.4		2.11.3	E2A, E2B, E2C	6		5.1	1.9, 8.3		2.3.1	2.4	5.2.1	2.3.1, 2.3.2, 2.3.3, 2.4.2			AG08A-A	1.3
3.2.4.1																
3.2.4.2							2.7									
3.3	F	2.2, 2.11.1, 2.11.2	E2B	7		6.3.1, 6.3.2, 6.3.3	1.9, 2.1, 2.2, 2.7, 8.6	1.3.1	2.3.1, 3.2.1	2.2.1, 2.2.2	5.2.2	2.5.2, 2.5.4	6.2 MG 6, 6.2 MG 8	3.7.2, 3.8.1.1, 3.8.1.2, 3.8.2	AG08A-A	1.3
3.3.1							8.4						6.2 MG 9, 6.2 MG 10, 6.3 MG 11, 6.3 MG 12, 6.3 MG 13			
3.3.2							8.4									
3.3.3													6.2 MG 3, 6.2 MG 4, 6.2 MG 5			

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3.4	F	2.11.1	E2B	7		63.2, 63.3	26	111, 112		23.1, 23.2	441, 522	253, 254	2.1.CG.1, 2.1.CG.2, 2.1.CG.3, 2.1.CG.4, 2.1.CG.5, 2.1.CG.6, 2.1.CG.7, 2.1.CG.8, 2.1.CG.9, 2.1.CG.10	3.4.2, 3.4.3	AG08A-B, ED02B, UL01A-C	5.4
3.5				7				122							AG08A-B, ED02B	5.4
3.5.1	F	2.11.1, 2.11.2	D2A			63.1, 63.2, 63.3	21, 22, 23, 27		3.2.1	2.1.1, 2.1.2	421	25.1	2.1.CG.11, 2.1.CG.12, 10.1.U.1, 10.1.U.4	3.4.2, 3.5.1		
3.5.2	J	25	D3			63.4	39, 61		3.2.2	31.1	43	26.1, 26.2	10.4.U.20	3.1.8.6		
3.6	E			7					3.2.1						AG08A-B, ED02B, UL01A-C	5.3.1
3.6.1		2.11.1	D2B			62	25	122		25, 51.7	421	24.1, 25.5	4.4.M.24, 4.4.M.25, 4.4.M.26	3.7.3, 5.1.2		
3.6.2																
3.6.2.1		2.11.1	D2B			62	24	122		21.1, 21.2	421	25.1	10.1.U.2, 10.1.U.3, 10.1.U.5, 10.1.U.6	3.5.1, 3.5.2		
3.6.2.2		26.2				79		123								
3.6.2.2.1										44			10.2.U.7, 10.2.U.8	3.6.3		
3.6.2.2.2										44			10.2.U.9	3.6.3		
3.6.2.2.3							35			43			10.2.U.10	3.6.3		
3.6.2.2.4										41.1			10.3.U.12	3.6.1		
3.6.2.2.5							35			44			10.3.U.11, 10.3.U.13, 10.3.U.14, 10.4.U.16, 10.4.U.17, 10.4.U.18, 10.4.U.19	3.6.1, 3.6.3, 3.7.8		

TABLE 9 INTERCOMPARISON OF TARGET CLASSIFICATIONS AND BASELINE

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3.7	0			7				122								
3.7.1			E2C							222	522		61 MG1	3813	UL01A-C	54
3.7.2				9			63			331			62 MG2	371, 377		
3.7.3						67	410			622			44M27, 44M28	371, 377		
4																
4.1				7				122	334						AG08A-B, ED02B, UL01A-D	51
4.1.1	1					611, 613	33, 34		322	411, 412, 42		311	31H1, 31H2, 31H3, 31H4, 31H6, 31H8, 31H9, 31H10, 32H12, 32H16, 32H21	312		
4.1.1.1		261, 263	D4B			684	57			866, 885	442, 47					
4.1.1.2		261	D1								41					
4.1.2	H					612, 613	36, 37		321	411, 412, 42, 45, 46		312	31H1, 31H2, 31H3, 31H4, 31H5, 31H6, 31H7, 31H8, 31H9, 31H10, 32H12, 32H13, 12H14, 32H15, 32H16, 32H21, 43M16	311, 312		
4.1.2.1		261, 263	D4A			684	57			866, 885	441, 47		31H11			
4.1.2.2		261	D1								451, 452					

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4.3.3	H								3.2.2				3.2.H.18, 3.2.H.19, 3.2.H.20, 3.2.H.22			
4.1.3.1		26.1	D1			6.1.1, 6.1.2, 6.1.3	3.8			4.1.1, 4.2	4.1	3.1.3		3.1.2		
4.1.3.2		26.2				7.9								3.1.4		
4.1.3.2.1													3.2.H.17			
4.1.3.2.2																
4.1.3.2.3													2.2.CG.13, 2.2.CG.14			
4.2				7		6.4, 7.9		12.2	4.1.2	5.1.6.1, 5.1.7, 5.4	4.6.1	6.8			AG08A-B, ED02B, UL01A-E	
4.2.1	H	27.1, 27.2	D2C, G1				4.2			5.1.6.2, 5.1.8	4.2.2, 4.5.3	3.2.1.1, 3.2.1.2, 3.2.1.3, 6.7	4.3.M.19, 4.3.M.20	5.2.2		3.3.1, 4.1.1, 4.1.2
4.2.2	M	27.1, 27.2	F3A, G1				4.1			5.3.1	6.3.1	3.2.2.1, 3.2.2.2	4.1.M.1, 4.1.M.2, 4.1.M.3, 4.3.M.14, 4.3.M.15, 4.3.M.17, 4.3.M.18, 4.3.M.21	3.1.1, 5.1.1, 5.2.1		3.3.1, 4.1.1, 4.1.2
5								12.1								
5.1				8												
5.1.1	L		C2		1, 8				2.4.4, 3.1.2		1.7, 3.2					2.1
5.1.1.1		21.4, 21.6				4.1.1, 4.6.2	1.4			1.1.2.2		5.2.2		8.3.3.1	AG08B-A	
5.1.1.2																
5.1.1.2.1		21.4, 21.6				4.1.1, 4.6.2	1.4			1.1.2.2		5.2.2		8.3.3.1	AG08B-A	
5.1.1.2.2		21.3				4.1.2	1.3			1.1.2.1		5.2.1	11.5.W.13, 11.8.W.18	3.1.8.G, 4.2.5, 4.2.A	ED02B, UL01A-G	
5.1.2	K	21.5, 21.6	C3		1, 2, 8	4.3, 4.6.2	1.5, 1.6		2.4.4, 3.1.3	1.1.3.1, 1.1.3.2	1.7, 3.3	5.3.1, 5.3.2		3.1.8.F	AG08B-E	2.3

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5.1.2			C1		2, 8	42			3.1.1		1.7, 3.1					2.2
5.1.3.1	K														AG08B-D	
5.1.3.1.1		2.1.2, 2.1.6				462	12			1.1.1.2		5.1.2		8.3.3.2		
5.1.3.1.2		2.1.1			3		1.1, 1.5, 1.7, 1.12			1.1.1.1		5.1.1	11.2.W.4, 11.2.W.5, 11.2.W.6, 11.2.W.7, 11.3.W.8, 11.3.W.9, 11.4.W.10, 11.4.W.11, 11.5.W.12, 11.6.W.14, 11.6.W.15, 11.7.W.16, 11.7.W.17	3.1.8.D, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.1.B, 4.1.D, 4.1.E, 4.1.F, 4.1.G, 4.4.1, 4.4.3, 4.4.A	ED02B, UL01A-G	
5.1.3.2	L	2.1.1					1.1			1.1.1.1				4.5.3		
5.2	K			8					3.2.4		3.4					2.4
5.2.1		2.1.1			7		1.1			1.1.1.1			11.3.W.8		AG08B-C, ED02B	
5.2.2					6									3.1.8.E	AG08B-B	
5.2.2.1		2.1.1					1.1			1.1.1.1						
5.2.2.2		2.1.1					1.1			1.1.1.1			11.3.W.8			
5.2.2.3		2.1.2					1.2			1.1.1.2		5.6				
5.3	K	2.4.1, 2.4.2	C4	8	8				3.2.4	1.2.1, 1.2.2	3.4	5.5.1, 5.5.2			ED02B, UL01A-G	2.4
5.3.1			D5			4.4, 4.5, 6.3.2	1.7, 1.8, 3.1, 3.2, 3.9, 5.8	1.2.2	2.4.4, 3.2.2	8.6.7, 10.1.4			8.5.5D.18, 11.8.W.19, 11.9.W.20, 11.10.W.21, 11.10.W.22, 11.10.W.23, 11.10.W.24, 11.10.W.15	3.1.6, 3.1.8.1, 3.1.8.2, 3.1.8.3, 3.1.8.4, 3.1.8.5, 3.1.8.8, 3.1.8.C, 3.1.8.D, 3.1.8.F, 3.1.8.G		

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5 3 2						4 2	1.12						11.1.W.1, 11.1.W.2, 11.1.W.3, 11.2.W.4, 11.2.W.5, 11.2.W.6, 11.2.W.7	4.4.1, 4.4.9		
5.4	G	2 1 7		8	9	4 6 2				1 1 1 1, 1 1 1 2, 1 1 2 1, 1 1 2 2, 1 1 3 1, 1 1 3 2, 1 4 1, 1 4 2, 1 4 3	3 5	5 1 3, 5 2 3, 5 3 3		3 1 8 7		2 1, 2 2, 2 3
5 5	G					4 6 1										
6	Q							1 2 3								6 1 1
6 1			G2	9		2 1			3 3 2		7 1 1		10.5.U.22, 10.5.U.23, 10.5.U.24		ED02B, UL01A-B	
6 1 1		2 13.1					6 4, 16.1, 16.10			3 2, 9 1.1 1, 9 1.1 2		6 3	10.4.U.15	6.2.1, 6.2.2, 6.2.4, 6.2.5		
6 1 2		2.13.1					16 3			9 1.1.1, 9 1.1.2		6 2		-		
6 1 3		2 13.3					16.9			9 1 3		6 5		6 2 3		
6 2			G2	9		2 1			3 3.2		7 1 1		10.5.U.21		ED02B, UL01A-B	
6 2 1		2 13 1					16.2			9 1.2 1, 9 1 2 2		6 4		6.1.1, 6.1.3		
6 2 2		2.13.3					16 4, 16 6			9 1.4 1, 9 1 4 2		6 2				

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7																
7.1	8			9		26		124				81		22, 23	ED02B	
7.1.1		2.10 1	F2				144		5.1 2, 5 2.1	7.1 1 7.1 2, 7.1 3, 7.1 4, 7.1 5, 7.1 6	6 2				TR04, UL01C-C, UL01C-D	7.1 3, 7 2 1
7.1.1.1													1.1 A 1, 1.1 A 2, 1.1 A 3, 1.1 A 4, 1 2 A 5, 1 2 A 7, 1 2 A 8, 1 2 A 9, 1 2 A 10, 1 2 A 11, 1 2 A 12, 1 2 A 13, 1 2 A 14, 1 2 A 15, 1 2 A 21, 1 2 A 22, 1 2 A 23, 1 2 A 24			
7.1.1.2							46, 49			6 2 1			7 1 S 9, 7 1 S 10, 7 1 S 11, 7 1 S 12, 7 1 S 13, 7 1 S 14, 7 1 S 15, 7 1 S 16, 7 1 S 17, 7 1 S 18, 7 1 S 22, 7 1 S 23	5 3 1		

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7.1.2		2.10.2	F2						5.1.2	7.1.1, 7.1.2, 7.1.3, 7.1.4	2.4, 6.2				TR04, UT03A-A	7.1.4
7.1.2.1													1.1.A.1, 1.1.A.2, 1.1.A.3, 1.1.A.4, 1.2.A.5, 1.2.A.7, 1.2.A.8, 1.2.A.9, 1.2.A.10, 1.2.A.11, 1.2.A.12, 1.2.A.13, 1.2.A.14, 1.2.A.15, 1.2.A.21, 1.2.A.22, 1.2.A.23, 1.2.A.24			
7.1.2.2							4.6, 4.9			6.2.1			7.1.S.22, 7.1.S.23	5.3.1		
7.1.3		2.10.2	B6							7.1.1, 7.1.2, 7.1.3, 7.1.4, 7.1.5, 7.1.6	2.4, 6.2				UL01C-D	7.1.3
7.1.3.1													1.1.A.1, 1.1.A.2, 1.1.A.3, 1.1.A.4, 1.2.A.5, 1.2.A.7, 1.2.A.8, 1.2.A.9, 1.2.A.10, 1.2.A.11, 1.2.A.12, 1.2.A.13, 1.2.A.14, 1.2.A.15, 1.2.A.21, 1.2.A.22, 1.2.A.23, 1.2.A.24			
7.1.3.2							4.6, 4.9			6.2.1			7.1.S.22, 7.1.S.23	5.3.1		

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7.2	B							1.2.4	5.1.1		9	8.2				
7.2.1		1.2.1, 2.10.3				2.6				7.2.1, 7.2.2, 7.2.3, 7.2.4, 7.2.5, 7.2.6				1.3.1, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.4.5	TR03A-B, TR04, UL01C-E	7.1.1
7.2.1.1													1.2.A.16, 1.2.A.17, 1.2.A.18, 1.2.A.19, 1.2.A.20			
7.2.1.2							4.6, 4.9			6.2.1			7.1.S.5, 7.1.S.6, 7.1.S.7, 7.1.S.8, 7.1.S.22, 7.1.S.23	5.3.1, 5.1.4		
7.2.2		1.2.2, 2.10.4								7.2.1, 7.2.2, 7.2.3, 7.2.6				8.9.2	TR03A-A, TR04, UL01C-A	7.1.2
7.2.2.1																
7.2.2.2							4.6, 4.9			6.2.1			7.1.S.5, 7.1.S.6, 7.1.S.7, 7.1.S.8, 7.1.S.22, 7.1.S.23	5.3.1		

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7.3	G			7				1.2.2, 1.2.3			6.3.2				AG08A-B, ED02B	4.3
7.3.1		2.9	F3B			6.7	4.4, 4.5, 4.7		4.1.1	2.5, 5.3.2, 5.3.3, 6.1		7.1, 7.3	4.2.M.4, 4.2.M.5, 4.2.M.8, 4.2.M.9, 4.4.M.27, 4.4.M.28, 7.1.S.1, 7.1.S.2, 7.1.S.3, 7.1.S.5, 7.1.S.6, 7.1.S.7, 7.1.S.8, 7.1.S.9, 7.1.S.11, 7.1.S.12, 7.1.S.13, 7.1.S.14, 7.1.S.15, 7.1.S.16, 7.1.S.17, 7.1.S.18, 7.1.S.19, 7.1.S.20, 7.1.S.21, 7.2.S.24, 7.2.S.25, 7.2.S.26, 7.2.S.27, 7.2.S.28	5.3.1, 5.3.2, 5.3.3, 5.3.5, 5.4.2, 5.4.5		
7.3.2		2.8	D2C			6.3	4.3			5.2.1, 5.2.2, 5.2.3		7.2	4.2.M.6, 4.2.M.7, 4.2.M.10, 4.2.M.11, 4.2.M.12, 4.2.M.13, 4.4.M.22, 4.4.M.23, 4.5.M.29, 4.5.M.31, 4.5.M.32, 4.5.M.33, 4.5.M.34, 4.5.M.35, 4.5.M.37, 4.5.M.38	5.4.1, 5.4.2, 5.4.4		

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BASE LINE	CS-1990 Land Cover	NCMS	MLC	MAFF Agric Census	FC Woodland Census	Land Cover Scotland	NI CS Survey	DoE Land Use Change	CORINE Land Cover	NCC Phase 1	Nat Parks Monitor	ESA Monitor	NVC	CORINE Biotopes	National Land Use Classn	UN/ECE
8																
8.0	A		F1						522, 523		61			11, 12, 132, 133		722, 723
8.1	C							123				69			ED02B, UL01A-A	
8.1.1							51		423	811	724		91SM1, 91SM2	14		63
8.1.2							51		423	811	722		91SM1, 91SM2	14		63
8.1.3									331	811	722		81SD3	161		395, 62
8.1.4			GJ				53		331	812, 83	723		81SD1, 81SD2, 81SD3	171, 172, 173, 174		63
8.2								122, 123				69				
8.2.1	D		F3C			65	52		421	823, 824, 825	633		91SM3, 92SM4, 92SM5, 92SM6, 92SM7, 92SM8, 92SM9, 92SM10, 92SM11, 93SM13, 93SM14, 91SM15, 93SM16, 93SM17, 93SM18, 93SM19, 93SM20, 91SM21, 91SM22, 93SM23, 94SM24, 94SM25, 94SM26, 94SM28	151, 152, 153, 156	ED02B, UL01A-F	43

TABLE 9 INTERCOMPARISON OF TARGET CLASSIFICATIONS AND BASELINE

Shaded entries in the Baseline Column are the CS-1990 Reporting Categories

BASE LINE	CS-1990 Land Cover	NCMS	MLC	MAFF Agric Census	FC Woodland Census	Land Cover Scotland	NI CS Survey	DoE Land Use Change	CORINE Land Cover	NCC Phase 1	Nat Parks Monitor	ESA Monitor	NVC	CORINE Biotopes	National Land Use Classn	UN/ECE
8.2.2	E		G3						3.3.1		7.2.1			1.6.2, 1.6.3, 6.4.2	ED02B, UL01A-A	5.4
8.2.2.1						68.1, 68.2	5.5			8.6.8			8.2.SD.4, 8.2.SD.5, 8.2.SD.6 8.4.SD.13, 8.4.SD.14, 8.4.SD.15, 8.4.SD.16, 8.4.SD.17			6.2
8.2.2.2						68.2, 68.3	5.5, 5.10			8.6.4			8.2.SD.6, 8.2.SD.7, 8.3.SD.10, 8.3.SD.11, 8.3.SD.12, 8.4.SD.13, 8.4.SD.14, 8.4.SD.15, 8.4.SD.16, 8.4.SD.17			
8.2.2.3				7		68.3	5.6, 5.10			8.6.5			8.3.SD.8, 8.3.SD.9, 8.3.SD.10, 8.3.SD.11, 8.3.SD.12	1.A	AG08A-B, ED02B	
8.3	C							12.3						1.8.1		
8.3.1									4.2.3	8.1.3						
8.3.2			G2			2.1			3.3.2	8.1.3, 8.3, 8.4	7.1.3	6.3			ED02B, UL01A-B	6.1.1
8.3.3			G2			2.1			3.3.2	8.8.1, 8.8.2	7.1.2	6.3	5.1.MC.1	1.8.2, 1.9	ED02B, UL01A-B	6.1.1
8.4	F		E2B			6.6	5.9	12.2, 12.3	3.2.1	8.8.3, 8.8.4	4.4.1		5.1.MC.2, 5.1.MC.3, 5.1.MC.4, 5.1.MC.5, 5.2.MC.6, 5.2.MC.7, 5.3.MC.8, 5.3.MC.9, 5.3.MC.10, 5.3.MC.11, 5.3.MC.12	1.8.2	ED02B, UL01A-C	5.4

TABLE 9 INTERCOMPARISON OF TARGET CLASSIFICATIONS AND BASELINE

Shaded entries in the Baseline Column are the CS-1990 Reporting Categories

BASE LINE	CS-1990 Land Cover	NCMS	MLC	MAFF Agric Census	FC Woodland Census	Land Cover Scotland	NI CS Survey	DoE Land Use Change	CORINE Land Cover	NCC Phase 1	Nat Parks Monitor	ESA Monitor	NVC	CORINE Biotopes	National Land Use Classn	UN/ECE
9																
9.1	0	2.14	G4C					2.2.2	1.2.2		8.1.2	9.1				
9.1.1						3.2.2	12.4			10.1.3					TR01F, TR02	3.7.2
9.1.2				9		3.2.1	12.1, 12.3	1.1.2, 2.2.1							TR01D, TR01E, TR02	3.7.1
9.2	0	2.14	G4A			3.1			1.1.2	10.3.6	8.3.1, 8.3.2					
9.2.1						1.1	10.2, 10.6, 10.7	1.1.2						8.6.5		1.4
9.2.1.1				9			10.5, 10.6, 10.7					9.2			AG01, AG02, AG07, ST	
9.2.1.2				4.2.2.2.05								9.3			AG06B-C	
9.2.2				9		1.1	10.1, 10.6, 10.7	2.1.1, 2.1.2				9.1, 9.2		8.5, 8.6.1, 8.6.2	RS02, UL02A-A, UL02A-B	3.1, 3.9.2
9.2.3				9		1.2.1	10.3, 10.6, 10.8	2.2.3, 2.3.1, 2.3.2, 2.3.3, 2.3.4				9.1		8.6.1, 8.6.2, 8.6.3	AG01, AG05, AG07, ED02A, MA, M101B, M101D, OF, RS01, RT, ST, TR05, UL02A-A, UL02A-B, UT01, UT02, UT03A-B, UT03A-C, UT03B, UT03C, UT08, W11	3.2, 3.4, 3.8.2, 3.8.3, 3.8.4

TABLE 9 INTERCOMPARISON OF TARGET CLASSIFICATIONS AND BASELINE

Shaded entries in the Baseline Column are the CS-1990 Reporting Categories

BASE LINE	CS-1990 Land Cover	NCMS	MLC	MAFF Agric Census	FC Woodland Census	Land Cover Scotland	NI CS Survey	DoE Land Use Change	CORINE Land Cover	NCC Phase 1	Nat Parks Monitor	ESA Monitor	NVC	CORINE Biotopes	National Land Use Classn	UN/ECE
9 2 4						1 1	10 4					9.1		8.6.1, 8.6.2	OF, ST, UL02A-A, UL02A-B	
9 2 4 1							106, 10 7	1 5, 2 2 3, 2 3 2, 2 4 1							AG05, CM, DF, ED02A, RS01, TR02, TR05, UT04, UT07	3 5
9 2 4 2							106, 10 7	2 4 2, 2 4 2							ED01, LE01, LE02	3 5
9 2 4 3								2 4 1								3 5
9 2 4 4				9			106, 10 7	2 4 2						8 5	LE01, LE04, LE05	3 9 5
9 3	P	2 1 4	G4A			3 1	9 1, 9 2		1 1 1	10 3 6	8 1 1	9 1		8.6.1		
9 3 1							106, 10 7	2 1 1, 2 1 2, 2 2 1							RS02, UL02A-A, UL02A-B	3 1, 3 9 2
9 3 2							9 3, 9 4, 106, 10 8	2 2 3, 2 3 1, 2 3 2, 2 3 3, 2 3 4	1 2 1, 1 2 3, 1 2 4					8 6 3	AG03, AG05, AG07, ED02A, MA, MI01B, MI01D, OF, RS01, RT, ST, TR05, TR06, UL02A-A, UL02A-B, UT01, UT02, UT03A-B, UT03A-C, UT03B, UT03C, UT06, UT08, WH	3 2, 3 4, 3 7 4, 3 8 2, 3 8 3, 3 8 4

TABLE 9 INTERCOMPARISON OF TARGET CLASSIFICATIONS AND BASELINE

Shaded entries in the Baseline Column are the CS-1990 Reporting Categories

BASE LINE	CS-1990 Land Cover	NCMS	MLC	MAFF Agric Census	FC Woodland Census	Land Cover Scotland	NTCS Survey	DoE Land Use Change	CORINE Land Cover	NCC Phase 1	Nat Parks Monitor	ESA Monitor	NVC	CORINE Biotopes	National Land Use Class	UN/ECE
9.3.3															OF, ST, RS01, UL02A-A, UL02A-B	
9.3.3.1							106, 107	15, 223, 232, 24.1							AG05, CM, DF, ED02A, TR02, TR05, UT04, UT07	35
9.3.3.2							106, 107	24.1, 242							ED01, LE01, LE02	35
9.3.3.3								24.1								35
9.3.3.4							107	242							LE01, LE04, LE05	395
9.4	O	2.14				3.1								861, 862, 864		
9.4.1			G4B	9		23	63, 15	132	132	922, 924	822	91, 94			M01C, UL01B-E, UT05	381
9.4.2			G4A, G4E				63, 15	251, 252	131	1013	822				UL01B-A, UL01B-F	394, 395
9.4.3			E1B					14							AG06B-A	391
9.5	O	2.14	G4A	9		31			131	104	811	91		861		395
9.5.1							15	25	133		822			864	UL01B-A, UL01B-F	393, 394
9.5.2							13	221							TR02	32, 34, 371
9.5.3							91	14							LE01, LE03	
9.5.4							13		131, 124							
9.6	O	2.13.2	G4D	9				13.1	133		82.1			864	M01A, UL01B-B	332
9.6.1						22	143			921		97				
9.6.2						22	141, 142			921, 1013		96				
9.6.3						23	141, 142			923		95				

TABLE 9 INTERCOMPARISON OF TARGET CLASSIFICATIONS AND BASELINE

Shaded entries in the Baseline Column are the CS-1990 Reporting Categories

BASE LINE	CS-1990 Land Cover	NCMS	MLC	MAFF Agric Census	FC Woodland Census	Land Cover Scotland	NI CS Survey	DoE Land Use Change	CORINE Land Cover	NCC Phase 1	Nat Parks Monitor	ESA Monitor	NVC	CORINE Biotopes	National Land Use Classn	UN/ECE
10																
101																
1011		1.1 2	B5			41.1, 42, 43	111							8.4		
1012			B5													
1013		1.1.1, 1.1.2	A1, A6				72, 77			1021.1, 1021.2, 1022.1, 1022.2, 1023.1, 1023.2	11, 16					
10131																
10132										1024						
10133																
102			A3, A6							1025, 1035	13, 16					
1021							73, 74, 75, 77									
1022							76									
103			A2, A6								12, 16					
1031							711									
1032							711									
1033							710									
104																
1041			A4, A6				71, 79				14, 16					
1042			A4, A6				71, 79			1028	14, 16					
1043			A5, A6							1026	15, 16					712
1044							165									
105																
106																
1061							123									
1062		13				25	122, 123									

TABLE 10 INTER-COMPARISON OF SELECTED LAND COVER CLASSIFICATIONS

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BASELINE *vs* NATIONAL VEGETATION CLASSIFICATION

BASELINE		NATIONAL VEGETATION CLASSIFICATION	
3.3	PERMANENT NON-INTENSIVE GRASS	6.2.MG.6	Lolium per-Cynos cris
		6.2.MG.8	Cynos cris-Caltha palu
3.3.1	Lowland grass, non-sown grasses >25%	6.2.MG.9	Holc lana-Desch cespit
		6.2.MG.10	Holc lana-Junc effusus
		6.3	GRASSY FLOOD-SWARDS
3.3.3	Lowl. grs., >25% cover non-weedy forbs	6.2.MG.3	Anthox odo-Geran sylv
		6.2.MG.4	Alopec pra-Sangui offi
		6.2.MG.5	Cynos cris-Centaur nigr
3.4	CALCAREOUS GRASS (SEMI-NATURAL)	2.1.CG.1	Fest ovina-Carlina vulg
		2.1.CG.2	Fest ovina-Avenula prat
		2.1.CG.3	Bromus erectus
		2.1.CG.4	Brachypodium pinnatum
		2.1.CG.5	Brom erect-Brach pinnat
		2.1.CG.6	Avenula pubescens
		2.1.CG.7	Fest ovi-Hier pil-Thym
		2.1.CG.8	Sesleria-Scabios columb
		2.1.CG.9	Sesleria-Gal sterneri
		2.1.CG.10	Fest ovi-Agro cap-Thym
3.5.1	Upland grass (esp. Agrostis/Festuca)	2.1.CG.11	Fes ovi-Agr cap-Alc alP
		2.1.CG.12	Fes ovi-Alc alp-Sil aca
		10.1.U.1	Fes ovi-Agr cap-Rum acl
		10.1.U.4	Fes ovi-Agr cap-Gal sax
3.5.2	Bracken (>50% cover)	10.4.U.20	Pteri aqui-Galium saxat
3.6.1	Molinia moor (Molinia >50%)	4.4.M.24	Molinia-Cirs dissectum
		4.4.M.25	Molinia-Pot erecta mire
		4.4.M.26	Molinia-Crepis paludosa
3.6.2.1	Low/medium altitude moorland grass	10.1.U.2	Deschampsia flexuosa
		10.1.U.3	Agrostis curtisii
		10.1.U.5	Nardus str-Galium saxat
		10.1.U.6	Junc squarr-Fest ovina
3.6.2.2.1	Carex bigelowii communities	10.2.U.7	Nardus str-Carex bigel
		10.2.U.8	Car bigel-Poly alpinum
3.6.2.2.2	Juncus trifidus communities	10.2.U.9	Junc trifid-Rac lanugin
3.6.2.2.3	Racomitrium "heath"	10.2 U.10	Car bigelow-Rac lanugin
3.6.2.2.4	Salix herbacea communities	10.3.U.12	Salix herb-Racom hetero
3.6.2.2.5	Other alpine non-shrubby vegetation	10.3.U.11	Polyt sexa-Kiaeria star
		10.3.U.13	Desch cesp-Galium saxat
		10.3.U.14	Alchem alp-Sibbald proc
		10.4.U.16	Luzul sylv-Vaccin myrt
		10.4.U.17	Luzul sylv-Geum rivale
		10.4.U.18	Crypt cris-Athy disten
		10.4.U.19	Tbely limb-Blec spican
3.7.1	False oat grass + couch	6.1	COARSE GRASSLAND
3.7.2	Tall herbs	6.2.MG.2	Filip ulm-Arrhen elat
3.7.3	Riparian vegetation (non-aquatic)	4.4.M.27	Filipend vulg-Ange sylv
		4.4.M.28	Iris pseudac-Fili ulma
4.1.1	Dense heath (Calluna + Erica >75%)	3.1.H.1	Calluna-Fest ovin heath
		3.1.H.2	Callun-Ulex minor heath
		3.1.H.3	Ulex min-Agr curt heath
		3.1.H.4	Ulex gal-Agr curt heath
		3.1.H.6	Eric vag-Ulex eur heath
		3.1.H.8	Calluna-Ulex gall heath
		3.1.H.9	Calluna-Desc flex heath
		3.1.H.10	Calluna-Eric cine heath
		3.2.H.12	Calluna-Vacc myrt heath
		3.2.H.16	Calluna-Arct uva- heath
		3.2.H.21	Cal vul-Vac myr-Spb cap

TABLE 10 INTER-COMPARISON OF SELECTED LAND COVER CLASSIFICATIONS

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BASELINE *vs* NATIONAL VEGETATION CLASSIFICATION

BASELINE		NATIONAL VEGETATION CLASSIFICATION	
4.1.2	Open-canopy heath (Calluna/Erica 25-75%)	3.1.H.1	Calluna-Fest ovin heath
		3.1.H.2	Callun-Ulex minor heath
		3.1.H.3	Ulex min-Agr curt heath
		3.1.H.4	Ulex gal-Agr curt heath
		3.1.H.5	Eric vag-Schoenus heath
		3.1.H.6	Eric vag-Ulex eur heath
		3.1.H.7	Calluna-Scil vern heath
		3.1.H.8	Calluna-Ulex gall heath
		3.1.H.9	Calluna-Desc flex heath
		3.1.H.10	Calluna-Eric cine heath
		3.2.H.12	Calluna-Vacc myrt heath
		3.2.H.13	Calluna-Clad arbu heath
		3.2.H.14	Calluna-Raco lanu heath
		3.2.H.15	Calluna-Juni nana heath
		3.2.H.16	Calluna-Arct uva- heath
		3.2.H.21	Cal vul-Vac myr-Sph cap
		4.3.M.16	Erica tetr-Spha comp
4.1.2.1	Lowland open-canopy heath	3.1.H.11	Calluna-Care aren heath
4.1.3	Berry-bush heath	3.2.H.18	Vacc myrt-Desc fle heath
		3.2.H.19	Vacc myrt-Clad arb heath
		3.2.H.20	Vacc myrt-Raco lan heath
		3.2.H.22	Vac myrt-Rub cham heath
4.1.3.2.1	Arctostaphylos alpinus heath	3.2.H.17	Calluna-Arct alpi heath
4.1.3.2.3	Other subalpine heath	2.2	CALCICOLOUS DWARF-SHRUB VEGETATION
4.2.1	Drier northern bogs	4.3.M.19	Calluna-E vag blanket b
		4.3.M.20	Erioph vag blanket/rais
4.2.2	Saturated bogs	4.1	BOG POOLS
		4.3.M.14	Schoen nigr-Narthecium
		4.3.M.15	Scirpu cesp-Eric tetr
		4.3.M.17	Scirp cesp-Erio vagi
		4.3.M.1	Erica tetr-Spha papi
		4.3.M.21	Narth ossi-Spha papi
5.1.1.2.2	Semi-natural (eg Caledonian forest)	11.5.W.13	Taxus baccata woodland
		11.8.W.18	Pinus syl-Hyl sple wood
5.1.3.1.2	Semi-natural (incl. self-sown exotics)	11.2	WET BIRCH AND ALDER WOOD
		11.3	BASIC WOODLAND - ASH, HAZEL, MAPLE ETC
		11.4	MESOSOPHILOUS MIXED BROADLEAF WOODLAND
		11.5.W.12	Fagus syl-Merc per wood
		11.6	ACID BEECHWOOD
		11.7	UPLAND OAK AND BIRCH WOOD
5.2.1	Coppice-with-standards	11.3.W.8	Fra exc-Ace cam-Mer per (subcomms a-d)
5.2.2.2	Traditional semi-natural coppice		
5.3.1	Shrub on dry or moist ground	8.5	DUNE SCRUB
		11.8.W.19	Junip com-Oxal ace wood
		11.9	SUBARCTIC WILLOW SCRUB
		11.10	THORNY SCRUB THICKETS ETC.
5.3.2	Swampy shrub and carr	11.1	SALLOW AND WILLOW CARR
		11.2	WET BIRCH AND ALDER WOOD
6.1	INLAND STABLE ROCK	10.5.U.22	Asple tric-Asple ruta-m
		10.5.U.23	Asple viri-Cysto fragil
		10.5.U.24	Arrhen ela-Geran robert
6.1.1	Inland cliff	10.4.U.15	Saxif aizo-Alchem glabr
6.2	INLAND LOOSE ROCK	10.5.U.21	Crypt cris-Desch flexu

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BASELINE *vs* NATIONAL VEGETATION CLASSIFICATION

BASELINE		NATIONAL VEGETATION CLASSIFICATION	
7.1.1.1	Open water in lake	1.1	FLOATING AQUATIC
		1.2.A.5	Ceratophyllum demersum
		1.2.A.7	Nymphaea alba
		1.2.A.8	Nuphar lutea
		1.2.A.9	Potamogeton natans
		1.2.A.10	Polygonum amphibium
		1.2.A.11	Potam pect-Myrio spic
		1.2.A.12	Potamogeton pectinatus
		1.2.A.13	Potam perf-Myrio alte
		1.2.A.14	Myriophyllum alternif
		1.2.A.15	Elodea canadensis
		1.2.A.21	Ranunculus baudotii
		1.2.A.22	Littorella-Lobelia
		1.2.A.23	Isoetes lacustr/setac
		1.2.A.24	Juncus bulbosus
7.1.1.2	Emergent macrophytes in lake	7.1.S.9	Carex rostrata swamp
		7.1.S.10	Equiset fluviatil swamp
		7.1.S.11	Carex vesicaria swamp
		7.1.S.12	Typha latifolia swamp
		7.1.S.13	Typha angustifol swamp
		7.1.S.14	Sparganium erect swamp
		7.1.S.15	Acorus calamus swamp
		7.1.S.16	Sagittaria sagitt swamp
		7.1.S.17	Carex pseudocyp swamp
		7.1.S.18	Carex otrubae swamp
		7.1.S.22	Glycer fluit water-marg
		7.1.S.23	Other water-margin veg
7.1.2.1	Open water in reservoir	1.1	FLOATING AQUATIC
		1.2.A.5	Ceratophyllum demersum
		1.2.A.7	Nymphaea alba
		1.2.A.8	Nuphar lutea
		1.2.A.9	Potamogeton natans
		1.2.A.10	Polygonum amphibium
		1.2.A.11	Potam pect-Myrio spic
		1.2.A.12	Potamogeton pectinatus
		1.2.A.13	Potam perf-Myrio alte
		1.2.A.14	Myriophyllum alternif
		1.2.A.15	Elodea canadensis
		1.2.A.21	Ranunculus baudotii
		1.2.A.22	Littorella-Lobelia
		1.2.A.23	Isoetes lacustr/setac
		1.2.A.24	Juncus bulbosus
7.1.2.2	Emergent macrophytes in reservoir	7.1.S.22	Glycer fluit water-marg
		7.1.S.23	Other water-margin veg
7.1.3.1	Open water in pond	1.1	FLOATING AQUATIC
		1.2.A.5	Ceratophyllum demersum
		1.2.A.7	Nymphaea alba
		1.2.A.8	Nuphar lutea
		1.2.A.9	Potamogeton natans
		1.2.A.10	Polygonum amphibium
		1.2.A.11	Potam pect-Myrio spic
		1.2.A.12	Potamogeton pectinatus
		1.2.A.13	Potam perf-Myrio alte
		1.2.A.14	Myriophyllum alternif
		1.2.A.15	Elodea canadensis
		1.2.A.21	Ranunculus baudotii
		1.2.A.22	Littorella-Lobelia
		1.2.A.23	Isoetes lacustr/setac
		1.2.A.24	Juncus bulbosus
7.1.3.2	Emergent macrophytes in pond	7.1.S.22	Glycer fluit water-marg
		7.1.S.23	Other water-margin veg
7.2.1.1	Open water in river	1.2.A.16	Callitriche stagnalis
		1.2.A.17	Ranunc penicillatus
		1.2.A.18	Ranunculus fluitans
		1.2.A.19	Ranunculus aquatilis
		1.2.A.20	Ranunculus peltatus

TABLE 10 INTER-COMPARISON OF SELECTED LAND COVER CLASSIFICATIONS

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BASELINE *vs* NATIONAL VEGETATION CLASSIFICATION

BASELINE		NATIONAL VEGETATION CLASSIFICATION	
7.2.1.2	Emergent macrophytes in river	7.1.S.5	Glyceria maxima swamp
		7.1.S.6	Carex riparia swamp
		7.1.S.7	Carex acutiformis swamp
		7.1.S.8	Scirpus lacustris swamp
		7.1.S.22	Glycer fluit water-marg
		7.1.S.23	Other water-margin veg
7.2.2.2	Emergent macrophytes in canal	7.1.S.5	Glyceria maxima swamp
		7.1.S.6	Carex riparia swamp
		7.1.S.7	Carex acutiformis swamp
		7.1.S.8	Scirpus lacustris swamp
		7.1.S.22	Glycer fluit water-marg
		7.1.S.23	Other water-margin veg
7.3.1	Fen and marsh	4.2.M.4	Carex rostr-Sph rec
		4.2.M.5	Carex rostr-Sph squarr
		4.2.M.8	Carex rostr-Sph warnst
		4.2.M.9	Carex rostr-Call cusp
		4.4.M.27	Filipend vulg-Ange sylv
		4.4.M.28	Iris pseudac-Fili ulma
		7.1.S.1	Carex elata swamp
		7.1.S.2	Cladium mariscus swamp
		7.1.S.3	Carex paniculata swamp
		7.1.S.5	Glyceria maxima swamp
		7.1.S.6	Carex riparia swamp
		7.1.S.7	Carex acutiformis swamp
		7.1.S.8	Scirpus lacustris swamp
		7.1.S.9	Carex rostrata swamp
		7.1.S.11	Carex vesicaria swamp
		7.1.S.12	Typha latifolia swamp
		7.1.S.13	Typha angustifol swamp
		7.1.S.14	Sparganium erect swamp
		7.1.S.15	Acorus calamus swamp
		7.1.S.16	Sagittaria sagitt swamp
		7.1.S.17	Carex pseudocyp swamp
		7.1.S.18	Carex otrubae swamp
		7.1.S.19	Eleocharis palustris swamp
		7.1.S.20	Scirpus tabern swamp
		7.1.S.21	Scirpus maritimus swamp
		7.2	TALL-HERB FENS
7.3.2	Flush	4.2.M.6	Carex echin-Sph rec/aur
		4.2.M.7	Carex curta-Sph russ
		4.2.M.10	Carex dioic-Ping vulg
		4.2.M.11	Carex demis-Saxi aizo
		4.2.M.12	Carex saxatilis mire
		4.2.M.13	Schoen nigr-Junc subno
		4.4.M.22	Junc subnod-Cirsi palu
		4.4.M.23	Junc eff/acfl-Gal palu
		4.5	SPRING AND FLUSH-FRINGE VEGETATION
8.1.1	Intertidal mud flats	9.1.SM.1	Zostera
		9.1.SM.2	Ruppia maritima
8.1.2	Intertidal sand flats	9.1.SM.1	Zostera
		9.1.SM.2	Ruppia maritima
8.1.3	Sandy shore	8.1.SD.3	Matri mari-Galium apar
8.1.4	Pebble/gravel shore	8.1	STRANDLINE AND SHINGLE VEGETATION
8.2.1	Salt marsh	9.1.SM.3	Elecocharis parvula
		9.2	LOWER AND MIDDLE SALTMARSH
		9.3	UPPER SALTMARSH AND SALT MEADOWS
		9.4	SALTMARSH DRIFTLINE VEGETATION
8.2.2.1	Dune with <75% vegetation cover	8.2.SD.4	Elymus farctus
		8.2.SD.5	Leymus arenarius
		8.2.SD.6	Ammophila arenaria
		8.4	DUNE SLACK AND ALLIED SALIX REPENS VEG.

TABLE 10 INTER-COMPARISON OF SELECTED LAND COVER CLASSIFICATIONS

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BASELINE *vs* NATIONAL VEGETATION CLASSIFICATION

BASELINE		NATIONAL VEGETATION CLASSIFICATION	
8.2.2.2	Dune with >75% vegetation cover	8.2.SD.6	Ammophila arenaria
		8.2.SD.7	Ammoph aren-Fest rubra
		8.3.SD.10	Carex arenaria
		8.3.SD.11	Carex aren-Cornic acul
		8.3.SD.12	Car are-Fes ovi-Agr cap
		8.4	DUNE SLACK AND ALLIED SALIX REPENS VEG.
8.2.2.3	Stabilized dune grassl. (incl. m	8.3	FIXED DUNE GRASSLAND
8.3.3	Coastal rocks and cliffs	5.1.MC.1	Crith mar-Sperg rupicol
8.4	MARITIME VEGETATION	5.1.MC.2	Armer mar-Ligustic scot
		5.1.MC.3	Rhodi ros-Armeria marit
		5.1.MC.4	Brassica oleracea cliff
		5.1.MC.5	Armer mar-Cerast diffus
		5.2	EUTROPHIC MARITIME CLIFF VEGETATION
		5.3	CLIFF & SALT-INFLUENCED MARITIME

GRASSL.

Categories in the Baseline survey which are not cross-referenced to NVC categories

1	Tilled land
2	Cropland with perennial crops
3.1	Recreational grass etc.
3.2	Intensive & agric. improved grass
5.1.1.1	Decid. conifer (in Britain larch only)
5.1.1.2.1	Evergreen conifer plantation
5.1.2	Mixed woodland (>20% of each)
5.1.3.1.1	Broadleaved woodland >30% planted
5.1.3.2	Evergreen brdlved. (Quercus ilex etc)
5.2.2.1	Chestnut coppice
5.2.2.3	Short-rotation coppice
5.4	Felled woodland (regrowth <1m high)
5.5	Land ploughed for afforestation
7.2.2.1	Open water in canal
8.0	Sea and estuaries
8.3.1	Intertidal seaweed-covered boulders
8.3.2	Rocky/boulder shore (not vegetated)
9	Transport, built, urban and industrial
10	Linear features (not land-cover)

There are no categories in the NVC which are not cross-referenced to the Baseline survey

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ITE LAND COVER MAP *vs* BASELINE

ITE LAND COVER MAP		BASELINE	
A	SEA/ESTUARY	8.0	SEA AND ESTUARIES
B	INLAND WATERS	7.1	STILL WATER (LAKE, POND, MERE, RESERVR.)
		7.2	RUNNING WATER (RIVER, CANAL)
C	COASTAL BARE GROUND	8.1	INTERTIDAL SOFT COAST WITHOUT VEG.
		8.3	HARD COAST LITTLE/NO VASCULAR VEGETATION
D	SALTMARSH / INTER-TIDAL VEGETATI	8.2.1	Salt marsh
E	MOORLAND / HEATHLAND GRASS INCL. DUNES.	3.6	MOORLAND AND MOUNTAIN GRASS
		8.2.2	Dune (open or with semi-nat. grassl.)
F	MANAGED GRASSLANDS (EVERGREEN)	3.1	RECREATIONAL GRASS ETC.
		3.2	INTENSIVE & AGRIC. IMPROVED GRASS
		3.3	PERMANENT NON-INTENSIVE GRASS
		3.4	CALCAREOUS GRASS (SEMI-NATURAL)
		3.5.1	Upland grass (esp. Agrostis/Festuca)
		8.4	MARITIME VEGETATION
G	MARSH / ROUGH GRASS / HERBACEOUS WEEDS	1.7	NON-CROPPED ARABLE LAND
		3.7	UNMANAGED LOWL. GRASSLAND AND TALL HERBS
		5.4	FELLED WOODLAND (REGROWTH <1M HIGH)
		5.5	LAND PLOUGHED FOR AFFORESTATION
		7.3	WETLAND
		9.4	VEGETATED WASTE LAND AND DERELICT LAND
H	OPEN CANOPY SHRUB HEATH / MOOR	4.1.2	Open-canopy heath (Calluna/Erica 25-75%)
		4.1.3	Berry-bush heath
		4.2.1	Drier northern bogs
I	DENSE SHRUB HEATH / MOOR	4.1.1	Dense heath (Calluna + Erica >75%)
J	BRACKEN	3.5.2	Bracken (>50% cover)
K	BRDLVED DECIDUOUS AND MIXED WOODLAND	2	CROPLAND WITH PERENNIAL CROPS
		5.1.2	Mixed woodland (>20% of each)
		5.1.3.1	Broadleaved woodland - deciduous
		5.2	MANAGED COPPICE
		5.3	SHRUB
L	CONIFER & BRDLVED EVERGREEN WOODLAND	5.1.1	Conifer woodland
		5.1.3.2	Evergreen brdlved. (Quercus ilex etc.)
M	BOGS AND FLUSHES DOMINATED BY HERB. SP.	4.2.2	Saturated bogs
N	TILLED LAND	1.1	CEREALS
		1.2	BRASSICACEAE (EXCEPT HORTICULTURE)
		1.3	LEGUMES
		1.4	ROOTS AND ALLIES (NON-BRASSICA)
		1.5	ADDITIONAL FIELD CROPS (NON-HORTICULT.)
		1.6	HORTICULTURE
O	SUBURB., DISCONT. URBAN & RURAL BUILDING	9.1	TRANSPORT
		9.2	DISCONTINUOUSLY BUILT LAND
P	CONTINUOUS URBAN	9.3	CONTINUOUSLY BUILT LAND
Q	INLAND BARE GROUND	6	INLAND ROCKS AND SCREES
		9.5	HARD AREAS WITHOUT BUILDINGS
		9.6	QUARRIES AND OTHER EXTRACTIVE INDUSTRIES

There are no categories in ITE Land Cover Map which are not cross-referenced to Baseline survey categories

Categories in the Baseline survey which are not cross-referenced to ITE Land Cover Map categories

10 LINEAR FEATURES (NOT LAND-COVER)

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MONITORING LANDSCAPE CHANGE *vs* BASELINE

MONITORING LANDSCAPE CHANGE		BASELINE	
A1	HEDGEROWS	10.1.3	Hedge
A2	FENCES & INSUBSTANTIAL FIELD BOUNDARIES	10.3	FENCES
A3	WALLS	10.2	WALLS
A4	BANKS WITH OR WITHOUT LOW HEDGES	10.4.1 10.4.2	Stone bank Earth bank
A5	OPEN DITCHES	10.4.3	Ditches
A6	WOODLAND FRINGE	10.1.3 10.2 10.3 10.4.1 10.4.2 10.4.3	Hedge WALLS FENCES Stone bank Earth bank Ditches
B5	LINEAR FEATURES (strips of woody veg.)	10.1.1 10.1.2	Line of trees Line of shrub
B6	FARMLAND PONDS	7.1.3	Pond (<0.25 ha)
C1	BROADLEAVED HIGH FOREST	5.1.3	Broadleaved woodland
C2	CONIFEROUS HIGH FOREST	5.1.1	Conifer woodland
C3	MIXED HIGH FOREST (INTIMATE MIXTURE)	5.1.2	Mixed woodland (>20% of each)
C4	SCRUB	5.3	SHRUB
D1	UPLAND HEATH	4.1.1.2 4.1.2.2 4.1.3.1	Upland dense heath Upland open-canopy heath Non-alpine berry-bush heath
D2A	Smooth grassland; (Festuca/Agrostis)	3.5.1	Upland grass (esp. Agrostis/Festuca)
D2B	Coarse grassland; (Molinia/Nardus)	3.6.1 3.6.2.1	Molinia moor (Molinia >50%) Low and medium altitude moorland grass
D2C	Blanket Bog (includes Juncus flushes)	4.2.1 7.3.2	Drier northern bogs Flush
D3	BRACKEN	3.5.2	Bracken (>50% cover)
D4A	Rough grassland (lowland heath)	4.1.2.1	Lowland open-canopy heath
D4B	Heather (lowland heath)	4.1.1.1	Lowland dense heath
D5	GORSE	5.3.1	Shrub on dry or moist ground
E1A	Ploughed/cropped land	1.1 1.2 1.3 1.4 1.5 1.7 3.2.1	CEREALS BRASSICACEAE (EXCEPT HORTICULTURE) LEGUMES ROOTS AND ALLIES (NON-BRASSICA) ADDITIONAL FIELD CROPS (NON-HORTICULT.) NON-CROPPED ARABLE LAND Recently sown grass, including leys
E1B	Market gardens	1.6 2.4 9.4.3	HORTICULTURE SOFT FRUIT (WOODY) Allotments
E1C	Orchards	2.1 2.3	ORCHARD HOPS
E2	GRASSLAND	3.2.4	Weedy swards with per. ryegrass 25-50%
E2A	Improved pasture	3.2.2 3.2.3	Est. swards with per. ryegrass dominant Well managed per. ryegrass & other grs.
E2B	Rough pasture	3.3 3.4 8.4	PERMANENT NON-INTENSIVE GRASS CALCAREOUS GRASS (SEMI-NATURAL) MARITIME VEGETATION
E2C	Neglected pasture	3.7.1	False oat grass + couch

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MONITORING LANDSCAPE CHANGE *vs* BASELINE

MONITORING LANDSCAPE CHANGE		BASELINE	
F1	OPEN WATER-COASTAL OR ESTUARINE	8.0	SEA AND ESTUARIES
F2	OPEN WATER-INLAND (NOT RIVERS)	7.1.1	Lake
		7.1.2	Reservoir
F3A	Peat bog (valley raised moss)	4.2.2	Saturated bogs
F3B	Freshwater marsh (reed swamp)	7.3.1	Fen and marsh
F3C	Saltmarsh	8.2.1	Salt marsh
G1	NON-VEGETATED PEAT	4.2	BOG
G2	BARE ROCK	6	INLAND ROCKS AND SCREES
		8.3.2	Rocky/boulder shore (not vegetated)
		8.3.3	Coastal rocks and cliffs
G3	SAND (incl. dunes & shingle)	8.1.4	Pebble/gravel shore
		8.2.2	Dune (open or with semi-nat. grassl.)
G4A	Built-up land	9.2	DISCONTINUOUSLY BUILT LAND
		9.3	CONTINUOUSLY BUILT LAND
		9.4.2	Derelict urban land (often vacant)
		9.5	HARD AREAS WITHOUT BUILDINGS
G4B	Urban open space	3.1	RECREATIONAL GRASS ETC.
G4C	Transport routes	3.1.6	Other (eg airfield, racecourse etc.)
		9.1	TRANSPORT
G4D	Quarries mineral workings	9.6	QUARRIES AND OTHER EXTRACTIVE INDUSTRIES
G4E	Derelict land	9.4.1	Domestic and industrial waste land
		9.4.2	Derelict urban land (often vacant)

Categories in MLC which are not cross-referenced to Baseline survey categories

A7	URBAN BOUNDARY
B1	ISOLATED TREES IN HEDGES
B2	ISOLATED TREES OUTSIDE HEDGEROWS
B3	TREE GROUP, MAINLY BROADLEAVED (<0.25 ha
B4	TREE GROUP, MAINLY CONIFEROUS (<0.25 ha)

Categories in the Baseline survey which are not cross-referenced to MLC categories

2.2	VINEYARD
2.5	TREES AND SHRUBS - NURSERY STOCK
3.6.2.2	Alpine and subalpine grass etc.
3.7.2	Tall herbs
3.7.3	Riparian vegetation (non-aquatic)
4.1.3.2	Alpine and subalpine heath
5.2	MANAGED COPPICE
5.4	FELLED WOODLAND (REGROWTH <1M HIGH)
5.5	LAND PLOUGHED FOR AFFORESTATION
7.2	RUNNING WATER (RIVER, CANAL)
8.1.1	Intertidal mud flats
8.1.2	Intertidal sand flats
8.1.3	Sandy shore
8.3.1	Intertidal seaweed-covered boulders
10.4.4	Embankments
10.5	GRASS STRIP
10.6	TRACK

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MAFF AGRICULTURAL CENSUS *vs* BASELINE

MAFF AGRICULTURAL CENSUS		BASELINE	
4.11	WHEAT	1.1.2	Wheat
4.12	WINTER BARLEY	1.1.3.1	Winter barley
4.13	SPRING BARLEY	1.1.3.2	Spring barley
4.14	OATS	1.1.4	Oats
4.15	MIXED CORN	1.1.5.3	Mixed corn
4.16	RYE	1.1.5.1	Rye
4.17	MAIZE	1.1.1	Maize
4.19	POTATOES	1.4.2	Potatoes
4.20	SUGAR BEET	1.4.1	Sugarbeet
4.21	HOPS	2.3	HOPS
4.22.1.170	Brussels Sprouts for fresh mar	1.6.2	Other horticulture (eg cauliflower etc.)
4.22.1.171	Brussels Sprouts for processing		
4.22.1.1772	Cabbage (Summer and Autumn)		
4.22.1.173	All other Cabbage		
4.22.1.174	Cauliflower (Summer and Autumn)		
4.22.1.175	Calabrese		
4.22.1.178	Carrots		
4.22.1.181	Parsnips		
4.22.1.182	Beetroot		
4.22.1.185	Onions for salad		
4.22.1.186	Dry bulb onions		
4.22.1.187	Broad beans		
4.22.1.189	Runner beans (pinched)		
4.22.1.190	Runner beans (climbing)		
4.22.1.192	French beans		
4.22.1.195	Green peas for fresh market		
4.22.1.196	Vining peas for processing		
4.22.1.197	Field celery (not main crop)		
4.22.1.198	Lettuce (not under glass)		
4.22.1.199	Sweet corn		
4.22.1.200	All other vegetables		
4.22.2.205	Glasshouse	9.2.1.2	Glasshouses
4.22.3.207	Orchards not grown commerciall	2.1	ORCHARD
4.22.3.208	Desert apples - Cox's		
4.22.3.209	All other varieties desert apples		
4.22.3.210	Bramley's seeding cooking apples		
4.22.3.211	All other varieties of cooking apples		
4.22.3.212	Cider apples and Perry pears		
4.22.3.213	Pears		
4.22.3.214	Plums		
4.22.3.215	Cherries		
4.22.3.216	Other top fruit (including nuts)		
4.22.4.218	Open grown strawberries	1.6.2	Other horticulture (eg cauliflower etc.)
4.22.4.219	Strawberries (covered)		
4.22.4.220	Raspberries	2.4	SOFT FRUIT (WOODY)
4.22.4.221	Blackcurrants for market		
4.22.4.222	Blackcurrants for processing		
4.22.4.223	Gooseberries		
4.22.4.224	Wine grapes	2.2	VINEYARD
4.22.4.225	Other small fruit	2.4	SOFT FRUIT (WOODY)
4.22.5.230	Fruit (woody) plants - nursery	2.5	TREES AND SHRUBS - NURSERY STOCK
4.22.5.231	Roses		
4.22.5.232	Shrubs, conifers, etc.		
4.22.5.233	Ornamental trees		

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MAFF AGRICULTURAL CENSUS *vs* BASELINE

MAFF AGRICULTURAL CENSUS		BASELINE	
4.22.5.234	Perennial herbaceous plants	1.6.1	Flowers
4.22.5.235	Other hardy nursery stock		
4.22.6.240	Bulbs, corms, tubers, rhizomes		
4.22.6.241	Dahlias		
4.22.6.242	Chrysanthemums		
4.22.6.243	All other flowers for cutting		
4.23	FIELD BEANS	1.3.2	Field beans
4.24	TURNIPS AND SWEDES (for stockf	1.2.1	Turnips/swedes
4.25	FODDER BEET AND MANGOLDS	1.4.3	Other roots and beets
4.26	KALE, CABBAGE, SAVOY, KOHL RABI & RAPE	1.2.2	Kale
		1.2.3	Oil-seed rape
		1.2.4	Other crucifer (including Mustard)
4.27	PEAS FOR HARVESTING DRY	1.3.1	Peas
4.28	OTHER CROPS FOR STOCKFEED (not grass)	1.3.3	Other legume
		1.5.3	Other field crop
4.29	RAPE GROWN FOR OILSEED	1.2.3	Oil-seed rape
4.30	LINSEED	1.5.1	Linseed
4.31	OTHER CROPS (Not for stockfeeding	1.3.3.3	Lupin
		1.5.2	Sunflower
		1.5.3	Other field crop
4.32	BARE FALLOW (Not set-aside land)	1.7.3	Fallow, including rotational Set-aside
4.33	TRITICALE	1.1.5.2	Triticale
4.34	SET-ASIDE LAND	1.7.2	Neglected, incl. permanent tumbledown
		1.7.3	Fallow, including rotational Set-aside
5	GRASSLAND PUT DOWN IN 1987 OR LATER	3.2.1	Recently sown grass, including leys
6	OTHER GRASSLAND EXCL. ROUGH GRAZING	3.2.2	Est. swards with per. ryegrass dominant
		3.2.3	Well managed per. ryegrass & other grs.
		3.2.4	Weedy swards with per. ryegrass 25-50%
7	ROUGH GRAZING	3.3	PERMANENT NON-INTENSIVE GRASS
		3.4	CALCAREOUS GRASS (SEMI-NATURAL)
		3.5	ACID GRASS (NON-MOORLAND) AND BRACKEN
		3.6	MOORLAND AND MOUNTAIN GRASS
		3.7	UNMANAGED LOWL. GRASSLAND/TALL HERBS
		4	HEATHLAND AND BOG
		7.3	WETLAND
		8.2.2.3	Stabilized dune grassl. (incl. machair)
8	WOODLAND	5.1	WOODLAND
		5.2	MANAGED COPPICE
		5.3	SHRUB
		5.4	FELLED WOODLAND (REGROWTH <1M HIGH)
9	ALL OTHER LAND	3.1	RECREATIONAL GRASS ETC.
		3.7.2	Tall herbs
		6	INLAND ROCKS AND SCREES
		7.1	STILL WATER (LAKE, POND, MERE, RESERVR.)
		9.1.2	Road
		9.2.1.1	Sheds, barns, silos
		9.2.2	Residential buildings with gardens
		9.2.3	Commercial and industrial buildings
		9.2.4.4	Sporting and recreational
		9.4.1	Domestic and industrial waste land
		9.5	HARD AREAS WITHOUT BUILDINGS
		9.6	QUARRIES AND OTHER EXTRACTIVE INDUSTRIES

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MAFF AGRICULTURAL CENSUS *vs* BASELINE

There are no categories in the MAFF Census which are not cross-referenced to Baseline survey categories

Categories in the Baseline survey which are not cross-referenced to the MAFF Census categories

1.7.1	Ploughed land
5.5	LAND PLOUGHED FOR AFFRESTATION
7.2	RUNNING WATER (RIVER, CANAL)
8.0	SEA AND ESTUARIES
8.1	INTERTIDAL SOFT COAST WITHOUT VEG.
8.2.1	Salt marsh
8.2.2.1	Dune with <75% vegetation cover
8.2.2.2	Dune with >75% vegetation cover
8.3	HARD COAST LITTLE/NO VASCULAR VEGETATION
8.4	MARITIME VEGETATION
9.1.1	Railway
9.2.4.1	Institutional (govnmnt., military, etc.)
9.2.4.2	Education and cultural
9.2.4.3	Religious
9.3	CONTINUOUSLY BUILT LAND
9.4.2	Derelict urban land (often vacant)
9.4.3	Allotments
10	LINEAR FEATURES (NOT LAND-COVER)

TABLE 10 INTER-COMPARISON OF SELECTED LAND COVER CLASSIFICATIONS

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LAND COVER OF SCOTLAND *vs* BASELINE

LAND COVER SCOTLAND		BASELINE	
1.1	ISOLATED FARMS AND OTHER BUILDINGS	9.2.1 9.2.2 9.2.4	Agricultural buildings Residential buildings with gardens Public services and facilities
1.2.1	Factories	9.2.3	Commercial and industrial buildings
1.2.2	Airfields	3.1.6	Other (eg airfield, racecourse etc.)
1.2.3	Golf Courses	3.1.3	Golf course
1.2.4	Cemeteries	3.1.6	Other (eg airfield, racecourse etc.)
1.2.5	Recreational Land	3.1.1 3.1.2 3.1.4 3.1.5 3.1.6	Amenity grass > 1 ha Playing fields Touring caravan park (if main use) Camp site (if main use) Other (eg airfield, racecourse etc.)
2.1	CLIFF, CRAGS AND SCREE	6 8.3.2 8.3.3	INLAND ROCKS AND SCREES Rocky/boulder shore (not vegetated) Coastal rocks and cliffs
2.2	QUARRIES	9.6.1 9.6.2	Gravel pit (not flooded nor revegetated) Quarry
2.3	BINGS	9.4.1 9.6.3	Domestic and industrial waste land Mine
2.5	HILL ROADS	10.6.2	Unconstructed track
2.6	WATER	7.1 7.2.1	STILL WATER (LAKE, POND, MERE, RESERVR.) River
3.1	BUILT-UP LAND	3.1 9.2 9.3 9.4 9.5	RECREATIONAL GRASS ETC. DISCONTINUOUSLY BUILT LAND CONTINUOUSLY BUILT LAND VEGETATED WASTE/DERELICT LAND HARD AREAS WITHOUT BUILDINGS
3.2.1	Road	9.1.2	Road
3.2.2	Rail	9.1.1	Railway
4.1.1	Coniferous Woods - Plantations	5.1.1.1 5.1.1.2.1 10.1.1	Decid. conifer (in Britain larch only) Evergreen conifer plantation Line of trees
4.1.2	Coniferous Woods - Seminatural	5.1.1.2.2	Semi-natural (eg Caledonian forest)
4.2	BROADLEAVED WOODS	2.1 5.1.3 5.3.2 10.1.1	ORCHARD Broadleaved woodland Swampy shrub and carr Line of trees
4.3	MIXED WOODS (>20% of each)	5.1.2 10.1.1	Mixed woodland (>20% of each) Line of trees
4.4 4.5	UNDIFFERENTIATED LOW SCRUB RHODODENDRON SCRUB	5.3.1	Shrub on dry or moist ground
4.6.1	Land Recently Ploughed for Afforestation	5.5	LAND PLOUGHED FOR AFFORESTATION
4.6.2	Recently Felled/Open Canopy Young Pltn.	5.1.1.1 5.1.1.2.1 5.1.2 5.1.3.1.1 5.4	Decid. conifer (in Britain larch only) Evergreen conifer plantation Mixed woodland (>20% of each) Broadleaved woodland >30% planted FELLED WOODLAND (REGROWTH <1M HIGH)
5.1	IMPROVED PASTURE	3.2.2 3.2.3 3.2.4	Est. swards with per. ryegrass dominant Well managed per. ryegrass & other grs. Weedy swards with per. ryegrass 25-50%
5.2	ARABLE LAND	1 2.4 3.2.1	TILLED LAND SOFT FRUIT (WOODY) Recently sown grass, including leys

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LAND COVER OF SCOTLAND *vs* BASELINE

LAND COVER SCOTLAND		BASELINE	
6.1	HEATHER AND DWARF SHRUB HEATHLAND	4.1.3.1	Non-alpine berry-bush heath
6.1.1	Dry Heather Moor	4.1.1	Dense heath (Calluna + Erica >75%)
6.1.2	Wet Heather Moor	4.1.2	Open-canopy heath (Calluna/Erica 25-75%)
6.1.3	Undifferentiated Heather Moor	4.1.1 4.1.2	Dense heath (Calluna + Erica >75%) Open-canopy heath (Calluna/Erica 25-75%)
6.2	UNDIFFERENTIATED COARSE GRASSLANDS	3.6.1 3.6.2.1	Molinia moor (Molinia >50%) Low and medium altitude moorland grass
6.3	SMOOTH GRASSLANDS	7.3.2	Flush
6.3.1	Smooth Grasslands with Rushes	3.3 3.5.1	PERMANENT NON-INTENSIVE GRASS Upland grass (esp. Agrostis/Festuca)
6.3.2	Smooth Grasslands with Low Scrub	3.3 3.4 3.5.1 5.3.1	PERMANENT NON-INTENSIVE GRASS CALCAREOUS GRASS (SEMI-NATURAL) Upland grass (esp. Agrostis/Festuca) Shrub on dry or moist ground
6.3.3	Undifferentiated Smooth Grasslands	3.3 3.4 3.5.1	PERMANENT NON-INTENSIVE GRASS CALCAREOUS GRASS (SEMI-NATURAL) Upland grass (esp. Agrostis/Festuca)
6.3.4	Undifferentiated Bracken	3.5.2	Bracken (>50% cover)
6.4	BLANKET BOG & OTHER PEATLAND VEGETATION	4.2	BOG
6.5	UNDIFFERENTIATED SALT MARSH	8.2.1	Salt marsh
6.6	MARITIME GRASSLAND	8.4	MARITIME VEGETATION
6.7	WET LANDS	3.7.3 7.3.1	Riparian vegetation (non-aquatic) Fen and marsh
6.8.1	Bare Dunes	8.2.2.1	Dune with <75% vegetation cover
6.8.2	Partially Stabilised Dunes	8.2.2.1 8.2.2.2	Dune with <75% vegetation cover Dune with >75% vegetation cover
6.8.3	Links with Grassland	8.2.2.2 8.2.2.3	Dune with >75% vegetation cover Stabilized dune grassl. (incl. machair)
6.8.4	Links with Heathland	4.1.1.1 4.1.2.1	Lowland dense heath Lowland open-canopy heath
7.9	MONTANE VEGETATION	3.6.2.2 4.1.3.2 4.2	Alpine and subalpine grass etc. Alpine and subalpine heath BOG

Categories in Land Cover of Scotland 7 which are not cross-referenced to Baseline survey categories.

2.4	PATHS
3.3	SNOW-OBSCURED AREAS
3.4	SKI TOWS

Categories in the Baseline survey which are not cross-referenced to Land Cover of Scotland categories.

2.2	VINEYARD	10.1.2	Line of shrub
2.3	HOPS	10.1.3	Hedge
2.5	TREES & SHRUBS - NURSERY STOCK	10.2	WALLS
3.7.1	False oat grass + couch	10.3	FENCES
3.7.2	Tall herbs	10.4	BANKS AND DITCHES
5.2	MANAGED COPPICE	10.5	GRASS STRIP
7.2.2	Canal	10.6.1	Constructed track
8.0	SEA AND ESTUARIES		
8.1	UNVEGETATED INTERTIDAL SOFT COAST		
8.3.1	Intertidal seaweed-covered boulders		

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NCC PHASE I SURVEY *vs* NATIONAL VEGETATION CLASSIFICATION

NCC PHASE I SURVEY		NATIONAL VEGETATION CLASSIFICATION	
1.1.1.1	Broadleaved woodland - Semi-natural	11.2	WET BIRCH AND ALDER WOOD
		11.3	BASIC WOODLAND - ASH, HAZEL, MAPLE ETC
		11.4	MESOSOPHILOUS MIXED BROADLEAF WOODLAND
		11.5.W.12	Fagus syl-Mercc per wood
		11.6	ACID BEECHWOOD
		11.7	UPLAND OAK AND BIRCH WOOD
1.1.2.1	Conifer woodland - Semi-natural	11.5.W.13	Taxus baccata woodland
		11.8.W.18	Pinus syl-Hyl sple wood
1.2	SCRUB (usually <5m)	8.5	DUNE SCRUB
		11.1	SALLOW AND WILLOW CARR
		11.2	WET BIRCH AND ALDER WOOD
		11.8.W.19	Junip comm-Oxal acc wood
		11.9	SUBARCTIC WILLOW SCRUB
		11.10	THORNY SCRUB THICKETS ETC.
2.1	ACID GRASSLAND	2.1.CG.11	Fes ovi-Agr cap-Alc alp
		2.1.CG.12	Fes ovi-Alc alp-Sil aca
		10.1	ACID GRASSLAND
2.2	NEUTRAL GRASSLAND	6.2.MG.3	Anthox odo-Geran sylv
		6.2.MG.4	Alopec pra-Sangui offi
		6.2.MG.5	Cynos cris-Centaur nigr
		6.2.MG.6	Lolium per-Cynos cris
		6.2.MG.8	Cynos cris-Caltha palu
		6.2.MG.9	Holc lana-Desch cespit
		6.2.MG.10	Holc lana-Junc effusus
		6.3	GRASSY FLOOD-SWARDS
2.2.2	Neutral grassland - Semi-improved	6.1	COARSE GRASSLAND
2.3	CALCAREOUS GRASSLAND	2.1.CG.1	Fest ovina-Carlina vulg
		2.1.CG.2	Fest ovina-Avenula prat
		2.1.CG.3	Bromus erectus
		2.1.CG.4	Brachypodium pinnatum
		2.1.CG.5	Brom erect-Brach pinnat
		2.1.CG.6	Avenula pubescens
		2.1.CG.7	Fest ovi-Hier pil-Thym
		2.1.CG.8	Sesleria-Scabios columb
		2.1.CG.9	Sesleria-Gal sterneri
		2.1.CG.10	Fest ovi-Agro cap-Thym
2.5	MARSH/MARSHY GRASSLAND	4.2.M.4	Carex rostr-Sph rec
		4.2.M.5	Carex rostr-Sph squarr
		4.2.M.8	Carex rostr-Sph warnst
		4.2.M.9	Carex rostr-Call cusp
		4.4.M.24	Molinia-Cirs dissectum
		4.4.M.25	Molinia-Pot erecta mire
		4.4.M.26	Molinia-Crepis paludosa
		4.4.M.27	Filipend vulg-Ange sylv
		4.4.M.28	Iris pseudac-Fili ulma
		7.1.S.1	Carex elata swamp
		7.1.S.2	Cladium mariscus swamp
		7.1.S.3	Carex paniculata swamp
		7.1.S.5	Glyceria maxima swamp
		7.1.S.6	Carex riparia swamp
		7.1.S.7	Carex acutiformis swamp
		7.1.S.8	Scirpus lacustris swamp
		7.1.S.9	Carex rostrata swamp
		7.1.S.11	Carex vesicaria swamp
		7.1.S.12	Typha latifolia swamp
		7.1.S.13	Typha angustifol swamp
		7.1.S.14	Sparganium erect swamp
		7.1.S.15	Acorus calamus swamp
		7.1.S.16	Sagittaria sagitt swamp
		7.1.S.17	Carex pseudocyp swamp
		7.1.S.18	Carex otrubae swamp
		7.1.S.19	Eleocharis palustris swamp
		7.1.S.20	Scirpus tabern swamp
		7.1.S.21	Scirpus maritimus swamp
		7.2	TALL-HERB FENS
3.1.1	Bracken - Continuous	10.4.U.20	Pteri aqui-Galium saxat

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NCC PHASE I SURVEY *vs* NATIONAL VEGETATION CLASSIFICATION

NCC PHASE I SURVEY		NATIONAL VEGETATION CLASSIFICATION	
3.2	UPLAND SPECIES-RICH LEDGES	10.4.U.15	Saxif saxo-Alchem glabr
		10.5.U.22	Asple tric-Asple ruta-m
		10.5.U.23	Asple viri-Cysto fragil
		10.5.U.24	Arrhen ela-Geran robert
3.3.1	Tall herb - ruderal	6.2.MG.2	Filip ulm-Arrhen elat
4.1	DRY DWARF SHRUB HEATH (>25% ericoids)	3.1	COASTAL AND LOWLAND HEATH
		3.2.H.12	Calluna-Vacc myrt heath
		3.2.H.13	Calluna-Clad arbu heath
		3.2.H.14	Calluna-Raco lanu heath
		3.2.H.15	Calluna-Juni nana heath
		3.2.H.16	Calluna-Arct uva- heath
		3.2.H.21	Cal vul-Vac myr-Sph cap
		4.3.M.16	Erica tetr-Spha comp
4.1.1	Dry dwarf shrub heath - Acid	3.2.H.18	Vacc myr-Desc fle heath
		3.2.H.19	Vacc myr-Clad arb heath
		3.2.H.20	Vacc myr-Raco lan heath
		3.2.H.22	Vac myrt-Rub cham heath
		10.3.U.12	Salix herb-Racom hetero
4.2	WET DWARF SHRUB HEATH (>25% ericoids)	3.1	COASTAL AND LOWLAND HEATH
		3.2.H.12	Calluna-Vacc myrt heath
		3.2.H.13	Calluna-Clad arbu heath
		3.2.H.14	Calluna-Raco lanu heath
		3.2.H.15	Calluna-Juni nana heath
		3.2.H.16	Calluna-Arct uva- heath
		3.2.H.18	Vacc myr-Desc fle heath
		3.2.H.19	Vacc myr-Clad arb heath
		3.2.H.20	Vacc myr-Raco lan heath
		3.2.H.21	Cal vul-Vac myr-Sph cap
		3.2.H.22	Vac myrt-Rub cham heath
		4.3.M.16	Erica tetr-Spha comp
4.3L	ICHEN/BRYOPHYTE HEATH	10.2.U.10	Car bigelow-Rac lanugin
4.4	MONTANE HEATH/DWARF HERB	10.2.U.7	Nardus str-Carex bigel
		10.2.U.8	Car bigel-Poly alpinum
		10.2.U.9	Junc trifid-Rac lanugin
		10.3.U.11	Polyt sexa-Kiaeria star
		10.3.U.13	Desch cesp-Galium saxat
		10.3.U.14	Alchem alp-Sibbald proc
		10.4.U.16	Luzul sylv-Vaccin myrt
		10.4.U.17	Luzul sylv-Geum rivale
		10.4.U.18	Crypt cris-Athy disten
		10.4.U.19	Thely limb-Blec spican
4.5	DRY HEATH/ACID GRASSLAND MOSAIC	3.1	COASTAL AND LOWLAND HEATH
		3.2.H.12	Calluna-Vacc myrt heath
		3.2.H.13	Calluna-Clad arbu heath
		3.2.H.14	Calluna-Raco lanu heath
		3.2.H.15	Calluna-Juni nana heath
		3.2.H.16	Calluna-Arct uva- heath
		3.2.H.21	Cal vul-Vac myr-Sph cap
		4.3.M.16	Erica tetr-Spha comp
4.6	WET HEATH/ACIDIC GRASSLAND MOSAIC	3.1	COASTAL AND LOWLAND HEATH
		3.2.H.12	Calluna-Vacc myrt heath
		3.2.H.13	Calluna-Clad arbu heath
		3.2.H.14	Calluna-Raco lanu heath
		3.2.H.15	Calluna-Juni nana heath
		3.2.H.16	Calluna-Arct uva- heath
		3.2.H.21	Cal vul-Vac myr-Sph cap
		4.3.M.16	Erica tetr-Spha comp
5.1	BOG (peat >0.5m)	4.3.M.19	Calluna-E vag blanket b
		4.3.M.20	Erioph vag blanket/rais
5.1.6.1	Sphagnum bog - Blanket bog	4.1	BOG POOLS
		4.3.M.14	Schoen nigr-Narthecium
		4.3.M.15	Scirpu cesp-Eric tetr
		4.3.M.17	Scirp cesp-Erio vagi
		4.3.M.18	Erica tetr-Spha papi
		4.3.M.21	Narth ossi-Spha papi

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NCC PHASE I SURVEY *vs* NATIONAL VEGETATION CLASSIFICATION

NCC PHASE I SURVEY		NATIONAL VEGETATION CLASSIFICATION	
5.1.7	Wet modified bog	4.1	BOG POOLS
		4.3.M.14	Schoen nigr-Narthecium
		4.3.M.15	Scirpu cesp-Eric tetr
		4.3.M.17	Scirp cesp-Erio vagi
		4.3.M.18	Erica tetr-Spha papi
		4.3.M.21	Narth ossi-Spha papi
		4.4.M.24	Molinia-Cirs dissectum
		4.4.M.25	Molinia-Pot erecta mire
		4.4.M.26	Molinia-Crepis paludosa
5.2	FLUSH AND SPRING (peat often <0.5m)	4.2.M.6	Carex echin-Sph rec/aur
		4.2.M.7	Carex curta-Sph russ
		4.2.M.10	Carex dioic-Ping vulg
		4.2.M.11	Carex demis-Saxi aizo
		4.2.M.12	Carex saxatilis mire
		4.2.M.13	Schoen nigr-Junc subno
		4.4.M.22	Junc subnod-Cirsi palu
		4.4.M.23	Junc eff/acfl-Gal palu
		4.5	SPRING AND FLUSH-FRINGE VEGETATION
5.3.1	Fen - Valley mire	4.1	BOG POOLS
		4.3.M.14	Schoen nigr-Narthecium
		4.3.M.15	Scirpu cesp-Eric tetr
		4.3.M.17	Scirp cesp-Erio vagi
		4.3.M.18	Erica tetr-Spha papi
		4.3.M.21	Narth ossi-Spha papi
5.3.2	Fen - Basin mire	4.2.M.4	Carex rostr-Sph rec
		4.2.M.5	Carex rostr-Sph squarr
		4.2.M.8	Carex rostr-Sph warnst
		4.2.M.9	Carex rostr-Call cusp
		4.4.M.27	Filipend vulg-Ange sylv
		4.4.M.28	Iris pseudac-Fili ulma
		7.1.S.1	Carex elata swamp
		7.1.S.2	Cladium mariscus swamp
		7.1.S.3	Carex paniculata swamp
		7.1.S.5	Glyceria maxima swamp
		7.1.S.6	Carex riparia swamp
		7.1.S.7	Carex acutiformis swamp
		7.1.S.8	Scirpus lacustris swamp
		7.1.S.9	Carex rostrata swamp
		7.1.S.11	Carex vesicaria swamp
		7.1.S.12	Typha latifolia swamp
		7.1.S.13	Typha angustifol swamp
		7.1.S.14	Sparganium erect swamp
		7.1.S.15	Acorus calamus swamp
		7.1.S.16	Sagittaria sagitt swamp
		7.1.S.17	Carex pseudocyp swamp
		7.1.S.18	Carex otrubae swamp
		7.1.S.19	Eleocharis palustris swamp
		7.1.S.20	Scirpus tabern swamp
		7.1.S.21	Scirpus maritimus swamp
		7.2	TALL-HERB FENS
5.3.3	Fen - Flood-plain mire	4.2.M.4	Carex rostr-Sph rec
		4.2.M.5	Carex rostr-Sph squarr
		4.2.M.8	Carex rostr-Sph warnst
		4.2.M.9	Carex rostr-Call cusp
		4.4.M.27	Filipend vulg-Ange sylv
		4.4.M.28	Iris pseudac-Fili ulma
		7.1.S.1	Carex elata swamp
		7.1.S.2	Cladium mariscus swamp
		7.1.S.3	Carex paniculata swamp
		7.1.S.5	Glyceria maxima swamp
		7.1.S.6	Carex riparia swamp
		7.1.S.7	Carex acutiformis swamp
		7.1.S.8	Scirpus lacustris swamp
		7.1.S.9	Carex rostrata swamp
		7.1.S.11	Carex vesicaria swamp
		7.1.S.12	Typha latifolia swamp
		7.1.S.13	Typha angustifol swamp
		7.1.S.14	Sparganium erect swamp
		7.1.S.15	Acorus calamus swamp
		7.1.S.16	Sagittaria sagitt swamp
		7.1.S.17	Carex pseudocyp swamp
		7.1.S.18	Carex otrubae swamp
		7.1.S.19	Eleocharis palustris swamp
		7.1.S.20	Scirpus tabern swamp
		7.1.S.21	Scirpus maritimus swamp
		7.2	TALL-HERB FENS

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NCC PHASE I SURVEY *vs* NATIONAL VEGETATION CLASSIFICATION

NCC PHASE I SURVEY		NATIONAL VEGETATION CLASSIFICATION	
5.4	BARE PEAT (>0.25 ha)	4.1	BOG POOLS
		4.3.M.14	Schoen nigr-Narthecium
		4.3.M.15	Scirpu cesp-Eric tetr
		4.3.M.17	Scirp cesp-Erio vagi
		4.3.M.18	Erica tetr-Spha papi
		4.3.M.19	Calluna-E vag blanket b
		4.3.M.20	Erioph vag blanket/rais
		4.3.M.21	Narth ossi-Spha papi
6.1	SWAMP (>5m wide)	4.2.M.4	Carex rostr-Sph rec
		4.2.M.5	Carex rostr-Sph squarr
		4.2.M.8	Carex rostr-Sph warnst
		4.2.M.9	Carex rostr-Call cusp
		4.4.M.27	Filipend vulg-Ange sylv
		4.4.M.28	Iris pseudac-Fili ulma
		7.1.S.1	Carex elata swamp
		7.1.S.2	Cladium mariscus swamp
		7.1.S.3	Carex paniculata swamp
		7.1.S.5	Glyceria maxima swamp
		7.1.S.6	Carex riparia swamp
		7.1.S.7	Carex acutiformis swamp
		7.1.S.8	Scirpus lacustris swamp
		7.1.S.9	Carex rostrata swamp
		7.1.S.11	Carex vesicaria swamp
		7.1.S.12	Typha latifolia swamp
		7.1.S.13	Typha angustifol swamp
		7.1.S.14	Sparganium erect swamp
		7.1.S.15	Acorus calamus swamp
		7.1.S.16	Sagittaria sagitt swamp
		7.1.S.17	Carex pseudocyp swamp
		7.1.S.18	Carex otrubae swamp
		7.1.S.19	Eleocharis palustris swamp
		7.1.S.20	Scirpus tabern swamp
		7.1.S.21	Scirpus maritimus swamp
		7.2	TALL-HERB FENS
6.2.1	Marginal (emergent) vegetation (<5m wide)	7.1.S.5	Glyceria maxima swamp
		7.1.S.6	Carex riparia swamp
		7.1.S.7	Carex acutiformis swamp
		7.1.S.8	Scirpus lacustris swamp
		7.1.S.9	Carex rostrata swamp
		7.1.S.10	Equiset fluviatil swamp
		7.1.S.11	Carex vesicaria swamp
		7.1.S.12	Typha latifolia swamp
		7.1.S.13	Typha angustifol swamp
		7.1.S.14	Sparganium erect swamp
		7.1.S.15	Acorus calamus swamp
		7.1.S.16	Sagittaria sagitt swamp
		7.1.S.17	Carex pseudocyp swamp
		7.1.S.18	Carex otrubae swamp
		7.1.S.22	Glycer fluit water-marg
		7.1.S.23	Other water-margin veg
6.2.2	Inundation vegetation	4.4.M.27	Filipend vulg-Ange sylv
		4.4.M.28	Iris pseudac-Fili ulma
7	OPEN WATER (standing/running)	7.1.S.22	Glycer fluit water-marg
		7.1.S.23	Other water-margin veg
7.1	STANDING WATER	1.1	FLOATING AQUATIC
		1.2.A.5	Ceratophyllum demersum
		1.2.A.7	Nymphaea alba
		1.2.A.8	Nuphar lutea
		1.2.A.9	Potamogeton natans
		1.2.A.10	Polygonum amphibium
		1.2.A.11	Potam pect-Myrio spic
		1.2.A.12	Potamogeton pectinatus
		1.2.A.13	Potam perf-Myrio alte
		1.2.A.14	Myriophyllum alternif
		1.2.A.15	Elodea canadensis
		1.2.A.21	Ranunculus baudotii
		1.2.A.22	Littorella-Lobelia
		1.2.A.23	Isoetes lacustr/setac
		1.2.A.24	Juncus bulbosus
		7.1.S.9	Carex rostrata swamp
		7.1.S.10	Equiset fluviatil swamp
		7.1.S.11	Carex vesicaria swamp
		7.1.S.12	Typha latifolia swamp
		7.1.S.13	Typha angustifol swamp
		7.1.S.14	Sparganium erect swamp
		7.1.S.15	Acorus calamus swamp
		7.1.S.16	Sagittaria sagitt swamp
		7.1.S.17	Carex pseudocyp swamp
		7.1.S.18	Carex otrubae swamp

TABLE 10 INTER-COMPARISON OF SELECTED LAND COVER CLASSIFICATIONS

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NCC PHASE I SURVEY *vs* NATIONAL VEGETATION CLASSIFICATION

NCC PHASE I SURVEY		NATIONAL VEGETATION CLASSIFICATION	
7.2	RUNNING WATER	1.2.A.16	Callitriche stagnalis
		1.2.A.17	Ranunc penicillatus
		1.2.A.18	Ranunculus fluitans
		1.2.A.19	Ranunculus aquatilis
		1.2.A.20	Ranunculus peltatus
		7.1.S.5	Glyceria maxima swamp
		7.1.S.6	Carex riparia swamp
		7.1.S.7	Carex acutiformis swamp
		7.1.S.8	Scirpus lacustris swamp
8.1.1	Intertidal - Mud/Sand	8.1.SD.3	Matri mari-Galium apar
		9.1.SM.1	Zostera
		9.1.SM.2	Ruppia maritima
8.1.2	Intertidal - Shingle/Cobbles	8.1	STRANDLINE AND SHINGLE VEGETATION
8.2	SALTMARSH	9.1.SM.3	Eleocharis parvula
		9.2	LOWER AND MIDDLE SALTMARSH
		9.3	UPPER SALTMARSH AND SALT MEADOWS
		9.4	SALTMARSH DRIFTLINE VEGETATION
8.3	SHINGLE/GRAVEL ABOVE HIGH-TIDE MARK	8.1	STRANDLINE AND SHINGLE VEGETATION
8.6.4	Dune slack	8.2.SD.6	Ammophila arenaria
		8.2.SD.7	Ammoph aren-Fest rubra
		8.3.SD.10	Carex arenaria
		8.3.SD.11	Carex aren-Cornic acul
		8.3.SD.12	Car are-Fes ovi-Agr cap
		8.4	DUNE SLACK AND ALLIED SALIX REPENS VEG.
8.6.5	Dune grassland	8.3	FIXED DUNE GRASSLAND
8.6.6	Dune heath	3.1	COASTAL AND LOWLAND HEATH
		3.2.H.12	Calluna-Vacc myrt heath
		3.2.H.13	Calluna-Clad arbu heath
		3.2.H.14	Calluna-Raco lanu heath
		3.2.H.15	Calluna-Juni nana heath
		3.2.H.16	Calluna-Arct uva- heath
		3.2.H.21	Cal vul-Vac myr-Sph cap
		4.3.M.16	Erica tetr-Spha comp
8.6.7	Dune scrub	8.5	DUNE SCRUB
		11.8.W.19	Junip com-Oxal ace wood
		11.9	SUBARCTIC WILLOW SCRUB
		11.10	THORNY SCRUB THICKETS ETC.
8.6.8	Open dune	8.2.SD.4	Elymus farctus
		8.2.SD.5	Leymus arenarius
		8.2.SD.6	Ammophila arenaria
		8.4	DUNE SLACK AND ALLIED SALIX REPENS VEG.
8.8.1	Maritime hard cliff (<10% vasc pl. cover	5.1.MC.1	Crith mar-Sperg rupicol
8.8.2	Maritime soft cliff (<10% vasc. pl.cover		
8.8.3	Crevice and ledge vegetation (>10%)	5.1.MC.2	Armer mar-Ligustic scot
		5.1.MC.3	Rhodi ros-Armeria mari
		5.1.MC.4	Brassica oleracea cliff
		5.1.MC.5	Armer mar-Cerast diffus
		5.2	EUTROPHIC MARITIME CLIFF VEGETATION
		5.3	CLIFF & SALT-INFLUENCED MARITIME GRASSL.
8.8.4	Coastal grassland (not dune)	5.1.MC.2	Armer mar-Ligustic scot
		5.1.MC.3	Rhodi ros-Armeria mari
		5.1.MC.4	Brassica oleracea cliff
		5.1.MC.5	Armer mar-Cerast diffus
		5.2	EUTROPHIC MARITIME CLIFF VEGETATION
		5.3	CLIFF & SALT-INFLUENCED MARITIME GRASSL.
8.8.5	Coastal heathland (not dune)	3.1	COASTAL AND LOWLAND HEATH
		3.2.H.12	Calluna-Vacc myrt heath
		3.2.H.13	Calluna-Clad arbu heath
		3.2.H.14	Calluna-Raco lanu heath
		3.2.H.15	Calluna-Juni nana heath
		3.2.H.16	Calluna-Arct uva- heath
		3.2.H.21	Cal vul-Vac myr-Sph cap
		4.3.M.16	Erica tetr-Spha comp
9.1.1	Inland cliff	10.4.U.15	Saxif aizo-Alchem glabr
		10.5.U.22	Asple tric-Asple ruta-m
		10.5.U.23	Asple viri-Cysto fragil
		10.5.U.24	Arrhen ela-Geran robert
9.1.2	Scree	10.5.U.21	Crypt cris-Desch flexu

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NCC PHASE I SURVEY *vs* NATIONAL VEGETATION CLASSIFICATION

NCC PHASE I SURVEY		NATIONAL VEGETATION CLASSIFICATION	
9.1.3	Limestone pavement	10.5.U.22	Asple tric-Asple ruta-m
		10.5.U.23	Asple viri-Cysto fragil
		10.5.U.24	Arrhen ela-Geran robert
9.1.4	Other rock exposure	10.5.U.21	Crypt cris-Desch flexu
10.1.4	Introduced shrub dominated	8.5	DUNE SCRUB
		11.8.W.19	Junip com-Oxal ace wood
		11.9	SUBARCTIC WILLOW SCRUB
		11.10	THORNY SCRUB THICKETS ETC.

Categories in the NCC Phase I Habitat survey which are not cross-referenced to NVC categories.

1.1.1.2	Broadleaved woodland - Plantation
1.1.2.2	Conifer woodland - Plantation
1.1.3	Mixed woodland (10-90% of either)
1.3	PARKLAND & SCATTERED TREES (<30% cover)
1.4	RECENTLY-FELLED WOODLAND (future use?)
2.4	IMPROVED GRASSLAND
2.6	POOR SEMI-IMPROVED GRASSLAND
3.1.2	Bracken - Scattered
3.3.2	Tall herb/fern - Non-ruderal
8.1.3	Intertidal - Boulders/Rocks
8.4	BOULDERS/ROCKS ABOVE HIGH-TIDE MARK
8.5	STRANDLINE VEGETATION
9.1.5	Cave
9.2	ARTIFICIAL EXPOSURES AND WASTE TIPS
10.1.1	Arable (incl. horticulture & grs. leys)
10.1.2	Amenity grassland
10.1.3	Ephemeral/Short perennial
10.2	BOUNDARIES
10.3	BUILT-UP AREAS
10.4	OTHER BARE GROUND
10.5	OTHER HABITAT

Categories in the NVC which are not cross-referenced to the NCC Phase I Habitat survey categories.

2.2	CALCICOLOUS DWARF-SHRUB VEGETATION
3.2.H.17	Calluna-Arct alpi heath

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CORINE BIOTOPES HABITATS *vs* NATIONAL VEGETATION CLASSIFICATION

CORINE BIOTOPES		NATIONAL VEGETATION CLASSIFICATION	
1.3.1	Tidal rivers	1.2.A.16	Callitriche stagnalis
		1.2.A.17	Ranunc penicillatus
		1.2.A.18	Ranunculus fluitans
		1.2.A.19	Ranunculus aquatilis
		1.2.A.20	Ranunculus peltatus
		7.1.S.5	Glyceria maxima swamp
		7.1.S.6	Carex riparia swamp
		7.1.S.7	Carex acutiformis swamp
		7.1.S.8	Scirpus lacustris swamp
		7.1.S.22	Glycer fluit water-marg
		7.1.S.23	Other water-margin veg
1.4	MUD FLATS AND SAND FLATS	9.1.SM.1	Zostera
		9.1.SM.2	Ruppia maritima
1.5	SALT MARSHES/STEPPES & GYPSUM SCRUBS	9.1.SM.3	Eleocharis parvula
		9.2	LOWER AND MIDDLE SALTMARSH
		9.3	UPPER SALTMARSH AND SALT MEADOWS
		9.4	SALTMARSH DRIFTLINE VEGETATION
1.6.1	Sand beaches	8.1.SD.3	Matri mari-Galium apar
1.6.2	Dunes	8.2	MOBILE DUNE GRASSLAND
		8.3	FIXED DUNE GRASSLAND
		8.4	DUNE SLACK AND ALLIED SALIX REPENS VEG.
1.6.3	Humid dune-slacks	8.2	MOBILE DUNE GRASSLAND
		8.3	FIXED DUNE GRASSLAND
		8.4	DUNE SLACK AND ALLIED SALIX REPENS VEG.
1.7	SHINGLE BEACHES	8.1	STRANDLINE AND SHINGLE VEGETATION
1.8	CLIFFS AND ROCKY SHORES	5.1.MC.1	Crith mar-Sperg rupicol
1.8.2	Vegetated sea cliffs and rocky shores	5.1.MC.2	Armer mar-Ligustic scot
		5.1.MC.3	Rhodi ros-Armeria marit
		5.1.MC.4	Brassica oleracea cliff
		5.1.MC.5	Armer mar-Cerast diffus
		5.2	EUTROPHIC MARITIME CLIFF VEGETATION
		5.3	CLIFF & SALT-INFLUENCED MARITIME GRASSL.
1.9	ISLETS AND ROCK STACKS	5.1.MC.1	Crith mar-Sperg rupicol
1.A	MACHAIR	8.3	FIXED DUNE GRASSLAND
2.2	STANDING FRESH WATER	1.1	FLOATING AQUATIC
		1.2.A.5	Ceratophyllum demersum
		1.2.A.7	Nymphaea alba
		1.2.A.8	Nuphar lutea
		1.2.A.9	Potamogeton natans
		1.2.A.10	Polygonum amphibium
		1.2.A.11	Potam pect-Myrio spic
		1.2.A.12	Potamogeton pectinatus
		1.2.A.13	Potam perf-Myrio alte
		1.2.A.14	Myriophyllum alterni f
		1.2.A.15	Elodea canadensis
		1.2.A.21	Ranunculus baudotii
		1.2.A.22	Littorella-Lobelia
		1.2.A.23	Isoetes lacustr/setac
		1.2.A.24	Juncus bulbosus
		7.1.S.9	Carex rostrata swamp
		7.1.S.10	Equiset fluviatil swamp
		7.1.S.11	Carex vesicaria swamp
		7.1.S.12	Typha latifolia swamp
		7.1.S.13	Typha angustifol swamp
		7.1.S.14	Sparganium erect swamp
		7.1.S.15	Acorus calamus swamp
		7.1.S.16	Sagittaria sagitt swamp
		7.1.S.17	Carex pseudocyp swamp
		7.1.S.18	Carex otrubae swamp
		7.1.S.22	Glycer fluit water-marg
		7.1.S.23	Other water-margin veg

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CORINE BIOTOPES HABITATS *vs* NATIONAL VEGETATION CLASSIFICATION

CORINE BIOTOPES		NATIONAL VEGETATION CLASSIFICATION	
2.3	STANDING BRACKISH AND SALT WATER	1.1	FLOATING AQUATIC
		1.2.A.5	Ceratophyllum demersum
		1.2.A.7	Nymphaea alba
		1.2.A.8	Nuphar lutea
		1.2.A.9	Potamogeton natans
		1.2.A.10	Polygonum amphibium
		1.2.A.11	Potam pect-Myrio spic
		1.2.A.12	Potamogeton pectinatus
		1.2.A.13	Potam perf-Myrio alte
		1.2.A.14	Myriophyllum alternif
		1.2.A.15	Elodea canadensis
		1.2.A.21	Ranunculus baudotii
		1.2.A.22	Littorella-Lobelia
		1.2.A.23	Isoetes lacustr/setac
		1.2.A.24	Juncus bulbosus
		7.1.S.9	Carex rostrata swamp
		7.1.S.10	Equiset fluviatil swamp
		7.1.S.11	Carex vesicaria swamp
		7.1.S.12	Typha latifolia swamp
		7.1.S.13	Typha angustifol swamp
		7.1.S.14	Sparganium erect swamp
		7.1.S.15	Acorus calamus swamp
		7.1.S.16	Sagittaria sagitt swamp
		7.1.S.17	Carex pseudocyp swamp
		7.1.S.18	Carex otrubae swamp
		7.1.S.22	Glycer fluit water-marg
		7.1.S.23	Other water-margin veg
2.4	RUNNING WATER	1.2.A.16	Callitriche stagnalis
		1.2.A.17	Ranunc penicillatus
		1.2.A.18	Ranunculus fluitans
		1.2.A.19	Ranunculus aquatilis
		1.2.A.20	Ranunculus peltatus
		7.1.S.5	Glyceria maxima swamp
		7.1.S.6	Carex riparia swamp
		7.1.S.7	Carex acutiformis swamp
		7.1.S.8	Scirpus lacustris swamp
		7.1.S.22	Glycer fluit water-marg
		7.1.S.23	Other water-margin veg
3.1.1	Wet heaths	3.1	COASTAL AND LOWLAND HEATH
		3.2.H.12	Calluna-Vacc myrt heath
		3.2.H.13	Calluna-Clad arbu heath
		3.2.H.14	Calluna-Raco lanu heath
		3.2.H.15	Calluna-Juni nana heath
		3.2.H.16	Calluna-Arct uva- heath
		3.2.H.21	Cal vul-Vac myr-Sph cap
		4.1	BOG POOLS
		4.3.M.14	Schoen nigr-Narthecium
		4.3.M.15	Scirpu cesp-Eric tetr
		4.3.M.16	Erica tetr-Spha comp
		4.3.M.17	Scirp cesp-Erio vagi
		4.3.M.18	Erica tetr-Spha papi
		4.3.M.21	Narth ossi-Spha papi
3.1.2	Dry heaths	3.1	COASTAL AND LOWLAND HEATH
		3.2.H.12	Calluna-Vacc myrt heath
		3.2.H.13	Calluna-Clad arbu heath
		3.2.H.14	Calluna-Raco lanu heath
		3.2.H.15	Calluna-Juni nana heath
		3.2.H.16	Calluna-Arct uva- heath
		3.2.H.18	Vacc myrt-Desc fle heath
		3.2.H.19	Vacc myrt-Clad arb heath
		3.2.H.20	Vacc myrt-Raco lan heath
		3.2.H.21	Cal vul-Vac myrt-Sph cap
		3.2.H.22	Vac myrt-Rub cham heath
		4.3.M.16	Erica tetr-Spha comp
3.1.4	Alpine and boreal heaths	2.2	CALCICOLOUS DWARF-SHRUB VEGETATION
		3.2.H.17	Calluna-Arct alpi heath
		3.2.H.18	Vacc myrt-Desc fle heath
		3.2.H.19	Vacc myrt-Clad arb heath
		3.2.H.20	Vacc myrt-Raco lan heath
		3.2.H.22	Vac myrt-Rub cham heath
3.1.6	Subalpine bush and tall herb communities	8.5	DUNE SCRUB
		11.8.W.19	Junip com-Oxal ace wood
		11.9	SUBARCTIC WILLOW SCRUB
		11.10	THORNY SCRUB THICKETS ETC.
3.1.8.1	Medio-European rich-soil thickets	8.5	DUNE SCRUB
		11.8.W.19	Junip com-Oxal ace wood
		11.9	SUBARCTIC WILLOW SCRUB
		11.10	THORNY SCRUB THICKETS ETC.

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CORINE BIOTOPES		NATIONAL VEGETATION CLASSIFICATION	
3.1.8.2	Box thickets	8.5	DUNE SCRUB
		11.8.W.19	Junip com-Oxal ace wood
		11.9	SUBARCTIC WILLOW SCRUB
		11.10	THORNY SCRUB THICKETS ETC.
3.1.8.3	Atlantic poor-sod thickets	8.5	DUNE SCRUB
		11.8.W.19	Junip com-Oxal ace wood
		11.9	SUBARCTIC WILLOW SCRUB
		11.10	THORNY SCRUB THICKETS ETC.
3.1.8.4	Broom fields	8.5	DUNE SCRUB
		11.8.W.19	Junip com-Oxal ace wood
		11.9	SUBARCTIC WILLOW SCRUB
		11.10	THORNY SCRUB THICKETS ETC.
3.1.8.5	Gorse thickets	8.5	DUNE SCRUB
		11.8.W.19	Junip com-Oxal ace wood
		11.9	SUBARCTIC WILLOW SCRUB
		11.10	THORNY SCRUB THICKETS ETC.
3.1.8.6	Bracken fields	10.4.U.20	Pteri aqui-Galium saxat
3.1.8.8	Common juniper scrub	8.5	DUNE SCRUB
		11.8.W.19	Junip com-Oxal ace wood
		11.9	SUBARCTIC WILLOW SCRUB
		11.10	THORNY SCRUB THICKETS ETC.
3.1.8.C	Hazel thicket	8.5	DUNE SCRUB
		11.8.W.19	Junip com-Oxal ace wood
		11.9	SUBARCTIC WILLOW SCRUB
		11.1	THORNY SCRUB THICKETS ETC.
3.1.8.D	Deciduous scrub woodland	8.5	DUNE SCRUB
		11.2	WET BIRCH AND ALDER WOOD
		11.3	BASIC WOODLAND - ASH, HAZEL, MAPLE ETC
		11.4	MEOSOPHILOUS MIXED BROADLEAF WOODLAND
		11.5.W.12	Fagus syl-Merc per wood
		11.6	ACID BEECHWOOD
		11.7	UPLAND OAK AND BIRCH WOOD
		11.8.W.19	Junip com-Oxal ace wood
		11.9	SUBARCTIC WILLOW SCRUB
		11.10	THORNY SCRUB THICKETS ETC.
3.1.8.E	Coppice	11.3.W.8	Fra exc-Ace cam-Mer per (subcomms a-d)
3.1.8.F	Mixed scrub woodland	8.5	DUNE SCRUB
		11.8.W.19	Junip com-Oxal ace wood
		11.9	SUBARCTIC WILLOW SCRUB
		11.10	THORNY SCRUB THICKETS ETC.
3.1.8.G	Coniferous scrub woodland	8.5	DUNE SCRUB
		11.5.W.13	Taxus baccata woodland
		11.8	NATIVE PINE AND JUNIPER WOOD
		11.9	SUBARCTIC WILLOW SCRUB
		11.10	THORNY SCRUB THICKETS ETC.
3.4.2	Lowland heavy metal grasslands	2.1	CALCAREOUS GRASSLAND
		10.1.U.1	Fes ovi-Agr cap-Rum acl
		10.1.U.4	Fes ovi-Agr cap-Gal sax
3.4.3	Dense per. grassl. & mid-Euro. steppes	2.1.CG.1	Fest ovina-Carlina vulg
		2.1.CG.2	Fest ovina-Avenula pra
		2.1.CG.3	Bromus erectus
		2.1.CG.4	Brachypodium pinnatum
		2.1.CG.5	Brom erect-Brach pinnat
		2.1.CG.6	Avenula pubescens
		2.1.CG.7	Fest ovi-Hier pil-Thym
		2.1.CG.8	Sesleria-Scabios columb
		2.1.CG.9	Sesleria-Gal sterneri
		2.1.CG.10	Fest ovi-Agro cap-Thym
3.5	DRY SILICEOUS GRASSLAND	10.1.U.2	Deschampsia flexuosa
		10.1.U.3	Agrostis curtisii
		10.1.U.5	Nardus str-Galium saxat
		10.1.U.6	Juoc squarr-Fest ovina

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CORINE BIOTOPES HABITATS *vs* NATIONAL VEGETATION CLASSIFICATION

CORINE BIOTOPES		NATIONAL VEGETATION CLASSIFICATION	
3.5.1	Atlantic mat-gr. swards & related comm.	2.1.CG.11	Fes ovi-Agr cap-Alc alp
		2.1.CG.12	Fes ovi-Alc alp-Sal aca
		10.1.U.1	Fes ovi-Agr cap-Rum acl
		10.1.U.4	Fes ovi-Agr cap-Gal sax
3.6	ALPINE AND SUBALPINE GRASSLANDS	10.3.U.11	Polyt sexa-Kiaeria star
		10.3.U.13	Desch cesp-Galium saxat
		10.3.U.14	Alchem alp-Sibbald proc
		10.4.U.16	Luzul sylv-Vaccin myrt
		10.4.U.17	Luzul sylv-Geum rivale
		10.4.U.18	Crypt cris-Athy disten
		10.4.U.19	Thely limb-Blec spican
3.6.1	Snow-patch communities	10.3.U.12	Salix herb-Racom hetero
3.6.3	Alpine & subalpine acidophilous grassl.	10.2	MONTANE GRASSLAND AND ALLIED COMMUNITIES
3.7.1	Meadowsweet stands & related communities	4.4.M.27	Filipend vulg-Ange sylv
		4.4.M.28	Iris pseudac-Fili ulma
		6.2.MG.2	Filip ulm-Arrhen elat
3.7.2	Eutrophic humid grasslands	6.2.MG.3	Anthox odo-Geran sylv
		6.2.MG.4	Alopec pra-Sangui offi
		6.2.MG.5	Cynos cris-Centaur nigr
		6.2.MG.6	Lolium per-Cynos cris
		6.2.MG.8	Cynos cris-Caltha palu
		6.2.MG.9	Holc lana-Desch cespit
		6.2.MG.10	Holc lana-Junc effusus
		6.3	GRASSY FLOOD-SWARDS
3.7.3	Oligotrophic humid grasslands	4.4.M.24	Molinia-Cirs dissectum
		4.4.M.25	Molinia-Pot erecta mire
		4.4.M.26	Molinia-Crepis paludosa
3.7.7	Humid tall herb fringes	4.4.M.27	Filipend vulg-Ange sylv
		4.4.M.28	Iris pseudac-Fili ulma
		6.2.MG.2	Filip ulm-Arrhen elat
3.7.8	Subalpine & alpine tall herb communities	10.3.U.11	Polyt sexa-Kiaeria star
		10.3.U.13	Desch cesp-Galium saxat
		10.3.U.14	Alchem alp-Sibbald proc
		10.4.U.16	Luzul sylv-Vaccin myrt
		10.4.U.17	Luzul sylv-Geum rivale
		10.4.U.18	Crypt cris-Athy disten
		10.4.U.19	Thely limb-Blec spican
3.8.1.1	Mesophile pastures (unbroken pastures)	6.2.MG.3	Anthox odo-Geran sylv
		6.2.MG.4	Alopec pra-Sangui offi
		6.2.MG.5	Cynos cris-Centaur nigr
		6.2.MG.6	Lolium per-Cynos cris
		6.2.MG.8	Cynos cris-Caltha palu
		6.2.MG.9	Holc lana-Desch cespit
		6.2.MG.10	Holc lana-Junc effusus
		6.3	GRASSY FLOOD-SWARDS
3.8.1.2	Ditch-broken pastures	6.2.MG.3	Anthox odo-Geran sylv
		6.2.MG.4	Alopec pra-Sangui offi
		6.2.MG.5	Cynos cris-Centaur nigr
		6.2.MG.6	Lolium per-Cynos cris
		6.2.MG.8	Cynos cris-Caltha palu
		6.2.MG.9	Holc lana-Desch cespit
		6.2.MG.10	Holc lana-Junc effusus
		6.3	GRASSY FLOOD-SWARDS
3.8.1.3	Overgrown pastures	6.1	COARSE GRASSLAND
3.8.2	Lowland hay meadows	6.2.MG.3	Anthox odo-Geran sylv
		6.2.MG.4	Alopec pra-Sangui offi
		6.2.MG.5	Cynos cris-Centaur nigr
		6.2.MG.6	Lolium per-Cynos cris
		6.2.MG.8	Cynos cris-Caltha palu
		6.2.MG.9	Holc lana-Desch cespit
		6.2.MG.10	Holc lana-Junc effusus
		6.3	GRASSY FLOOD-SWARDS

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CORINE BIOTOPES HABITATS *vs* NATIONAL VEGETATION CLASSIFICATION

CORINE BIOTOPES		NATIONAL VEGETATION CLASSIFICATION	
4.1	BROAD-LEAVED DECIDUOUS FORESTS	11.2	WET BIRCH AND ALDER WOOD
		11.3	BASIC WOODLAND - ASH, HAZEL, MAPLE ETC
		11.4	MESOSOPHILOUS MIXED BROADLEAF WOODLAND
		11.5.W.12	Fagus syl-Merc per wood
		11.6	ACID BEECHWOOD
		11.7	UPLAND OAK AND BIRCH WOOD
4.2	CONIFER WOODLAND	11.5.W.13	Taxus baccata woodland
		11.8.W.18	Pinus syl-Hyl spic wood
4.4	ALLUVIAL AND VERY WET FORESTS AND BRUSH	11.2	WET BIRCH AND ALDER WOOD
4.4.1	Riparian willow formations	11.1	SALLOW AND WILLOW CARR
		11.3	BASIC WOODLAND - ASH, HAZEL, MAPLE ETC
		11.4	MESOSOPHILOUS MIXED BROADLEAF WOODLAND
		11.5.W.12	Fagus syl-Merc per wood
		11.6	ACID BEECHWOOD
		11.7	UPLAND OAK AND BIRCH WOOD
4.4.3	Medio-European stream ash-alder woods	11.3	BASIC WOODLAND - ASH, HAZEL, MAPLE ETC
		11.4	MESOSOPHILOUS MIXED BROADLEAF WOODLAND
		11.5.W.12	Fagus syl-Merc per wood
		11.6	ACID BEECHWOOD
		11.7	UPLAND OAK AND BIRCH WOOD
4.4.9	Alder, willow and bog-myrtle swamp woods	11.1	SALLOW AND WILLOW CARR
4.4.A	Birch and conifer swamp woods	11.3	BASIC WOODLAND - ASH, HAZEL, MAPLE ETC
		11.4	MESOSOPHILOUS MIXED BROADLEAF WOODLAND
		11.5.W.12	Fagus syl-Merc per wood
		11.6	ACID BEECHWOOD
		11.7	UPLAND OAK AND BIRCH WOOD
5.1.1	Near-natural raised bogs	4.1	BOG POOLS
		4.3.M.14	Schoen nigr-Narthecium
		4.3.M.15	Scirpu cesp-Eric tetr
		4.3.M.17	Scirp cesp-Erio vagi
		4.3.M.18	Erica tetr-Spha papi
		4.3.M.21	Narth ossi-Spha papi
5.1.2	Purple moorgrass bogs	4.4.M.24	Molinia-Cirs dissectum
		4.4.M.25	Molinia-Pot erecta mire
		4.4.M.26	Molinia-Crepis paludosa
5.2.1	Lowland blanket bogs	4.1	BOG POOLS
		4.3.M.14	Schoen nigr-Narthecium
		4.3.M.15	Scirpu cesp-Eric tetr
		4.3.M.17	Scirp cesp-Erio vagi
		4.3.M.18	Erica tetr-Spha papi
		4.3.M.21	Narth ossi-Spha papi
5.2.2	Upland blanket bogs	4.3.M.19	Calluna-E vag blanket b
		4.3.M.20	Erioph vag blanket/rais
5.3	WATER-FRINGE VEGETATION	7.1.S.5	Glyceria maxima swamp
		7.1.S.6	Carex riparia swamp
		7.1.S.7	Carex acutiformis swamp
		7.1.S.8	Scirpus lacustris swamp

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CORINE BIOTOPES HABITATS *vs* NATIONAL VEGETATION CLASSIFICATION

CORINE BIOTOPES		NATIONAL VEGETATION CLASSIFICATION	
5.3.1	Reed beds	4.2.M.4	Carex rostr-Sph rec
		4.2.M.5	Carex rostr-Sph squarr
		4.2.M.8	Carex rostr-Sph warnst
		4.2.M.9	Carex rostr-Call cusp
		4.4.M.27	Filipend vulg-Ange sylv
		4.4.M.28	Iris pseudac-Fili ulma
		7.1.S.1	Carex elata swamp
		7.1.S.2	Cladium mariscus swamp
		7.1.S.3	Carex paniculata swamp
		7.1.S.9	Carex rostrata swamp
		7.1.S.10	Equiset fluviatil swamp
		7.1.S.11	Carex vesicaria swamp
		7.1.S.12	Typha latifolia swamp
		7.1.S.13	Typha angustifol swamp
		7.1.S.14	Sparganium erect swamp
		7.1.S.15	Acorus calamus swamp
		7.1.S.16	Sagittaria sagitt swamp
		7.1.S.17	Carex pseudocyp swamp
		7.1.S.18	Carex otrubae swamp
		7.1.S.19	Eleocharis palustris swamp
		7.1.S.20	Scirpus tabern swamp
		7.1.S.21	Scirpus maritimus swamp
		7.1.S.22	Glycer fluit water-marg
		7.1.S.23	Other water-margin veg
		7.2	TALL-HERB FENS
5.3.2	Large-sedge communities	4.2.M.4	Carex rostr-Sph rec
		4.2.M.5	Carex rostr-Sph squarr
		4.2.M.8	Carex rostr-Sph warnst
		4.2.M.9	Carex rostr-Call cusp
		4.4.M.27	Filipend vulg-Ange sylv
		4.4.M.28	Iris pseudac-Fili ulma
		7.1.S.1	Carex elata swamp
		7.1.S.2	Cladium mariscus swamp
		7.1.S.3	Carex paniculata swamp
		7.1.S.9	Carex rostrata swamp
		7.1.S.11	Carex vesicaria swamp
		7.1.S.12	Typha latifolia swamp
		7.1.S.13	Typha angustifol swamp
		7.1.S.14	Sparganium erect swamp
		7.1.S.15	Acorus calamus swamp
		7.1.S.16	Sagittaria sagitt swamp
		7.1.S.17	Carex pseudocyp swamp
		7.1.S.18	Carex otrubae swamp
		7.1.S.19	Eleocharis palustris swamp
		7.1.S.20	Scirpus tabern swamp
		7.1.S.21	Scirpus maritimus swamp
		7.2	TALL-HERB FENS
5.3.3	Fen-sedge beds	4.2.M.4	Carex rostr-Sph rec
		4.2.M.5	Carex rostr-Sph squarr
		4.2.M.8	Carex rostr-Sph warnst
		4.2.M.9	Carex rostr-Call cusp
		4.4.M.27	Filipend vulg-Ange sylv
		4.4.M.28	Iris pseudac-Fili ulma
		7.1.S.1	Carex elata swamp
		7.1.S.2	Cladium mariscus swamp
		7.1.S.3	Carex paniculata swamp
		7.1.S.9	Carex rostrata swamp
		7.1.S.11	Carex vesicaria swamp
		7.1.S.12	Typha latifolia swamp
		7.1.S.13	Typha angustifol swamp
		7.1.S.14	Sparganium erect swamp
		7.1.S.15	Acorus calamus swamp
		7.1.S.16	Sagittaria sagitt swamp
		7.1.S.17	Carex pseudocyp swamp
		7.1.S.18	Carex otrubae swamp
		7.1.S.19	Eleocharis palustris swamp
		7.1.S.20	Scirpus tabern swamp
		7.1.S.21	Scirpus maritimus swamp
		7.2	TALL-HERB FENS
5.3.4	Small reed beds of fast-flowing waters	7.1.S.22	Glycer fluit water-marg
		7.1.S.23	Other water-margin veg

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CORINE BIOTOPES HABITATS *vs* NATIONAL VEGETATION CLASSIFICATION

CORINE BIOTOPES		NATIONAL VEGETATION CLASSIFICATION	
5.3.5	Tall rush swamps	4.2.M.4	Carex rostr-Sph rec
		4.2.M.5	Carex rostr-Sph squarr
		4.2.M.8	Carex rostr-Sph warnst
		4.2.M.9	Carex rostr-Call cusp
		4.4.M.27	Filipend vulg-Ange sylv
		4.4.M.28	Iris pseudac-Fili ulma
		7.1.S.1	Carex elata swamp
		7.1.S.2	Cladium mariscus swamp
		7.1.S.3	Carex paniculata swamp
		7.1.S.9	Carex rostrata swamp
		7.1.S.11	Carex vesicaria swamp
		7.1.S.12	Typha latifolia swamp
		7.1.S.13	Typha angustifol swamp
		7.1.S.14	Sparganium erect swamp
		7.1.S.15	Acorus calamus swamp
		7.1.S.16	Sagittaria sagitt swamp
		7.1.S.17	Carex pseudocyp swamp
		7.1.S.18	Carex otrubae swamp
		7.1.S.19	Eleocharis palustris swamp
		7.1.S.20	Scirpus tabern swamp
		7.1.S.21	Scirpus maritimus swamp
		7.2	TALL-HERB FENS
5.4.1	Springs	4.2.M.6	Carex echin-Sph rec/aur
		4.2.M.7	Carex curta-Sph russ
		4.2.M.10	Carex dioic-Ptig vulg
		4.2.M.11	Carex demis-Saxi aizo
		4.2.M.12	Carex saxatilis mire
		4.2.M.13	Schoen nigr-Junc subno
		4.4.M.22	Junc subnod-Cirsi palu
		4.4.M.23	Junc eff/acfl-Gal palu
		4.5	SPRING AND FLUSH-FRINGE VEGETATION
5.4.2	Rich fens	4.2	SEDGE FLUSHES (small sedges)
		4.4.M.22	Junc subnod-Cirsi palu
		4.4.M.23	Junc eff/acfl-Gal palu
		4.4.M.27	Filipend vulg-Ange sylv
		4.4.M.28	Iris pseudac-Fili ulma
		4.5	SPRING AND FLUSH-FRINGE VEGETATION
		7.1.S.1	Carex elata swamp
		7.1.S.2	Cladium mariscus swamp
		7.1.S.3	Carex paniculata swamp
		7.1.S.5	Glyceria maxima swamp
		7.1.S.6	Carex riparia swamp
		7.1.S.7	Carex acutiformis swamp
		7.1.S.8	Scirpus lacustris swamp
		7.1.S.9	Carex rostrata swamp
		7.1.S.11	Carex vesicaria swamp
		7.1.S.12	Typha latifolia swamp
		7.1.S.13	Typha angustifol swamp
		7.1.S.14	Sparganium erect swamp
		7.1.S.15	Acorus calamus swamp
		7.1.S.16	Sagittaria sagitt swamp
		7.1.S.17	Carex pseudocyp swamp
		7.1.S.18	Carex otrubae swamp
		7.1.S.19	Eleocharis palustris swamp
		7.1.S.20	Scirpus tabern swamp
		7.1.S.21	Scirpus maritimus swamp
		7.2	TALL-HERB FENS
5.4.4	Acidic fens	4.2.M.6	Carex echin-Sph rec/aur
		4.2.M.7	Carex curta-Sph russ
		4.2.M.10	Carex dioic-Ptig vulg
		4.2.M.11	Carex demis-Saxi aizo
		4.2.M.12	Carex saxatilis mire
		4.2.M.13	Schoen nigr-Junc subco
		4.4.M.22	Junc subnod-Cirsi palu
		4.4.M.23	Junc eff/acfl-Gal palu
		4.5	SPRING AND FLUSH-FRINGE VEGETATION

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CORINE BIOTOPES HABITATS *vs* NATIONAL VEGETATION CLASSIFICATION

CORINE BIOTOPES		NATIONAL VEGETATION CLASSIFICATION	
5.4.5	Transition mires	4.2.M.4	Carex rostr-Sph rec
		4.2.M.5	Carex rostr-Sph squarr
		4.2.M.8	Carex rostr-Sph warnst
		4.2.M.9	Carex rostr-Call cusp
		4.4.M.27	Filipend vulg-Ange sylv
		4.4.M.28	Iris pseudac-Fili ulma
		7.1.S.1	Carex elata swamp
		7.1.S.2	Cladium mariscus swamp
		7.1.S.3	Carex paniculata swamp
		7.1.S.5	Glyceria maxima swamp
		7.1.S.6	Carex riparia swamp
		7.1.S.7	Carex acutiformis swamp
		7.1.S.8	Scirpus lacustris swamp
		7.1.S.9	Carex rostrata swamp
		7.1.S.11	Carex vesicaria swamp
		7.1.S.12	Typha latifolia swamp
		7.1.S.13	Typha angustifol swamp
		7.1.S.14	Sparganium erect swamp
		7.1.S.15	Acorus calamus swamp
		7.1.S.16	Sagittaria sagitt swamp
		7.1.S.17	Carex pseudocyp swamp
		7.1.S.18	Carex otrubae swamp
		7.1.S.19	Eleocharis palustris swamp
		7.1.S.20	Scirpus tabern swamp
		7.1.S.21	Scirpus maritimus swamp
		7.2	TALL-HERB FENS
6.1	SCREES	10.5.U.21	Crypt cris-Desch flexu
6.2	INLAND CLIFFS AND EXPOSED ROCKS	10.5.U.22	Asple tric-Asple ruta-m
		10.5.U.23	Asple viri-Cysto fragil
		10.5.U.24	Arrhen ela-Geran robert
6.2.1	Vegetated calcareous inland cliffs	10.4.U.15	Saxif aizo-Alchem glabr
6.2.2	Vegetated siliceous inland cliffs		
6.2.4	Bare inland cliffs		
6.2.5	Wet inland cliffs		
6.4	INLAND SAND DUNE	8.2	MOBILE DUNE GRASSLAND
		8.3	FIXED DUNE GRASSLAND
		8.4	DUNE SLACK AND ALLIED SALIX REPENS VEG.
8.9.2	Fresh-water industrial lagoons & canals	7.1.S.5	Glyceria maxima swamp
		7.1.S.6	Carex riparia swamp
		7.1.S.7	Carex acutiformis swamp
		7.1.S.8	Scirpus lacustris swamp
		7.1.S.22	Glycer fluit water-marg
		7.1.S.23	Other water-margin veg

Categories in the CORINE Biotopes Classification which are not cross-referenced to NVC categories

1.1	OCEAN AND SEAS
1.2	SEA INLETS
1.3.2	Estuaries
1.3.3	Submerged beds of vascular marine veg.
1.3.4	Submerged beds of vascular brackish veg
2.1	LAGOONS
3.1.8.7	Woodland clearings
3.4.1	Middle European pioneer swards
4.5	BROAD-LEAVED EVERGREEN WOODLAND
6.5	CAVES
8.1	IMPROVED GRASSLANDS
8.2	CROPS
8.3	ORCHARDS, GROVES AND TREE PLANTATIONS
8.4	TREE LINES, HEDGES, SMALL WOODS, ETC.
8.5	URBAN PARKS AND LARGE GARDENS
8.6	TOWNS, VILLAGES, INDUSTRIAL SITES
8.7	FALLOW LAND, WASTE PLACES
8.9.1	Saline indutrial lagoons and canals

There are no categories in the NVC which are not cross-referenced to the CORINE Biotopes Classification

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UN ECE STATISTICAL CLASSIFICATION OF LAND USE *vs* BASELINE

UN ECE LAND USE		BASELINE	
1.1	ARABLE LAND	1.1	CEREALS
		1.2	BRASSICACEAE (EXCEPT HORTICULTURE)
		1.3	LEGUMES
		1.4	ROOTS AND ALLIES (NON-BRASSICA)
		1.5	ADDITIONAL FIELD CROPS (NON-HORTICULT.)
		1.6	HORTICULTURE
		1.7.1	Ploughed land
		3.2.1	Recently sown grass, including leys
1.2	LAND UNDER PERMANENT CROPS	2	CROPLAND WITH PERENNIAL CROPS
1.3	LAND UNDER PERMANENT MEADOWS & PASTURES	3.2.2	Est. swards with per. ryegrass dominant
		3.2.3	Well managed per. ryegrass & other grs.
		3.2.4	Weedy swards with per. ryegrass 25-50%
		3.3	PERMANENT NON-INTENSIVE GRASS
1.4	ALL OTHER AGRICULTURAL LAND	9.2.1	Agricultural buildings
1.5	FALLOW AGRICULTURAL LAND	1.7.2	Neglected, incl. permanent tumbledown
		1.7.3	Fallow, including rotational Set-aside
2.1	LAND UNDER CONIFEROUS FOREST	5.1.1	Conifer woodland
		5.4	FELLED WOODLAND (REGROWTH <1M HIGH)
2.2	LAND UNDER NON-CONIFEROUS FOREST	5.1.3	Broadleaved woodland
		5.4	FELLED WOODLAND (REGROWTH <1M HIGH)
2.3	LAND UNDER MIXED FOREST	5.1.2	Mixed woodland (>20% of each)
		5.4	FELLED WOODLAND (REGROWTH <1M HIGH)
2.4	OTHER WOODED LAND	5.2	MANAGED COPPICE
		5.3	SHRUB
3.1	RESIDENTIAL LAND	9.2.2	Residential buildings with gardens
		9.3.1	Residential buildings without gardens
3.2	INDUSTRIAL LAND, EXCL. QUARRIES ETC.	9.2.3	Commercial and industrial buildings
		9.3.2	Commercial and industrial buildings
		9.5.2	Car park
3.3.1	Land used for peat cutting	4.2	BOG
3.3.2	Other open-cast mining and quarrying	9.6	QUARRIES AND OTHER EXTRACTIVE INDUSTRIES
3.4	COMMERCIAL LAND	9.2.3	Commercial and industrial buildings
		9.3.2	Commercial and industrial buildings
		9.5.2	Car park
3.5	LAND USED FOR PUBLIC SERVICES	9.2.4.1	Institutional (govmnt., military, etc.)
		9.2.4.2	Education and cultural
		9.2.4.3	Religious
		9.3.3.1	Institutional (govmnt, military, etc.)
		9.3.3.2	Education and cultural
		9.3.3.3	Religious
3.7.1	Land under roads	9.1.2	Road
		9.5.2	Car park
3.7.2	Land under railways	9.1.1	Railway
3.7.3	Land under airports & related facilities	3.1.6	Other (eg airfield, racecourse etc.)
3.7.4	Other land for transport & communication	9.3.2	Commercial and industrial buildings
3.8.1	Land used for the disposal of wastes	9.4.1	Domestic and industrial waste land
3.8.2	Water supply & waste water treatment	9.2.3	Commercial and industrial buildings
		9.3.2	Commercial and industrial buildings
3.8.3	Electricity generation & distribution	9.2.3	Commercial and industrial buildings
		9.3.2	Commercial and industrial buildings
3.8.4	Other land for technical infrastructure	9.2.3	Commercial and industrial buildings
		9.3.2	Commercial and industrial buildings
3.9.1	Parks, green areas, hobby gardens etc	3.1.1	Amenity grass > 1 ha
		3.1.2	Playing fields
		9.4.3	Allotments

TABLE 10 INTER-COMPARISON OF SELECTED LAND COVER CLASSIFICATIONS

This listing was generated by a computer program described elsewhere in this Report. The program infers likely matches from explicitly defined links to terms in the Baseline classification. A minority of the matches suggested may be invalid. If in doubt, you should check on the definitions of the terms concerned in the appropriate Dictionary entry. Case changes indicate the hierarchical structure in the classifications.

UN ECE STATISTICAL CLASSIFICATION OF LAND USE *vs* BASELINE

UN ECE LAND USE		BASELINE	
3.9.2	Camp sites holiday homes etc.	3.1.4	Touring caravan park (if main use)
		3.1.5	Camp site (if main use)
		9.2.2	Residential buildings with gardens
		9.3.1	Residential buildings without gardens
3.9.3	Land under current construction	9.5.1	Unveg. derelict land, building sites
3.9.4	Land intended for future construction	9.4.2	Derelict urban land (often vacant)
		9.5.1	Unveg. derelict land, building sites
3.9.5	Other recreational and open land	3.1.3	Golf course
		3.1.6	Other (eg airfield, racecourse etc.)
		8.1.3	Sandy shore
		9.2.4.4	Sporting and recreational
		9.3.3.4	Sporting and recreational
		9.4.2	Derelict urban land (often vacant)
		9.5	HARD AREAS WITHOUT BUILDINGS
4.1	MIRES	4.2	BOG
4.3	OTHER WET OPEN LAND	7.3	WETLAND
		8.2.1	Salt marsh
5.1	HEATHLAND	4.1	HEATHLAND
5.3	MONTANE GRASSLAND	3.6	MOORLAND AND MOUNTAIN GRASS
5.4	DRY OPEN LAND NOT ELSEWHERE SPECIFIED	3.4	CALCAREOUS GRASS (SEMI-NATURAL)
		3.5	ACID GRASS (NON-MOORLAND) AND BRACKEN
		3.7.1	False oat grass + couch
		8.2.2	Dune (open or with semi-nat. grassl.)
		8.4	MARITIME VEGETATION
6.1.1	Bare rocks	6	INLAND ROCKS AND SCREES
		8.3.2	Rocky/boulder shore (not vegetated)
		8.3.3	Coastal rocks and cliffs
6.2	SAND-BEACHES, DUNES & OTHER SANDY LAND	8.1.3	Sandy shore
		8.2.2.1	Dune with <75% vegetation cover
6.3	OTHER UNVEG. LAND NOT ELSWHERE SPECIFIED	8.1.1	Intertidal mud flats
		8.1.2	Intertidal sand flats
		8.1.4	Pebble/gravel shore
7.1.1	Natural watercourses	7.2.1	River
7.1.2	Artificial watercourse	7.2.2	Canal
		10.4.3	Ditches
7.1.3	Natural land-locked bodies of water	7.1.1	Lake
		7.1.3	Pond (<0.25 ha)
7.1.4	Artificial water impoundment	7.1.2	Reservoir
7.2.1	Coastal lagoons	7.1.1	Lake
7.2.2	Estuaries	8.0	SEA AND ESTUARIES
7.2.3	Other tidal waters		

Categories in UN/ECE Statistical Classification of Land Use which are not cross-referenced to the Baseline survey categories

3.3.3	Other mineral extraction	5.2	DRY TUNDRA
3.6	LAND OF MIXED USE	6.1.2	Glaciers and perpetual snow
4.2	WET TUNDRA	7.1.5	Other inland waters

Categories in the Baseline survey which are not cross-referenced to UN/ECE Statistical Classification of Land Use categories

3.7.2	Tall herbs	10.3	FENCES
3.7.3	Riparian vegetation (non-aquatic)	10.4.1	Stone bank
5.5	LAND PLOUGHED FOR AFFORESTATION	10.4.2	Earth bank
8.3.1	Intertidal seaweed-covered boulders	10.4.4	Embankments
10.1	TREE-LINES AND HEDGES	10.5	GRASS STRIP
10.2	WALLS	10.6	TRACK

7.4 INTER-CALIBRATION OF SELECTED LAND COVER SURVEYS

7.4.1 Pixel-by-pixel inter-calibration of Countryside Survey 1990 Field Survey *vs* ITE Land Cover Map. The results of this inter-calibration are shown in Table 11. This records the correspondence between mapped categories in the ITE Land Cover Map (rows) and equivalent classes from the Countryside Survey-1990 Field Survey (columns), generated by combining categories from the 59 Reporting Classes, as described in Paragraph 6.3.2. The cells are recorded as percentages of the total area included in the inter-calibration study (128 km^2, or 204 800 pixels).

These data have been previously reported in Fuller *et al*, 1993. They are useful as a means of assessing the overall correspondence between the field survey data and the remotely-sensed map but, because of the aggregation of the field survey from the 59 Reporting Classes, they do not allow inter-calibration between the individual field survey categories and those used in the Land Cover Map. Nevertheless, it is possible to establish quantitative relationships between the two approaches at the level of the aggregated classes.

Direct agreement between the two surveys, measured by coincidences along the diagonal of the correspondence matrix, is 46% (Table 11a). A full discussion of the factors contributing to these differences is contained in Fuller *et al*, 1993. Some of the mapped differences are due to minor differences in registration and cartographic inaccuracies between the satellite map and the field data records. Others relate to time differences, while some derive from the classic problem of the mixed radiometric response of pixels at the boundaries between land parcels of different types. These effects were minimised by excluding all pixels which fell under vector boundaries in the digitised field data. The effect of this was to increase the overall correspondence to 54% (Table 11b).

The residual differences are of greater interest to the present study; these result mainly from differences in interpretation and class assignment between the two surveys. Table 11c records the Landsat class assignments as a proportion of the field survey categories (ie computes row percentages), while Table 11d shows the inverse relationships (ie column percentages, or field survey assignments as a proportion of the Land Cover Map classes). These matrices offer a crude means of normalising areal estimates from the two surveys. For example, of the land mapped from remote sensing as being under tillage, 78% was also identified as tilled land by the field surveyors (Table 11c), while 14% was classed as managed grass and 4% as continuous urban cover. Conversely (Table 11d), of the land mapped from field survey as being under tillage, 72% fell in the land cover map category 'Tilled Land' and 11% was mapped as managed grass. The values in the columns of Table 11c could therefore be used to reallocate areal data from the land cover map to the reference frame of the CS-1990 field survey. Similarly, values in the rows of Table 11d could be applied in the same way to adjust estimates from the field survey to conform with the Land Cover Map.

TABLE 11a **CORRESPONDENCE (%) BETWEEN 1km FIELD SURVEY SQUARES AND EQUIVALENT AREAS IN THE LAND COVER MAP**

Results include boundary pixels

Landsat / Field Survey	Unclass.	Suburb	Urban	Sea / Estuary	Inland Water	Coastal Bare	Salt Marsh	Inland Bare	Tilled	Managed Grass	Rough Grass	Bracken	Heath / Moor	Bog	Open Heath	Dense Heath	Decid	Conifer	Total Landsat
Unclassified																			1
Suburban																			0
Continuous Urban		2	1						2	2									8
Sea / Estuary				2															2
Inland Water					1														2
Coastal Bare Ground				1		1													3
Saltmarsh																			0
Inland Bare Ground																			1
Tilled	1	1							14	3									21
Managed Grass	1								3	18	1		2		2		1		29
Rough Grass										1									2
Bracken																			1
Heath / Moor													2		2				6
Bog													2	1	5	1			10
Open Shrub Heath													1		2	1			5
Dense Shrub Heath																			1
Deciduous Wood									1	1							2		6
Coniferous Wood															1		1	1	4
Total Field Survey	3	4	1	3	1	2	0	1	21	27	2	2	9	3	13	3	4	2	100
																		Hits (diagonal)	46

TABLE 11b **CORRESPONDENCE (%) BETWEEN 1km FIELD SURVEY SQUARES AND EQUIVALENT AREAS IN THE LAND COVER MAP**

Results exclude pixels on vector boundaries

Landsat / Field Survey	Unclass	Suburb	Urban	Sea/ Estuary	Inland Water	Coastal Bare	Salt Marsh	Inland Bare	Tilled	Managed Grass	Rough Grass	Bracken	Heath/ Moor	Bog	Open Heath	Dense Heath	Decid	Conifer	Total Landsat
Unclassified																			1
Suburban																			1
Continuous Urban		2	1						1	1									6
Sea / Estuary				2															3
Inland Water					1														2
Coastal Bare Ground				2		1													3
Saltmarsh																			0
Inland Bare Ground																			1
Tilled	1	1							19	3	1								27
Managed Grass	1								3	21	1		2		1		1		31
Rough Grass										1									1
Bracken																			1
Heath / Moor													2		1				5
Bog													2	1	4	1			9
Open Shrub Heath															2	1			4
Dense Shrub Heath																			0
Deciduous Wood										1							1		4
Coniferous Wood															1		1	1	4
Total Field Survey	3	4	1	4	2	1	0	1	24	28	2	1	8	2	12	3	4	2	100
																	Hits (diagonal)		54

TABLE 11c **PROPORTIONAL COMPOSITION (%) OF LAND COVER MAP CLASSES IN TERMS OF FIELD SURVEY CATEGORIES**

Results exclude pixels on vector boundaries

Landsat / Field Survey	Unclass.	Suburb	Urban	Sea/ Estuary	Inland Water	Coastal Bare	Salt Marsh	Inland Bare	Tilled	Managed Grass	Rough Grass	Bracken	Heath/ Moor	Bog	Open Heath	Dense Heath	Decid	Conifer
Unclassified		1		1			1	1				1	1		1	1	1	
Suburban																		
Continuous Urban	10	54	72			2	1	11	4	5	4	2	2		1	1	3	
Sea / Estuary	1			53	1	18	2	1						1				
Inland Water	2		1		96			1						1		1	1	
Coastal Bare Ground	1			45		58		2				1						
Saltmarsh						2	85											
Inland Bare Ground			2			10	5	4				1	1		1			
Tilled	38	30	18			1		39	78	11	26	6	5	2	3		11	3
Managed Grass	28	9	3			5	6	18	14	77	32	31	21	9	12	2	18	3
Rough Grass	1	1				2			1	2	2	2	2	2	1	2	2	
Bracken	5				2						1	5	2	1	1	1	1	1
Heath / Moor	5			1		1		4		1	10	14	29	9	12	3	1	
Bog	2				1			14			9	12	23	61	38	28	2	
Open Shrub Heath	1							3		1	4	14	5	6	18	46	5	
Dense Shrub Heath		1									2	1	2	1	1	2		
Deciduous Wood	3	3	2					1	2	2	5	9	4	1	2	1	37	8
Coniferous Wood	2							1			3	2	2	4	9	12	18	81
Total Field Survey	99	99	98	100	100	99	100	100	99	99	98	101	99	98	100	100	100	96

TABLE 11d **PROPORTIONAL COMPOSITION (%) OF FIELD SURVEY CLASSES IN TERMS OF LAND COVER MAP CATEGORIES**

Results exclude pixels on vector boundaries

Landsat / Field Survey	Unclass.	Suburb	Urban	Sea/ Estuary	Inland Water	Coastal Bare	Salt Marsh	Inland Bare	Tilled	Managed Grass	Rough Grass	Bracken	Heath/ Moor	Bog	Open Heath	Dense Heath	Decid	Conifer	Total Landsat
Unclassified		3		7		1		2	14	21	1	2	11	1	28	4	6	1	102
Suburban	6	14							12	53	3	1	2		1	1	8		101
Continuous Urban	5	33	10			1		2	17	22	1		3		2	1	2		99
Sea / Estuary	1			86		10		1					1	1					100
Inland Water	3				86				1	1			1	1	3	1	2	1	100
Coastal Bare Ground	1			65		30		1							1				98
Saltmarsh	9					25	43		2	1	1		18	2	1				102
Inland Bare Ground	3	4	3			28	1	6	9	15	1	2	10	2	18	1	1		104
Tilled	4	4	1					1	72	11	2		2		1		2		100
Managed Grass	3	1							11	69	2	1	5	1	4		2		99
Rough Grass	3	2		1		3			11	41	4	2	12	3	11	3	5		101
Bracken	19	2			3	1			5	9	3	8	26	2	14	2	5	3	102
Heath / Moor	3			1				1	1	8	4	3	45	4	28	2	1		101
Bog	1							1	1	1	2	2	20	15	49	8	1		101
Open Shrub Heath	1							1	1	3	2	4	8	3	47	26	4		100
Dense Shrub Heath	1	8								10	8	2	39	7	17	9			101
Deciduous Wood	3	3	1						11	16	3	3	10	1	6	1	40	4	102
Coniferous Wood	1								3	3	1	1	3	2	26	8	17	34	99

7.4.2 **Inter-calibration of Countryside Survey 1990 Field Survey *vs* ITE Land Cover Map using 25-point grid sampling**. Using the point-grid sampling scheme described in paragraph 6.3.2, inter-calibration of the two surveys was carried out at the level of the original recorded classes (ie 59 Reporting Classes from CS-1990 field survey and 17 categories from the Land Cover Map). The compromise required to achieve this was, of course, the spatial sub-sampling entailed. Nevertheless, comparison of class assignments between the two systems was undertaken for a total of 445 1km squares, leading to a dataset of no fewer than 11116 points. The results of this exercise are presented in Table 12.

Table 12a records total individual point counts and shows overall correspondence between the Countryside Survey-1990 Field Survey (columns) and the ITE Land Cover Map (rows). In Table 12b, the cells are shown as proportions per thousand of the points sampled, while Tables 12c and 12d record individual cell counts as a percentage of the row and column totals, respectively.

Tables 12c and 12d therefore provide a basis for converting land cover estimates in one survey to the classification framework of the second system, as described in the preceding paragraph in relation to the per-pixel evaluation. For example, Table 12c shows that, (ignoring incidences of 1% or less), the Managed Grass category in the Land Cover Map has been allocated by field surveyors to 14 field classes, in the proportions, Road (3%), Residential Buildings (2%), Continuous built (2%), Wheat (3%), Barley (3%), Recently Sown Grass (7%), Pure Rye Grass (23%), Well Managed Grass (21%), Recreational Grass (3%), Weedy swards, (9%), Unmanaged Grassland and Tall Herb (2%), Non-agriculturally Improved Grass (2%), Upland Grass (3%) and Broadleaved Woodland (3%). Conversely, Table 12d indicates that land mapped by field surveyors as Rye Grass falls into seven Land Cover Map categories in the proportions Suburban Land (3%), Tilled Land (12%), Managed Grass (73%), Marsh & rough grass (2%), Moorland / Heathland Grass (2%), Open shrub heath (2%) and Deciduous and mixed woodland (2%). The reasons for these differences in interpretation are not the primary concern of this study, but are addressed in Fuller *et al* (1993). What is important in this context is that we have a quantitative measure of the nature and extent of overlaps between the different classification systems, and so are better able to understand and interpret comparative statistics of land cover and land use generated by the two approaches.

The same data (from the 25-point grid sampling technique) also provide a means of verifying the correspondence statistics presented in Table 11, on the basis of a geographically more representative population of data (445 1km squares, compared with 128 squares in Table 11). Table 13 shows the correspondence, per thousand points, between the two surveys, after condensing the 59 CS-1990 Reporting Classes down to 17 categories equivalent to the Land Cover Map classes, using the empirical guidelines shown in Table 6.

TABLE 12 CALIBRATION OF CS-1990 FIELD SURVEY vs ITE LAND COVER MAP USING 25-POINT GRID

12a: individual point counts

Land Cover Map / Field Survey	Unclass	Suburban	Urban	Sea/ Estuary	Inland water	Beach/ Mudflat	Salt marsh	Inland Bare	Tilled land	Managed grass	Marsh/ r. grass	Bracken	Grass moor	Bogs/ Bushes	Open heath	Dense heath	Bridleal/ Decid	Conifer wood	Total
Unclassified	1	1								2			1		3		1		9
Railway						1			7	5			2	1			2		18
Road	6	21	5					4	61	72	2		12		11	1	18	4	217
Agric. Bldgs	2	7		3					13	25	3		5		3		1		62
Res. Bldgs	7	146	3	3		1		4	59	71	4		10	1	7	1	12	2	331
Cont. Built	1	31	22	1		3		4	18	51	5		7		5	2	4	2	156
Sea/Estuary	6	6		185		17	2	1		6	2		1	2	7	1	2	2	234
Still water	2	1	2	1	63			1	3	4	1	1	3	7	8	1	6	1	105
Running water	1	1				1	2		6	6	1		4	2	2		18	2	136
Soft coast	1	1	1	57		39	2		2	3			2						107
Hard coast	4	1	1	15		22		4		3	1	1	3	3	8	1	1	2	70
Saltmarsh	2	2				5	29		1		1		1		1				42
Inland rocks				1				1					1		3	1			7
Waste land		7	3			4		1	3	5	1				1		1		26
Hard areas		1	1						1	2						1			6
Quarries		1	1						2	3	1		2		1				11
Wheat	35	75	8	13	1	2		5	844	93	11	1	5	2	3	1	19	3	1121
Barley	17	25	2	9		1		14	339	98	8	2	14	1	10		3	2	545
Oats	1	2							22	11			2		3	1			42
Other cereal		1							10		2								13
Maize	1	3						1	3	5	2		1					1	17
Turnip/rswede	4	1							14	9					3				31
Kale									12	7							2		21
Oilseed rape	11	16	9						151	12			2		2		2	1	206
Other cruciffers		4						1	8	1					2				16
Peas	7	4	1						39	5	2				1				59
Field beans	2	4	2						41	3	1				1		6		60
Other legumes					1					1									1
Sugar beet	5	4	1						90	9	2	1	1						114
Potatoes		3			1				37	9			1		1		2		54
Other roots		2								1		1							4
Other field crops	1	2						2	27	9	4				1				46
Horticulture	1	2						2	12	2	2						1		22
Sown grass	15	6	1	2				5	81	186	7	8	13	1	9		7	1	342
Rye grass	19	23		4		1		1	112	663	15	10	16		17	3	17	6	907
Managed grass	30	9		7			1	2	78	603	22	13	35	2	22	4	41	10	879
Rec. grass	2	9	3				1		13	72		4	2		2	1	5	1	115
Weedy grass	14	3		10		1	1		29	260	15	13	32	2	24	8	22	2	436
Maritime veg	1			2		2	1	1	1	4	1		2	1	7	1		1	25
Fallow	2	7	1	2				1	122	25	1		5		2		1	1	170
Felled	2									1	1	1	1	1	6		3	3	19
Wetland	3		1	1	2	1		2	14	26	16	7	32	4	40	6	5		160
Unman. grass	4	7	1	1		3		1	34	52	5	2	8	1	5	2	12	1	139
Unimp. grass	1	3		4					10	68	9	2	7		15		8		127
Calc. grass	5			1		1		1	2	21	5	2	8	1	5		4	1	57
Upland grass	11					1		3	9	83	11	21	84	3	34	7	9	2	278
Bracken	10	3		1		1			2	26	2	12	29	4	18	11	16	6	141
Dune						4					1	3	4		5		1		18
Moor (not moln)	12	2			1	1		10	4	24	4	23	124	15	85	18	2	2	327
Moinia moor	1				1			1		7	1	4	38	9	31	6	3	5	107
Wet bog	11	1		1		5		12	6	13	13	11	169	111	450	35	15	4	857
Dry bog	1					3		8	2	4	4	2	79	22	149	18	2	2	296
Berry-bush heath	5							1		4	1		14	2	30	8	1		66
Open heath	6			2	1			6	5	16	11	13	54	17	152	76	5	3	367
Dense heath	3					1		1	3	11	3	5	16	4	85	84	8	1	225
Perennial crops	1	1							2	19									22
Shrubs	2	4							4	22	5	2	1		1		5	2	48
Broadleaf decid.	5	12		1				1	41	75	8	12	121	3	30	21	159	48	397
Mixed wood	1	3						1	15	15	2	2	3	2	3	4	32	22	105
Conifers	16	6						2	20	28	6	7	71	27	190	41	55	308	677
Total	300	467	69	327	70	121	39	105	2434	2861	225	186	948	251	1404	365	530	414	11116

TABLE 12 CALIBRATION OF CS-1990 FIELD SURVEY vs ITE LAND COVER MAP USING 25-POINT GRID

12b: Correspondence, per thousand points sampled

Land Cover Map / Field Survey	Unclass	Suburban	Urban	Sea/ Estuary	Inland water	Beach/ Mudflat	Salt marsh	Inland Bare	Tilled land	Managed grass	Marsh/ grass	Bracken	Green moor	Bogs/ bushes	Open heath	Dense heath	Broadleaf Decid	Conifer wood	Total
Unclassified																			1
Railway									1										2
Road	1	2							5	6			1		1		2		20
Agric. Bldgs		1							1	2									6
Res. Bldgs	1	13							5	6			1		1		1		30
Cont. Built		3	2						2	5			1						14
Sea/Estuary	1			17		2				1					1				21
Still water					6									1	1		1		9
Running water									1	1							1		3
Soft coast				5		4													10
Hard coast				1		2									1				6
Saltmarsh							3												4
Inland rocks																			1
Waste land		1																	2
Hard cover																			1
Orchard																			1
Wheat	3	7	1	1					76	8	1						2		101
Barley	2	2		1				1	30	9	1		1		1				49
Oats									2	1									4
Other cereal									1										1
Maize																			2
Turnip/swede									1	1									3
Kale									1	1									2
Oilseed rape	1	1	1						14	1									19
Other crucifers									1										1
Peas	1								4										5
Field beans									4								1		5
Other legumes																			
Sugar beet									8	1									10
Potatoes									3	1									5
Other roots																			
Other field crops									2	1									4
Horticulture									1										2
Sown grass	1	1							7	17	1	1	1		1		1		31
Rye grass	2	2							10	60	1	1	1		2		2	1	82
Managed grass	3	1		1					7	54	2	1	3		2		4	1	79
Rec. grass		1							1	6									10
Weedy grass	1			1					3	23	1	1	3		2	1	2		39
Maritime veg.															1				2
Fallow		1							11	2									15
Felled															1				2
Wetland									1	2	1	1	3		4	1			14
Unman. grass		1							3	5			1				1		13
Unimp. grass									1	6	1		1		1		1		11
Calc. grass										2			1						5
Upland grass	1								1	7	1	2	8		3	1	1		25
Bracken	1									2		1	3		2	1	1	1	13
Dune																			2
Moor (not mallin)	1							1		2		2	11	1	8	2			29
Mallinic moor										1			3	1	3	1			10
Wet bog	1							1	1	1	1	1	15	10	40	3	1		77
Dry bog								1					7	2	13	2			27
Berry-bush heath													1		3	1			6
Open heath	1							1		1	1	1	5	2	14	7			33
Dense heath										1			1		8	8	1		20
Perennial crops										2									2
Shrub										2									4
Broadleaf decid.		1							4	7	1	1	2		3	2	14	1	36
Mixed wood									1	1							3	2	9
Conifers	1	1							2	3	1	1	6	2	8	4	5	28	61
Total	27	42	6	29	6	11	4	9	219	257	20	17	85	23	126	33	48	37	1000

TABLE 12 CALIBRATION OF CS-1990 FIELD SURVEY vs ITE LAND COVER MAP USING 25-POINT GRID

12c: Proportional Composition (%) of Land Cover Map Classes in terms of Field Survey Categories

Land Cover Map / Field Survey	Unclass.	Suburban	Urban	Sea/ Estuary	Inland water	Beach/ Mudflat	Salt marsh	Inland Bare	Tilled land	Managed grass	Marsh/ r. grass	Bracken	Grass moor	Bogs/ Rushes	Open heath	Dense heath	Birch/ Decid	Conifer wood
Unclassified																		
Railway						1												
Road	2	4	7					4	3	3	1		1		1		3	1
Agric. Bldgs	1	1		1					1	1	1		1					
Res. Bldgs	2	31	4	1		1		4	2	2	2		1				2	
Comm. Bldg		7	32			2		4	1	2	2		1			1	1	
Sea/Estuary	2			57		14	5	1			1			1				
Still water	1		3		80	1		1				1		3	1		1	
Running water						1	5							1			2	
Soft coast			1	17		32	5											
Hard coast	1		1	5		18		4				1		1	1			
Saltmarsh	1					4	74											
Inland rocks								1										
Waste land		1	4			3		1										
Hard areas			1															
Quarries																		
Wheat	12	16	12	4	1	2		5	35	3	5	1	1	1			4	1
Barley	6	5	3	3		1		13	14	3	4	1	1		1		1	
Oats																		
Other cereal									1		1							
Maize		1						1			1							
Turnip/swede	1								1									
Kale																		
Oilseed rape	4	3	13						6									
Other cruciferae		1						1										
Peas	2	1	1						2		1							
Field beans	1	1	3						2								1	
Other legumes																		
Sugar beet	2	1	1						4		1	1						
Potatoes		1			1				2									
Other roots												1						
Other field crops								2	1		2							
Horticulture								2			1							
Sown grass	5	1	1	1				5	3	7	3	4	1		1		1	
Rye grass	6	5		1		1		1	5	23	7	5	2		1	1	3	1
Managed grass	10	2		2			3	2	3	21	10	17	4	1	2	1	8	2
Rec. grass	1	2	4				3		1	3		2					1	
Weedy grass	5	1		3		1	3		1	9	7	7	3	1	2	2	4	
Maritime veg.				1		2	3	1										
Fallow	1	1	1	1				1	5	1			1					
Felled	1											1					1	1
Wetland	1		1		3	1		2	1	1	7	4	3	2	3	2	1	
Unman. grass	1	1	1			2		1	1	2	2	1	1			1	2	
Unimp. grass		1		1						2	4	1	1		1		2	
Calc. grass	2					1		1		1	2	1	1				1	
Upland grass	4					1		3		3	5	11	9	1	2	2	2	
Bracken	3	1				1				1	1	6	3	2	1	3	3	1
Dune						3						2						
Moor (not mollin)	4				1	1		10		1	2	12	13	6	6	5		
Mollin moor	1				1			1				2	4	4	2	2	1	1
Wet bog	4					4		11			6	6	18	44	32	10	3	1
Dry bog						2		8			2	1	8	9	11	5		
Berry-bush heath	2							1					1	1	2	2		
Open heath	2			1	1			6		1	5	7	6	7	11	21	1	1
Dense heath	1					1		1			1	3	2	2	6	23	2	
Perennial crops										1								
Shrub	1	1								1	2	1	2				1	
Broadleaf decid.	2	3						1	2	3	4	6	2	1	2	6	30	2
Mixed wood		1						1	1	1	1	1		1		1	6	5
Conifers	5	1						2	1	1	3	4	7	11	6	11	10	74
Total	99	95	95	99	98	100	101	103	99	97	97	101	96	100	95	99	98	91

TABLE 12 CALIBRATION OF CS-1990 FIELD SURVEY vs ITE LAND COVER MAP USING 25-POINT GRID

12d: Proportional Composition (%) of Field Survey Classes in terms of Land Cover Map Categories

Land Cover Map / Field Survey	Unclass	Suburban	Urban	Sea/ Estuary	Inland water	Beach/ Mudflat	Salt marsh	Inland Bare	Tilled land	Managed grass	Marsh/ r grass	Bracken	Grass moor	Bogs/ Bushes	Open heath	Dense heath	Birdsel/ Decid	Conifer wood	Total
Unclassified	11	11								22			11		33		11		99
Railway						6			39	28			11	6			11		101
Road	3	10	2					2	28	33	1		6		5		8	2	100
Agric. Bldgs	3	11		5					21	40	5		8		5		2		100
Res. Bldgs	2	44	1	1				1	18	21	1		3		2		4	1	99
Cont. Built	1	20	14	1		2		3	12	33	3		4		3	1	3	1	101
Sea/Estuary	3			79		7	1			3	1			1	3		1		100
Still water	2	1	2	1	60			1	3	4	1	1	3	7	8	1	1	1	102
Running water	3	3				3	6		17	17	3		11	6	6		22	6	103
Soft coast	1		1	53		36	2		2	3			2						100
Hard coast	6	1	1	21		31		6		4	1	1	4	4	11	1	1	3	96
Saltmarsh	5	5				12	69		2		2		2		2				99
Inland rocks				14				14					14		43	14			99
Waste land		27	12			15		4	12	19	4				4		4		101
Hard areas		17	17						17	33						17			101
Quarries		9	9						18	27	9		18		9				99
Wheat	3	7	1	1					75	8	1						2		98
Barley	3	15		2				3	62	18	1		3		2		1		100
Oats	2	5							52	26			5		7	2			99
Other cereal		8							77		15								100
Maize	6	18						6	18	29	12		6					6	101
Turnip/swede	13	3							45	29					10				100
Kale									57	33							10		100
Oilseed rape	5	8	4						73	6			1		1		1		99
Other cruciferx		25						6	50	6					13				100
Peas	12	7	2						66	8	3				2				100
Field beans	3	7	3						68	5	2				2		10		100
Other legumes									100										100
Sugar beet	4	4	1						79	8	2	1	1				1		101
Potatoes		6			2				69	17			2		2		4		102
Other roots		50								25		25							100
Other field crops	2	4						4	59	20	9				2				100
Horticulture	5	9						9	55	9	9						5		101
Sown grass	4	2		1				1	24	54	2	2	4		3		2		99
Rye grass	2	3							12	73	2	1	2		2		2	1	100
Managed grass	3	1		1					9	69	3	1	4		3		5	1	100
Rec. grass	2	8	3				1		11	63		3	2		2	1	4	1	101
Weedy grass	3	1		2					7	60	3	3	7		6	2	5		99
Maritime veg	4			8		8	4	4	4	16	4		8	4	28	4		4	100
Fallow	1	4	1	1				1	72	15	1		3		1		1	1	102
Felled	11									5	5	5	5	5	32		16	16	100
Wetland	2		1	1	1	1		1	9	16	10	4	20	3	25	4	3		101
Unman. grass	3	5	1	1		2		1	24	37	4	1	6	1	4	1	9	1	101
Unimp. grass	1	2		3					8	54	7	2	6		12		6		101
Calc. grass	9			2		2		2	4	37	9	4	14	2	9		7	2	103
Upland grass	4							1	3	30	4	8	30	1	12	3	3	1	100
Bracken	7	2		1		1			1	18	11	9	21	3	13	8	11	4	100
Dune						22					6	17	22		28		6		101
Moor (not mollin)	4	1						3	1	7	1	7	38	5	26	6	1	1	101
Mollinia moor	1				1			1		7	11	4	36	8	29	6	3	5	102
Wet bog	1					1		1	1	2	2	1	20	13	53	4	2		101
Dry bog						1		3	1	1	1	1	27	7	50	6	1	1	100
Berry-bush heath	8							2		6	2		21	3	45	12	2		101
Open heath	2			1				2	1	4	3	4	15	5	41	21	1	1	101
Dense heath	1								1	5	1	2	7	2	38	37	4		98
Perennial crops		5							9	86									100
Shrub	4	8							8	46	10	4	22		2		10	4	98
Broadleaf decid.	1	3							10	19	2	3	5	1	6	5	30	2	99
Mixed wood	1	3						1	14	14	2	2	3	2	3	4	30	21	100
Conifers	2	1							3	4	1	1	10	4	13	6	8	45	98

TABLE 13 CALIBRATION OF CS-1990 FIELD SURVEY vs EQIVALENT ITE LAND COVER MAP CLASSES USING 25-POINT GRID

Correspondence, per thousand points sampled

Land Cover Map / Field Survey	Unclass.	Suburban	Urban	Sea/ Estuary	Inland water	Beach/ Mudflat	Salt marsh	Inland Bare	Tilled land	Managed grass	Marsh/ r. grass	Bracken	Grass moor	Bogs/ flushes	Open heath	Dense heath	Brdleaf Decid	Conifer wood	Total
Unclassified																			1
Suburban	1	**16**	1	1				1	13	16	1		3		2		3	1	57
Urban		3	**2**						2	5			1						14
Sea/Estuary	1			**17**		2				1					1				21
Inland water					**6**				1	1			1	1	1		1		13
Beach/mudflat				5		**4**	3		1	1			1						16
Saltmarsh							**3**												4
Inland Bare																			2
Tilled Land	8	13	2	2				2	**148**	25	3		2		2		3	1	213
Managed grass	9	5		3		1		1	30	**176**	8	7	18	1	12	2	10	2	285
Marsh/r. grass	1	2	1			1			16	10	**2**	1	4	1	5	1	2		46
Bracken	1									2		**1**	3		2	1	1	1	13
Grass moor	1							1		3	1	3	**15**	2	11	2	1	1	41
Bogs/flushes	1							1	1	1	1	1	15	**10**	40	3	1		77
Open heath	1							1	1	2	1	1	13	4	**30**	9	1		66
Dense heath										1			1		8	**8**	1		20
Brdleaf decid.	1	2							6	12	1	1	2		3	2	**18**	3	51
Conifer wood	1	1							2	3	1	1	6	2	8	4	5	**28**	61
Total	27	42	6	28	6	9	6	9	219	258	20	17	85	22	126	33	48	37	1000

Table 13 indicates that the direct correspondence between the surveys is 48.4% (as measured by the sum of the coincidences along the diagonals of the matrix); this is consistent with the data presented in paragraph 7.4.1, since it is intermediate between the estimates of correspondence presented in Table 11a (which include boundary pixels) and those of Table 11b (which do not).

The effects of differences in land cover nomenclatures depends, in part at least, on the nature of the landscape surveyed; for example, methods based on satellite remote sensing or aerial photo-interpretation may be particularly sensitive to highly fragmented landscapes, where there is a high proportion of boundary features smaller than the resolution limit of the survey technique. Tables 14-17 present inter-calibration data separately for the four broad landscape types recognised by the ITE Land Classification.

In Figure 2, the distribution of a single category from the land cover map - 'Tilled Land' - amongst the CS-1990 Reporting Categories is compared across the four landscape types. The histogram is instructive on several counts. In arable and pastural landscapes, there is high correspondence (68% and 60%, respectively) between tilled land mapped from satellite and equivalent field survey categories. In the upland landscapes, direct correspondence falls to about 18%. However, arable land forms a much smaller proportion of the total land cover in upland landscapes than in the lowlands (less than 3% of all land in the marginal uplands is cropped, compared with 44% in arable landscapes), so that differences in interpretation between surveys, when expressed as a percentage, appear disproportionately large. Thus, although 18% of the land in the uplands mapped from satellite as 'Tilled Land' was classified by field surveyors as wet bog, this represents only 1% of all upland bog.

In the specific case of tilled land, the most significant factor lies in the overlap with managed grassland categories. In pastural landscapes, 18% of land mapped from satellite as cropped was recorded in the field as under managed grass. In the marginal uplands, this increased to 50%. Given that improved grassland involves rotational cultivation, it is not unexpected that some managed pastures exhibit the temporal signature of cropped fields, or that their physical appearance might have differed significantly between the date of imaging and the date of the field survey.

Similar observations could be made with respect to the other mapped classes; in relation to the aims of this report, it is sufficient to note that:

a) these results confirm the hypothesis that differences in terminology and definition can influence quantitative results from land survey;

b) it is possible to compute empirical relationships to allow inter-calibration of different surveys;

c) significant variation in these inter-calibration factors is apparent across landscape units; some method of geographical stratification is therefore needed if such corrections are to be applied to land statistics at levels more localised than broad national summaries.

TABLE 14 CALIBRATION OF CS-1990 FIELD SURVEY vs ITE LAND COVER MAP USING 25-POINT GRID

14a: Correspondence, per thousand points sampled - arable landscapes

Land Cover Map / Field Survey	Unclass	Suburban	Urban	Sea/ Estuary	Inland water	Beach/ Mudflat	Salt marsh	Inland Bare	Tilled land	Managed grass	Marsh/ grass	Bracken	Gorse moor	Bogs/ Bushes	Open heath	Dense heath	Broad Decid	Conifer wood	Total
Unclassified																			
Railway									1	1									2
Road	1	5						1	11	6							2		26
Agric. Bldgs		1		1					3	3	1				1				10
Res. Bldgs		20							6	9			1		1		1		38
Cont. Built		4	4			1			2	5	1		1						18
Sea/Estuary				7		1				1									10
Built water					6					2									15
Running water										1									14
Salt coast				4		4													8
Hard coast						1				1									2
Saltmarsh						1	5												6
Inland rocks																			
Waste land		2	1						1	1									5
Hard grass										1									1
Quarries																			
Wheat	5	14	1	4				1	172	15	2		1				3		219
Barley	3	4		2					61	12	1		2				1		89
Oats		2							3	2									7
Other cereal									3										3
Maize		1								1									1
Turnip/swede	1								3	1									5
Kale									3	1									4
Oilseed rape	2	3							30	3			1		1				40
Other crucifers		1							2						1				4
Peas		1							9	1	1								13
Field beans									29								2		33
Other legumes																			
Sugar beet		1							19	2	1						2		25
Potatoes		1							6	1									8
Other roots		1																	1
Other field crops		1							6	2	1								10
Horticulture										1									1
Bown grass	1	1							11	17	1		1		1		1		34
Rye grass	1	3							12	62	2		1		1		2		84
Managed grass	1	1							10	43	2		3		2	1	43		67
Rec. grass		1	1						1	9							1		13
Woody grass									3	16	1	1	1		1	1	1		26
Maritime veg.										1									1
Fallow		1							30	4			1		1				37
Felled																			
Wetland									1	2	3		1		1				8
Unman. grass	1	1							7	8					1		2		20
Unimp. grass		1							1	8	2				1				13
Calc. grass	1									3							1		5
Upland grass									1	2	1		2		1				17
Bracken										1			1						2
Dwarf																			
Moor (not moss)																			
Moss/a moor																			
Wet bog												1	5		3				9
Dry bog													1	1	1				3
Berry-bush heath																			
Open heath									1				1		1				3
Dense heath									1						1				2
Perennial crops									1	4									5
Shrub									1	2									3
Broadleaf trees									7	9	1	2	2		2		21	1	44
Mixed wood									3	2			1			1	5	4	15
Conifers									3	2			1		1	1	3	6	17
Total	19	72	8	18	5	8	6	3	446	266	23	4	25	1	26	3	51	15	999

TABLE 14 CALIBRATION OF CS-1990 FIELD SURVEY vs ITE LAND COVER MAP USING 25-POINT GRID

14b: Proportional Composition (%) of Land Cover Map Classes in terms of Field Survey Categories - Arable landscapes

Land Cover Map / Field Survey	Unclass.	Suburban	Urban	Sea/ Estuary	Inland water	Beach/ Mudflat	Salt marsh	Inland Bare	Tilled land	Managed grass	Marsh/ r. grass	Bracken	Grass moor	Bog/ Bushes	Open heath	Dense heath	Birch/ Decid	Conifer wood
Unclassified													1					
Railway													1					
Road	3	7						18	2	2	1		1		1		4	2
Agric. Bldgs.		1		3					1	1	4				2		1	
Res. Bldgs.		27	3					9	1	3	1		2		3		2	
Cons. Built		5	45	2		8		9		2	4		3			8	1	2
Sea/Estuary				38		19	4											
Still water				2	86						1						1	
Running water	1					4	9				1							
Soft coast				20		50	4											
Hard coast				2		8					1							
Saltmarsh						8	78						1		1			
Inland rocks																		
Waste land		3	10												1			
Hard areas																		
Quarries											1							
Wheat	25	19	17		5			18	39	6	10							
Barley	13	5	3					8	14	4	3	6						
Oats	1							1	1									
Other cereal											3							
Maize	1	1																
Turnip/swede	3								1						1			
Kale									1	1							1	
Oilseed rape	10	4							7	1			2		2		1	2
Other crucifers		2						9							2			
Peas	4	2							2		3							
Field beans		2	7						2		1						3	
Other legumes																		
Sugar beet		2	3						4	1	3	6					1	
Potatoes		1			5				1									
Other roots		1																
Other field crops		1							1	1	5							
Horticulture																	1	
Sown grass	6	1						9	3	7	4	6	3		4		1	2
Rye grass	7	4							3	23	8		5		4	8	3	
Managed grass	7	1		2			4		2	6	9	6	10		8	17	5	1 8
Rec. grass		1	7							4			1		1		2	2
Weedy grass	6			2					1	6	4	12	5		2	17	2	2
Maritime veg																		
Fallow	1	2	3					9	7	2			5		2		1	2
Felled																	1	2
Wetland					5					1	13		2		5		1	
Unman. grass	6	2							2	3	1	6	1		3	8	4	
Unmp. grass		1								3	8				2		1	
Calc. grass	3									1							2	
Upland grass										1	4		8		3			
Bracken													6		1		1	
Dune						4												
Moor (not moss)																		
Moss/ moor													1		2			
Wet bog												12	19		12			
Dry bog													2	67	5			
Berry-bush heath																		
Open heath													3		4			
Dense heath											1		1		3			
Perennial crops																		
Shrubs																		
Broadleaf (Decid)																		
Mixed wood																		
Conifers																		
Total	100	98	98	102	101	101	99	99	100	97	103	101	97	100	94	99	106	103

TABLE 14 CALIBRATION OF CS-1990 FIELD SURVEY vs ITE LAND COVER MAP USING 25-POINT GRID

14c: Proportional Composition (%) of Field Survey Classes in terms of Land Cover Map Categories - Arable landscapes

Land Cover Map / Field Survey	Unclass	Suburban	Urban	Sea/ Estuary	Inland water	Beach/ Mud/Dist	Salt marsh	Inland Bare	Tilled land	Managed grass	Marsh/ r grass	Bracken	Grass moor	Bog/ Bushes	Open heath	Dense heath	Brdlfeal/ Decid	Conifer wood	Total
Unclassified																			
Railway									50	33			17						100
Road	2	19						2	41	23	1		1		1		8	1	99
Agric. Bldgs		9		6					28	38	9				6		3		99
Res. Bldgs		51	1					1	17	24	1		1		2		2		100
Cont. Built		22	20	2		3		2	11	27	5		5			2	2	2	103
Salt/Estuary				67		14	3			11								6	101
Still water		4		4	78				4		4						4		99
Running water	8					8	15		31	15	8						15		100
Soft coast				48		48	4												100
Hard coast				14		29				43	14								100
Saltmarsh		4				9	78						4		4				99
Inland rocks																			
Waste land		47	20						13	13					7				100
Hard areas									33	67									100
Oats/Rye		33							63		33								99
Wheat	2	6	1	2					79	7	1								89
Barley	3	5		2					70	19	1		2						100
Oats	5								41	36			5		14				101
Other cereal		8							77		15								100
Maize	11	22							33	33									99
Turnip/swede	13								56	25					6				100
Kale									63	31							6		100
Oilseed rape	5	8							76	7			1		1		1	1	100
Other crucifers		27						7	47	7					13				101
Peas	7	10							74	5	5								101
Field beans		9	4						70		2						13		100
Other legumes										100									100
Sugar beet		5	1						81	8	2								99
Potatoes		7							74	15									100
Other roots		67								33									100
Other field crops		6							62	21	12								101
Horticulture		25								50							25		100
Sown grass	3	2						1	33	50	2	1	2		3		2	1	100
Rye grass	2	3							14	73	2		1		1		2		98
Managed grass	2	1							15	64	3		4		3		1	2	99
Rec. grass		6	4		1				8	69			2		2		6	2	99
Weedy grass	5			1					11	64	3	2	5		2	2	3	1	99
Maritime veg.									25	75									100
Fallow	1	4	1					1	78	11			3		1		1	1	102
Felled																	50	50	100
Wetland					4				11	21	36		7		18		4		101
Unman. grass	5	5							33	36	1	1	1		4	1	11		98
Unimp. grass		7							7	65	14				5		2		100
Calc. grass	12								6	59							24		101
Upland grass									9	35	13		30		13				100
Bracken		9							9	18			45		9		9		99
Dune						100													100
Moor (not moltn)																			
Moltnb moor													33		67				100
Wet bog												7	57		37				101
Dry bog													22	22	56				100
Berry-bush heath																			
Open heath									22				33		44				99
Dense heath									25	13	13		13		38				102
Perennial crops		6							13	81	5								100
Shrub	6	6							12	35	12								100
Broadleaf decid.	1	3							16	19	63								102
Mixed wood		6							17	13	2	2							101
Conifers	2								17	11	2	3	2	2	5	5	17	17	101

TABLE 15 CALIBRATION OF CS-1990 FIELD SURVEY vs ITE LAND COVER MAP USING 25-POINT GRID

15a: Correspondence, per thousand points sampled - pastural landscapes

Land Cover Map / Field Survey	Unclass	Suburban	Urban	Saltmarsh / Estuary	Inland water	Beach/ Mudflat	Salt marsh	Inland Bare	Tilled land	Managed grass	Marshy grass	Blackthorn	Grass moor	Bogs/ Bushes	Open heath	Dense heath	Birdwood/ Decid	Conifer wood	Total
Unclassified															1				1
Railway									1										1
Road	1	1	2					1	7	12			2				2	1	29
Agric. Bldgs		1							1	3			1						6
Res. Bldgs	2	21	1	1				1	11	11	1		2		1		2		54
Cont. Bldg		5	3					1	3	10	1		1		2		1		27
Sand/Estuary				17		2													19
Bare rock			1		2														4
Running water																	2		3
Salt water				11		5													16
Hard coast	1			2		4		1											8
Saltmarsh	1					1	3											1	9
Inland rocks																			5
Waste land						1				1									2
Hard areas																			
Quarries																			
Wheat	5	8	1			1		1	58	11	1		1		1		2		101
Barley	2	3						4	35	13	2		2		1				63
Oats		1							4	1									6
Other cereal																			
Maize											1								1
Turnip/swede	1								1	1									3
Kale									1	1									2
Oilseed rape	1	2	3						14	1									21
Other oilcrops																			
Peas	1								2	1									4
Field beans	1								3										5
Other legumes																			
Sugar beet																			
Potatoes	2								5	2							1		10
Other roots																			
Other field crops								1	2	1									4
Horticulture								1	4		1								6
Sown grass	3	1		1				1	11	27	1	2	2		1		1		51
Rye grass	4	3		1					17	105	2	2	3		2	1	3	2	145
Managed grass	2	2		1				1	6	81	2	1	4		1		5	1	107
Rec. grass	1	2							3	12		1					1		20
Weedy grass	2	1							4	33	2	2	4		1		2		52
Maritime veg													1						1
Fallow		1							4	2									8
Felled																			
Wetland									1	3		1	2		2		1		10
Unman. grass						1			3	5	1		2				1		13
Unmg. grass									2	5	1		2		1		2		13
Calc. grass										2	2		1						5
Upland grass									1	8	2	3	6		2	1	1		24
Bracken										3	1	1	1		1		1		8
Dune															1				1
Moor (not scrub)										1			1						2
Maritime moor													1		2				3
Wet bog													1		2				3
Dry bog													1		2				3
Berry-bush heath																			
Open heath								1		1	2	1	2		1				8
Dense heath															1	1			2
Deciduous crops																			
Coniferous crops																			
Mixed crops																			
Broadleaf decid.																			
Coniferous																			
Mixed wood																			
Orchard																			
Gardens																			
Total	31	56	11	37	2	16	3	14	231	380	26	17	52	3	29	8	56	24	996

TABLE 15 CALIBRATION OF CS-1990 FIELD SURVEY vs ITE LAND COVER MAP USING 25-POINT GRID

15b: Proportional Composition (%) of Land Cover Map Classes in terms of Field Survey Categories - pastural landscapes

Land Cover Map / Field Survey	Unclass	Suburban	Urban	Sea/ Estuary	Inland water	Beach/ Mudflat	Salt marsh	Inland Bare	Tilled land	Managed grass	Marsh/ r. grass	Bracken	Grass moor	Bogs/ Bushes	Open heath	Dense heath	Brdlleaf Decid	Conifer wood
Unclassified		1													2		1	
Railway						2			1				1	8			1	
Road	3	2	14					4	3	3	1		3		1		4	2
Agric. Bldgs.	1	2		1						1			1					
Res. Bldgs.	7	37	6	2		2		7	5	3	4		4		3	3	4	1
Cont. Built	1	8	25			2			1	3	3		2		5			
Sea/Estuary				44		9												
Still water			6		100							2	1					
Running water		11											1				3	
Soft coast			3	30		30	7						1					
Hard coast	3	1		6		26		7				2			1			2
Saltmarsh	2	1				4	73				1							
Inland rocks																		
Waste land						8		2			1						1	
Hard areas																		
Quarries																		
Wheat	15	14	8			4		7	30		3	2	1	15	2			
Barley	5	5	3			2		6	15	3	6	2	4		4			
Oats		1							2									
Other cereal																		
Maize		1						2			3							1
Turnip/swede	2	1																
Kale																	1	
Oilseed rape	4	3	25						6								1	
Other crucifers																		
Peas	4		3						1						1			
Field beans	2								1									
Other legumes																		
Sugar beet	5								3				1					
Potatoes		1							2				1		1		1	
Other roots																		
Other field crops	1							4	1									
Horticulture	1	1						4	2		3							
Sown grass	8	2	3	2				9	5	7	3	8	3	8	2		2	
Rye grass	11	6		3		2		2	7	28	10	13	6		8	6	5	6
Managed grass	8	3		3				4	3	21	10	7	8		4	3	9	4
Rec. grass	2	3	3				7		1	3		5	1		1	33	1	
Weedy grass	7	2		2			7		2	9	9	12	58		4	3	4	1
Maritime veg.						4	7						3		1			1
Fallow	1	1		2					2	1	1		1					
Felled															1		1	
Wetland	1							2	1	1		5	3		5		1	
Unman. grass		1	3			4		2	1	1	5	2	3		1	3	2	1
Unimp. grass				1					1	1	4	2	4		2		3	
Calc. grass	1			1						1	6		2					1
Upland grass	1							2	1	2	6	15	11		6	6	2	
Bracken	1	1		1		2				1	3	5	2		3	3	2	2
Dune																		
Moor (not peat)																		
Moor on peat																		
Wet bog													2		5			
Dry bog													2	8	6	3		
Berry-bush heath																		
Open heath								4			8	3	4	8	4			
Dense heath															3	6		1
Perennial crops																		
Shrub																		
Broadleaf (decid.)																		
Mixed wood																		
Conifers		1											9	46				63
Total	103	106	102	101	100	101	101	99	101	96	102	102	102	101	97	98	104	97

TABLE 15 CALIBRATION OF CS-1990 FIELD SURVEY vs ITE LAND COVER MAP USING 25-POINT GRID

15c: Proportional Composition (%) of Field Survey Classes in terms of Land Cover Map Categories - pastural landscapes

Land Cover Map / Field Survey	Unclass	Suburban	Urban	Sea/ Estuary	Inland water	Beach/ Mudflat	Salt marsh	Inland Bare	Tilled land	Managed grass	Marsh/ r. grass	Bracken	Grass moor	Bog/ Rushes	Open heath	Dense heath	Brdlfast/ Decid	Conifer wood	Total
Unclassified		20								20					40		20		100
Railway						11			44	11			11	11			11		99
Road	3	3	5					2	24	44	1		5		1		8	2	98
Agric. Bldgs	5	18		5					14	50			9						101
Res. Bldgs	4	39	1	2		1		2	20	20	2		4		2	1	4	1	103
Cont. Built	1	17	10			1		3	13	37	2		5		6	1	2	1	99
Sea/Estuary				90		8		2											100
Still water			14		43				14	7		7	7					7	99
Running water		7							7	21			14				43	7	99
Salt coast	11		2	62		26	2	1	3	3			2						100
Hard coast	9	3		24		42		9				3			3			6	99
Saltmarsh	11	6				11	61		6		6								101
Inland rocks																			
Waste land						36		9	9	27	9						9		99
Hard areas																			
Cereals									25	75									
Wheat	5	8	1			11		1	68	11	1		1	1	1		2		100
Barley	2	5						6	66	21	2		3		2				101
Oats		11							72	11						6			98
Other cereal																			100
Maize		17						17		17	33							17	101
Turnip/swede	22	11							33	33									99
Kale									40	40							20		100
Oilseed rape	6	8	14						68	3							2		101
Other crucifers									100										100
Peas	24		6						47	18					6				101
Field beans	14								64	21									99
Other legumes																			
Sugar beet	16								74	6			3						99
Potatoes		4							63	19			4		4		7		101
Other roots																			
Other field crops	9							18	55	18									
Horticulture	6	6						11	67		11								100
Sown grass	5	2	1	1				2	23	54	1	3	3	1	1		2		101
Rye grass	2	2		1					11	72	2	2	2		2		2	1	99
Managed grass	2	2						1	6	74	2	1	4		1		5	1	99
Rec. grass	3	8	2				2		14	60		5	2		2	2	3		100
Weedy grass	4	2		1			1		7	62	4	4	7		2	1	4	1	103
Maritime veg.						29	14						29		14			14	100
Fallow	4	7		7		8			46	29	4		4						100
Felled										33					33		33		101
Wetland	3							3	13	30		10	17		17		7		99
Unman. grass		2	2			4		2	18	37	8	2	10		2	2	8	2	100
Unimp. grass				2					15	41	7	2	15		5		12		99
Calc. grass	5			5					5	37	26		16					5	99
Upland grass	1							1	5	35	6	12	24		8	3	5		100
Bracken	3	3		3		3			3	27	6	9	12		9	3	12	6	99
Dune													100						100
Moor (not moth)										100		100	300	1	300	100			900
Mothb moor										36		9	36		9		19		109
Wet bog									10	10			30		50				100
Dry bog													27	9	55	9			100
Berry-bush heath																			
Open heath								8	4	8	25	8	25	4	17				99
Dense heath															50	33		17	100
Perennial cmnce										100									100
Shrub		11							4	52	11	7	4						101
Broadleaf decid.	2	4		1					9	17	2	2	36	1	14	9	12	2	101
Mixed wood	3							3	21	14		3	7		00	7	31	2	89
Conifers		2							4	8	3	2	13	5	6		12	46	101

TABLE 16 CALIBRATION OF CS-1990 FIELD SURVEY vs ITE LAND COVER MAP USING 25-POINT GRID

16a: Correspondence, per thousand points sampled - marginal upland landscapes

Land Cover Map / Field Survey	Unclass	Suburban	Urban	Sea/ Estuary	Inland water	Beach/ Mudflat	Salt marsh	Inland Bare	Tilled land	Managed grass	Marsh/ grass	Bracken	Grass moor	Bogs/ Bushes	Open heath	Dense heath	Birch/ Decid	Conifer wood	Total
Unclassified	1									1			1						3
Railway										1							1		2
Road	1									4			3		2	1	1	1	13
Agric. Bldgs	1								1	1			1		1				5
Res. Bldgs		2								1			1	1			1	1	7
Const. Bldg		1								1							1		3
Sea/Estuary	2			27		1				1			1		3				35
Still water	1				7					1			1	2	1		1		14
Running water									1	1				1	1			1	5
Soft coast	1																		1
Hard coast	1			1		2							1	2	2	1	1		11
Saltmarsh																			
Inland rocks																			
Waste land																			
Hard waste		1	1													1			3
Orchards	1												1		1				3
Wheat	1								3	1	1								6
Barley	1								4	7	1		1		1				16
Oats																			
Other cereals																			
Maize										1			1						2
Turnip/swede									1	1					1				3
Kale																			
Oilseed rape																			
Other crucifers																			
Peas																			
Field beans																			
Other legumes																			
Sugar beet																			
Potatoes																			
Other roots												1							1
Other field crops															1				1
Horticulture																			
Sown grass	1								1	13	1	1	2		1		1		21
Rye grass	1	1							4	39	1	1	1		2		1	1	52
Managed grass	8			1					10	78	4	4	6	1	3	1	7		123
Rec. grass		1										1							2
Woody grass	2			4		21			3	38	3	2	6		5	1	5		70
Mar/Ums veg	1			1						1	1			1	2	1			8
Fallow									1	1									2
Felled	1												1				1	1	4
Wasteland	1					1		1	4	3	2	1	6	1	7		1		28
Unman. grass				1						4			1	1					7
Unimp. grass				2					1	9		1	1		5		1		20
Calc. grass	1												1		2				4
Upland grass	3							1	1	14		5	18		6	3	2	1	55
Bracken		1								5		4	5	1	1	1	55	1	28
Dune											1	2	1		3				18
Moor (not moss)								1	1	8	2	9	33	1	8	4	1		75
Moss/ peat moor										1		1	8	1	6	1	1	1	20
Wet bog	2									3	1	3	18	6	35	5	3	1	77
Dry bog	1							1	1	1	1	1	12	5	31	4		1	59
Berry-bush heath	3									1	1		3		6	2	1		17
Open heath	2								1	3	1	4	6	2	20	16	2	1	58
Dense heath	1									3	1	2	7	1	14	26	3		58
Deciduous wood																			
Scrub									1	1						1			3
Broadleaf decid.									1	7	1	1	4	1	4	2	7	1	29
Mixed wood										2			1	1		1	2	1	8
Conifers	6	2							1	4	1	1	12	5	22	10	8	37	108
Total	52	11	2	37	7	7		4	41	261	24	45	166	34	197	81	59	50	1078

TABLE 16 CALIBRATION OF CS-1990 FIELD SURVEY vs ITE LAND COVER MAP USING 25-POINT GRID

16b: Proportional Composition (%) of Land Cover Map Classes in terms of Field Survey Categories - marginal upland landscapes

Land Cover Map / Field Survey	Unclass.	Suburban	Urban	Sea/ Estuary	Inland water	Beach/ Mudflat	Salt marsh	Inland Bare	Tilled land	Managed grass	Marsh/ r. grass	Bracken	Grass moor	Bogs/ Bushes	Open heath	Dense heath	Brdlsaf Decid	Conifer wood
Unclassified	1																	
Railway																	1	
Road	1									2			2		1	1	2	1
Agric. Bldgs	1								1				1					
Res. Bldgs		27												2			1	1
Cont. Built		7																
Sea/Estuary	3			77		20												
Still water	1				100									7	1			
Running water									1					2	1			
Soft coast	1																	
Hard coast	1			3		30								5	1	1	1	
Saltmarsh																		
Inland rocks																		
Waste land																		
Hard areas		7	50													1		
Quarries			50															
Wheat	1								9		3							
Barley	2	7							10	3	3				1			
Oats																		
Other cereal																		
Maize																		
Turnip/swede									1									
Kale																		
Oilseed rape																		
Other crucifers																		
Peas																		
Field beans																		
Other legumes																		
Sugar beet																		
Potatoes																		
Other roots												1						
Other field crops																		
Horticulture																		
Sown grass	2								3	5	3	1	1				1	
Rye grass	2	7							11	15	3	3	1		1		2	1
Managed grass	19	7		3					29	31	21	10	4	2	2	2	13	
Rec. grass																		
Weedy grass	3			10		10			7	15	15	5	4		3		10	
Maritime veg.	1			1							3			2	1	1		
Fallow									1									
Felled	2																1	2
Wetland	1					10		20	10	1	12	3	4	4	4		1	
Unman. grass				1						1				2				
Unimp. grass				4					1	4		1			3		2	
Calc. grass	2														1			
Upland grass	6							20	3	6		11	12		3	3	3	
Bracken	8	7								2		9	3	2	1	1	9	2
Dune						20					3	4			1			
Moor (not mgmt)	10	13				10		40	41	3	9	23	21	4	4	5	1	
Mgmts moor												3	5	4	3	1	2	2
Wet bog	3									1	6	6	12	20	18	6	5	1
Dry bog	1							20	1		3	1	7	16	16	5		1
Berry-bush heath	6										3		2		3	2	1	
Open heath	5								3	1	3	9	4	5	10	21	3	1
Dense heath	2									1	3	5	4	2	7	34	6	
Perennial crops																		
Arable																		
Broadleaf decid.																		
Mixed wood																		
Conifers	10	20							3	1	6	3	7	16	11	13	16	81
Total	95	102	100	99	100	100		100	97	96	102	102	98	103	101	100	101	98

TABLE 16 CALIBRATION OF CS-1990 FIELD SURVEY vs ITE LAND COVER MAP USING 25-POINT GRID

16c: Proportional Composition (%) of Field Survey Classes in terms of Land Cover Map Categories - marginal upland landscapes

Land Cover Map / Field Survey	Unclass	Suburban	Urban	Sea/ Estuary	Inland water	Beach/ Mudflat	Salt marsh	Inland Bare	Tilled land	Managed grass	Marsh/ r. grass	Bracken	Grass moor	Bog/ Rushes	Open heath	Dense heath	Birdwd Decid	Conifer wood	Total
Unclassified	33									33			33						99
Railway										67							33		100
Road	5									36			23		18	5	9	5	101
Agric. Bldgs	14								14	29			29		14				100
Res. Bldgs		44								11			11	11			11	11	99
Comt. Bldg		33								33							33		99
Sea/Estuary	5			80		3				2			2		9			3	101
Still water	4				56					8			4	16	8		4		100
Running water									17	17				17	33			17	101
Bare ground	100																		100
Hard coast	7			13		20							7	20	20	7	7		101
Salt marsh																			
Inland rocks																			
Waste land																			
Hard areas		33	33													33			99
Quarries			33										33		33				99
Wheat	10								60	20	10								100
Barley	7	4							25	50	4		4	4	7				101
Oats																			
Other cereal																			
Maize										50			50						100
Turnip/swede									33	33					33				99
Kale																			
Oilseed rape																			
Other crucifers																			
Peas																			
Field beans																			
Other legumes																			
Sugar beet																			
Potatoes																			
Other roots												100							100
Other field crops															100				100
Horticulture																			
Sown grass	5								5	68	3	3	11		3		3		101
Rye grass	2	1							8	77	1	2	2		4		2	1	100
Managed grass	7			1					8	65	3	3	5		3		5		100
Rec. grass		50										50							100
Weedy grass	2			5		1			4	57	4	3	8		7	11	7		99
Mar/trop veg	10			10						10	10			10	40	10			100
Fallow									33	67									100
Felled	33												17				17	33	100
Wetland	2					2		2	14	10	8	4	24	4	28		2		100
Unman. grass				10						70			10	10					100
Unimp. grass				8					3	50		3	3		28		6		101
Calc. grass	29												14		57				100
Upland grass	15							1	2	27		9	37		12	5	3	1	102
Bracken	14									20		14	20	2	14	2	18		100
Dune						17					8	25	18		42				100
Moor (not grass)	16					1		1	1	11	2	13	45	1	11	1	1		100
Mixed moor										5		5	39	25	29	5	5	5	98
Wet bog	2									3	1	3	24	7	48	6	3	1	98
Dry bog	1							1	1	1	1	1	21	8	57	7		1	100
Berry-bush heath	17									7	3		20		40	10	3		100
Open heath	4								2	6	1	6	11	3	36	28	3	1	101
Dense heath	2									5	1	4	12	1	24	46	5		100
Perennial grass																			
Shrub																			
Broadleaf decid.																			
Mixed wood																			
Conifer																			

TABLE 17 CALIBRATION OF CS-1990 FIELD SURVEY vs ITE LAND COVER MAP USING 25-POINT GRID

17a: Correspondence, per thousand points sampled - upland landscapes

Land Cover Map / Field Survey	Unclass.	Suburban	Urban	Sea/ Estuary	Inland water	Beach/ Mudflat	Salt marsh	Inland Bare	Tilled land	Managed grass	Marsh/ rough grass	Bracken	Gorse/ mixed scrub	Bogs/ Rushes	Open heath	Dense heath	Birch/ Decid	Conifer wood	Total
Unclassified																			
Railway																			
Road										1					2				3
Agric. Bldgs																			
Res. Bldgs.		1								1									2
Cont. Built																			
Sea/Estuary	1			23		2								1					29
Still water					11						11			1	2		1		17
Running water																			
Bog/ moor				2															2
Hard coast				2		1							1		2				6
Saltmarsh																			
Inland rocks															1				1
Waste land																			
Hard areas																			
Quarries																			
Wheat																			
Barley																			1
Oats																			
Other cereal																			1
Maize																			
Turnip/swede																			
Kale																			
Oilseed rape																			
Other cruciters																			
Peas																			
Field beans																			
Other legumes																			
Potatoes																			
Other roots																			
Other field crops																			
Horticulture																			
Sown grass										4					1				5
Rye grass									3	8									11
Managed grass										11			1		2			1	15
Rec. grass																			
Rough grass										8			2	1	4				16
Gardens veg.															1				1
Fallow																			
Felled															2				2
Wetland										3	1	1	6	1	7	3			22
Urban, grass		1																	1
Urbn. grass										2									2
Coll. grass										2		1	2						5
Upland grass	2									9	1		9	1	6		1		30
Bracken	1									2			4	1	5	4		2	20
Gorse													1						1
Moor (not moss)	1												25	6	29	4			76
Mobile moor													8	3	8				22
Wet bog	4					2		5	2	3	5	2	50	44	161	11	4	1	294
Dry bog						1		3		1	1		23	4	34	4	1		72
Berry-bush heath										1			4	1	8	2			16
Open heath	1				1			2		4	2	2	15	6	46	20	1	1	101
Dense heath										2			1	1	23	14	1		42
Managed crops																			
Shrub																			
Broadleaf decid.										2			1		4	1	1		9
Mixed wood										1	1				1			2	3
Conifers	3									2			14	5	16	8	6	20	127
Total	13	2		29	11	10		15	9	69	12	11	168	76	365	74	19	78	961

TABLE 17 CALIBRATION OF CS-1990 FIELD SURVEY vs ITE LAND COVER MAP USING 25-POINT GRID

17b: Proportional Composition (%) of Land Cover Map Classes in terms of Field Survey Categories - upland landscapes

Land Cover Map / Field Survey	Unclass.	Suburban	Urban	Sea/ Estuary	Inland water	Beach/ Mudflat	Salt marsh	Inland Bare	Tilled land	Managed grass	Marsh/ r. grass	Bracken	Grass moor	Bogs/ Bushes	Open heath	Dense heath	Bridleal/ Decid	Conifer wood
Unclassified																		
Railway										1					1		2	
Road																		
Agric. Bldgs		33							4	2							2	
Res. Bldgs		11								1								
Cont. Built				76		16	100			1	6			1			4	
Sea/Estuary	8				86			2		1				2	1		8	
Still water	3												1	1				
Running water				9		31				1								
Soft coast			50	6		9		2					1					
Hard coast						3												
Saltmarsh				1				2								1		
Inland rocks																		
Waste land																		
Hard areas																		
Quarries																		
Wheat																		
Barley	3																	
Oats										1								
Other cereal																		
Maize																		
Turnip/swede									4	1								
Kale																		
Oilseed rape																		
Other cruciters																		
Peas																		
Field beans																		
Other legumes																		
Sugar beet																		
Potatoes																		
Other roots																		
Other field crops																		
Horticulture																		
Sown grass									4	5	3	3						
Rye grass		11							21	12								
Managed grass	3									16			1	1	1			1
Rec. grass									4	10			1	1	1	2	2	
Weedy grass				1				2										
Maritime veg.																		
Fallow											3	3		1	1			
Felled																		
Wetland	3		50	1	3					4	6	7	3	1	2	3	2	
Unman. grass		22				3												
Unimp. grass	3									3								
Calc. grass						3		2		2		7	1	1				
Upland grass	14					3		2	4	12	9	10	5	2	2		1	
Bracken	6									3		7	3	2	1	5	4	1
Dune						3							1	2	1	1	2	
Moor (not mtn)	8				3			19	11	4	13	14	15	7	8	6	2	
Mobile moss	3				3			2		1	3	3	5	4	2	2	2	
Wet bog	22	11		1		16		28	18	4	34	14	30	56	44	15	20	2
Dry bog						9		16	4	2	9	3	13	6	9	5	4	1
Berry-bush heath								2		1			2	1	2	3		
Open heath	6			3	3			9		5	13	14	9	7	13	26	4	1
Dense heath	3					3		2	4	2	3	3	1	2	6	18	4	
Perennial crops																		
Shrub																		
Broadleaf decid.								2										
Mixed wood											6							
Conifers	17	11						5				10	18	6		10	29	89
Total	102	99	100	98	98	99	100	97	103	101	98	98	101	103	99	100	99	101

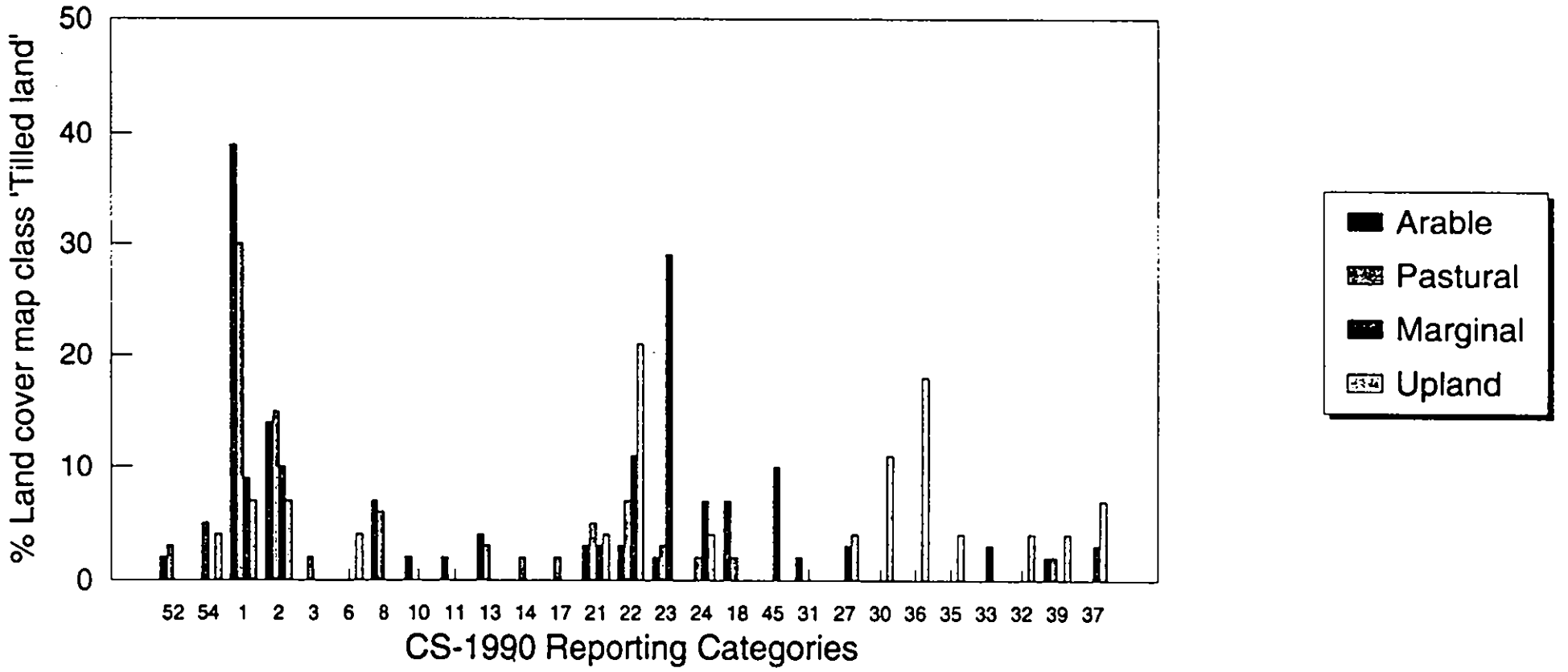
TABLE 17 CALIBRATION OF CS-1990 FIELD SURVEY vs ITE LAND COVER MAP USING 25-POINT GRID

17c: Proportional Composition (%) of Field Survey Classes in terms of Land Cover Map Categories - upland landscapes

Land Cover Map / Field Survey	Unclass	Suburban	Urban	Sea/ Estuary	Inland water	Beach/ Mudflat	Salt marsh	Inland Bare	Tilled land	Managed grass	Marsh/ r grass	Bracken	Grass moor	Bogs/ Bushes	Open heath	Dense heath	Birdwat Decid	Conifer wood	Total
Unclassified															100				100
Railway																			
Road										22			11		56		11		100
Agric. Bldgs													100						100
Res. Bldgs		33							11	33					11		11		99
Cont. Built		50								50									100
Sea/Estuary	4			74			1			1	3			3	1	1	3		98
Still water	2				58			2		2			2	7	14	2	9		98
Running water													67	33					100
Salt coast				33		56				6			6						101
Hard coast			7	27		20		7					13		27				101
Saltmarsh						100													100
Inland rocks				14				14					14		43	14			99
Waste land																			
Hard areas																			
Quarries													100						100
Wheat									100										100
Barley	25								50				25	25					100
Oats										50			50						100
Other cereal																			
Maize																			
Turnip/rswede									33	33					33				99
Kale																			
Oilseed rape																			
Other cruciffers																			
Peas																			
Field beans																			
Other legumes																			
Sugar beet																			
Potatoes																			
Other roots																			
Other field crops																			
Horticulture																			
Sown grass									7	57	7	7	7		14				99
Rye grass		4							22	70					4				100
Lowland managed grass	3									70			5	3	14			15	100
Rec. grass																			
Weedy grass									3	47			11	6	22	8	3		100
Mixture veg				25				25							50				100
Fallow																			
Felled											13	13		13	63				102
Wetland	2		2	2	2					12	4	4	25	4	31	12	2		102
Unman. grass		40				20							20		20				100
Unimp. grass	14									71					14				99
Calc. grass						7		7		29		14	29	7	7				100
Upland grass	7					1		1	1	27	4	4	27	4	18		3	1	98
Bracken	4									41		4	21	6	28	19	4	24	99
Dune						25							50				25		100
Moor (not moth)	2							5	2	4	2	2	32	7	38	5	1	1	101
Moor (moth)	2					2		2		2	2	2	33	13	31	7		5	101
Wet bog	1					1		2	1	1	2	1	17	15	54	4	1		100
Dry bog						2		4	1	2	2	1	31	6	46	5	1	1	102
Berry-bush heath								3		6			22	6	50	14			101
Open heath	1			1				2		4	2	2	15	6	47	20	1	1	102
Dense heath	1					1		1	1	4	1	1	2	3	52	31	2		100
Perennial crops																			
Urban																			
Broadleaf decid.								4	4	16			12		40	12	12		100
Mixed wood										13	25				13			50	101
Conifers	2							1	1	12	1	1	11	4	13	26	5	55	101

FIGURE 2 Land Cover Map Class 'Tilled Land'

Effects of landscape type on relationship with CS-1990 Reporting Categories



7.4.3 **Inter-calibration of Countryside Survey 1990 Field Survey *vs* ITE Land Cover Map using summary statistics.** Summary land cover estimates were available from both CS-1990 field records and from the Land Cover Map for a total of 506 1km squares. For each square, estimates were derived from the two datasets of the extent of land in each of the mapped categories. The challenge is then to utilise these estimates of land cover as a guide to the degree of overlap between individual land categories in the two surveys.

Let $[A]_{ms}$ be the estimated value from survey A of the extent of land class n in grid square s and $[B]_{ns}$ the corresponding estimate from survey B of the extent of the equivalent land class m.

When classes m and n are exactly equivalent, a plot of $[A]_{ms}$ *vs* $[B]_{ns}$ would be linear, with a slope of unity. In practice, the data diverge from this ideal, because of mis-match in class definitions (slope greater than, or less than unity) and because of mapping errors (scatter of points about the line).

In principle, estimates in survey A of the coverage of class m across all squares can be represented as a linear combination of the areal extent of those classes ni..nj in survey B which correspond wholly or in part with class m. That is:

$$[A]_m = f_1[B]_{n1} + f_2[B]_{n2} \ldots + f_j[B]_{nj}$$

Therefore, multiple linear regression of the areal estimates of class m in survey A against estimated cover for all classes in survey B will generate a linear transform between the two systems. There are assumptions in this hypothesis, notably that the inter-class relationship is linear with respect to areal extent and that, within the $1km^2$ recording units, the coincidence in summary statistics does indeed correspond to geographical overlap between classes.

The choice of significant predictors, $f_i[B]_{ni}..f_j[B]_{nj}$ was determined as follows:

1 stepwise regression, using the maximum F-statistic, was used to identify a useful subset of the predictors. An arbitrary cut-off was chosen, when the contribution to the cumulative value of R^2 resulting from the addition of new predictors fell below 1%. Occasionally, some empirical judgements were made to reject marginally significant categories which were not intuitively associated with the target class. For example, stepwise regression indicated a weak association between Land Cover Map class 'C' (Beach / Mudflats) and CS-1990 Reporting Category 15 (Root Crops). Given the weakness of the association, this was ignored.

2 A correlation matrix was generated for all pairs of classes, so as to identify any significant associations missed by the stepwise regression. Those predictors were considered with a correlation coefficient ≥0.25.

3 If the correlation matrix suggested the use of additional predictors, a best subsets regression was computed, using the maximum R^2 criterion.

4 The final set of predictors was chosen, once again using an arbitrary cut-off at the point at which the increment in R^2 fell below 1%.

Table 18 records the coefficients of regression. Table 18a shows the regression of Land Cover Map classes on equivalent CS-1990 Reporting Categories and 18b shows the inverse (CS-1990 Reporting Categories on Land Cover Map classes). It is suggested that these linear transforms provide the most secure base from which to model land cover data from one survey in terms of the second. Figures 3 and 4 are plots of the above regression data, which provide a graphical representation of the inter-calibration for the statistically preferred class combinations. All results are significant at the 1% level. In many cases, the fit of predicted cover to the measured values is remarkable, especially where a category in one classification is comprised of a number of constituent classes in the second system (eg Land Cover Map Classes F and N). The regression model is less satisfactory in the case of more heterogeneous classes, especially those corresponding to natural and semi-natural vegetation, where the model shows much greater scatter and where the calibrations are less successful and the slope of the regression line departs from unity.

In general, the approach is less successful in calibrating Field Survey data, because the regression falsely assumes an even spatial distribution of the field categories which correspond to the much broader Land Cover Map classes. Thus, the regression model predicts that 18.5% of land recorded as 'Tilled Land' in the Land Cover Map is barley. Over the complete population of 508 squares, this is valid, but in any one square, the proportional cover varies between zero and 75%. The model predicts the presence of barley, in any square where the remotely-sensed database detects tilled land, even in those sites exclusively under other crops. It is probable that a more reliable calibration could be achieved by ignoring data where one or other survey records zero cover.

TABLE 18 CALIBRATION OF CS-1990 FIELD DATA AND LAND COVER MAP FROM SUMMARY STATISTICS

18a Coefficients of regression: Land Cover Map Classes regressed against CS-1990 Reporting Categories

Land Cover Map / CS-1990 Reporting classes	Suburban	Urban	Sea/ Estuary	Inland water	Beach/ Mudflat	Salt marsh	Inland Bare	Tilled land	Managed grass	Marsh/ rough grass	Bracken	Gorse moor	Bogs/ Bushes	Open heath	Dense heath	Birdwood Decid	Conifer wood
Railway																	
Road																	
Agric. Bldgs																	
Res. Bldgs	0.635																
Com. Bldgs	0.281	0.245															
Sea/Estuary			0.982														
Still water				0.859			0.056										
Running water																	
Soft coast			0.644		0.487												
Hard coast /					0.681					0.201							
Saltmarsh					0.278	0.946											
Inland rocks																	
Waste land																	
Hard areas																	
Quarries																	
Wheat	0.102							0.966									
Barley								0.821									
Oats																	
Other cereal																	
Maize																	
Turnip/swede																	
Kale																	
Oilseed rape		0.101						0.857									
Other crucifers	0.653																
Peas																	
Field beans																	
Other legumes																	
Sugar beet								0.907									
Potatoes								1.01									
Other roots																	
Other field crops										0.255							
Horticulture		0.123					0.192										
Sown grass									0.698								
Rye grass									0.906								
Managed grass									0.806								
Rec. grass	0.261								0.891								
Woody grass									0.668								
Maritime veg.																	
Fallow								0.909									
Felled																	-0.91
Wetland										0.355				0.694			
Unmgm. grass										0.217							
Unmgd. grass									0.652	0.17							
Calc. grass					0.13							0.476					
Upland grass											0.145	0.651					
Bracken																	
Dune																	
Moor (not moltin)							0.037				0.075	0.66					
Moltinia moor										0.069		0.742					
Wet bog							0.02					0.153	0.207	0.583			
Dry bog												0.337		0.634			
Berry-bush heath											0.143						
Open heath														0.489	0.427		
Dense heath														0.376	0.565		
Perennial crops																	
Shrub																	
Broadleaf decid																0.86	
Mixed wood																0.252	0.353
Conifers														0.139			0.615
Constant	0.474	0.044	0.323	-0.09	-0.02	-0.02	0.49	4.02	5.54	0.826	1.2	3.14	0.669	2.66	0.721	1.54	-0.25
R-squared	0.666	0.372	0.644	0.96	0.716	0.94	0.072	0.858	0.813	0.288	0.073	0.539	0.408	0.622	0.551	0.605	0.749

TABLE 18 CALIBRATION OF CS-1990 FIELD DATA AND LAND COVER MAP FROM SUMMARY STATISTICS

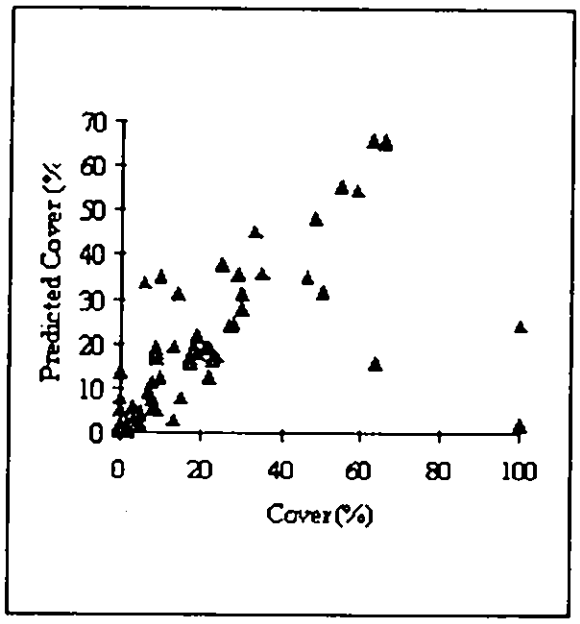
18b Coefficients of regression: CS-1990 Reporting Classes regressed against Land Cover Map Categories

Land Cover Map / CS-1990 Reporting classes	Suburban	Urban	Sea/ Estuary	Inland water	Beach/ Mudflat	Salt marsh	Inland Bare	Tilled land	Managed grass	Marsh grass	Bracken	Grass moor	Bogs/ Bushes	Open heath	Dense heath	Birdwd/ Decid	Conifer wood	Constant	R-squared
Railway	0.01	0.06																0.12	0.07
Road	0.07								0.03				0.02					0.41	0.27
Agric. Bldgs			0.01					0.01	0.02									-0.04	0.22
Res. Bldgs	0.73							-0.03										0.66	0.56
Cont. Built	0.19	0.98						-0.02										0.45	0.37
Sea/Estuary			0.53															0.48	0.57
Still water				1.12														0.13	0.96
Running water						0.21												0.30	0.39
Soft coast			0.11		0.72													-0.12	0.51
Hard coast			0.05		0.28	-0.12												0.21	0.29
Saltmarsh						0.99												0.04	0.94
Inland rocks																			
Waste land	0.03				0.06													0.00	0.10
Hard grass																			
Orchards																			
Wheat								0.49										-1.20	0.63
Barley								0.19										0.94	0.24
Oats																			
Other cereal																			
Maize																			
Turnip/swede																			
Kale																			
Oilseed rape		0.53						0.09										-0.52	0.22
Other cruciferx																			
Peas								0.02										-0.04	0.07
Field beans																			
Other legumes																			
Sugar beet								0.04										-0.11	0.10
Potatoes								0.03										-0.09	0.08
Other roots																			
Other field crops						0.08		0.02		0.09								-0.21	0.09
Horticulture		0.22					0.11											-0.04	0.08
Sown grass								0.03	0.11									-0.44	0.17
Rye grass									0.39									-1.70	0.46
Managed grass									0.32									-0.38	0.38
Rec. grass	0.21																	0.18	0.15
Woody grass								-0.04	0.14									1.74	0.18
Maritime veg.			0.03		0.06									0.01				-0.00	0.13
Fallow								0.08										-0.24	0.09
Felled																			
Wetland										0.47			0.05					-0.03	0.24
Unman. grass										0.09		-0.02		-0.02				1.42	0.08
Ubmp. grass									0.03	0.34								-0.59	0.12
Calc. grass																			
Upland grass										0.19	0.14	0.14						0.37	0.16
Bracken												0.05			0.08	0.07		0.07	0.06
Dune																			
Mixed (not marsh)							0.58					0.34						-0.77	0.30
Marsh grass										0.30	-0.14	0.18						-0.80	0.19
Wet bog												0.13	1.33	0.43				-2.11	0.58
Dry bog												0.11		0.16				-0.66	0.22
Berry-bush heath												0.04			0.08			-0.03	0.06
Open heath											0.20			0.11	0.55			-0.30	0.42
Dense heath															0.51			0.25	0.38
Perennial crops																			
Shrub																			
Broadleaf decid.																0.68		0.37	0.60
Mixed wood																0.05	0.10	0.26	0.10
Conifers																	1.20	1.53	0.73

* R-squared < 0.005

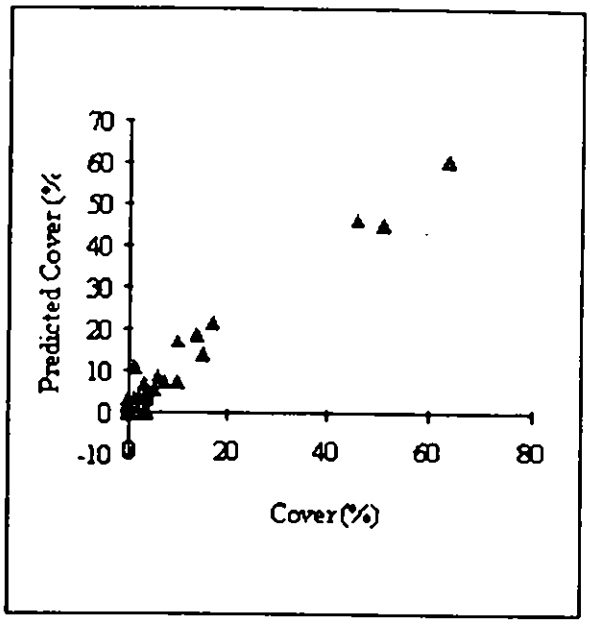
FIGURE 3: FIT OF PROPORTIONAL COVER FROM THE LAND COVER MAP WITH VALUES PREDICTED BY LINEAR REGRESSION OF EQUIVALENT CS-1990 REPORTING CATEGORIES

LCP-A = 0.323 + 0.982 CS-59 + 0.644 CS-46



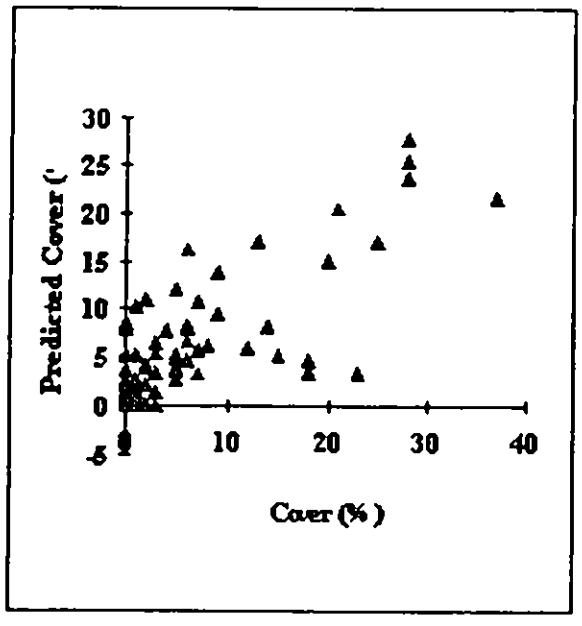
Land Cover Map Class A: Sea & Estuary
Equivalent CS-1990 Reporting Classes: 59 (Sea); 46 (Soft Coast)

LCP-B = -0.0919 + 0.859 CS-43



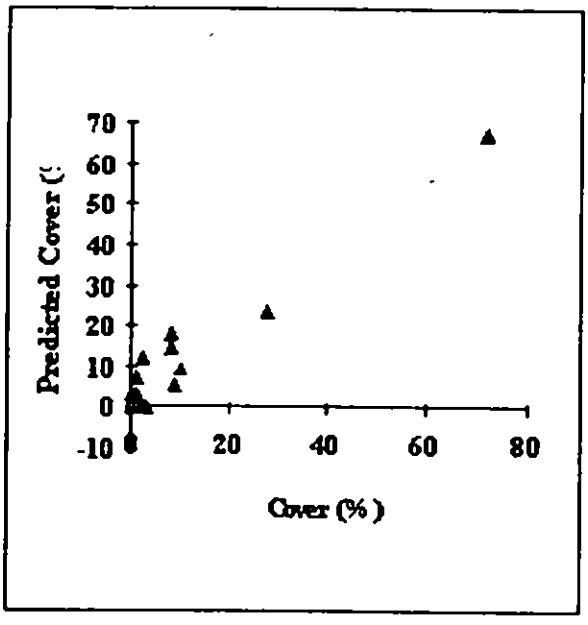
Land Cover Map Class B: Inland Waters
Equivalent CS-1990 Reporting Class: 43 (Still Water)

LCP-C = -0.203 + 0.487 CS-46 + 0.681 CS-49 + 0.278 CS-47 + 0.13 CS-26



Land Cover Map Class C: Beach & Mudflats
Equivalent CS-1990 Reporting Classes: 46 (Soft Coast); 49 (Hard Coast); 47 (Saltmarsh); 26 (Calcareous Grass)

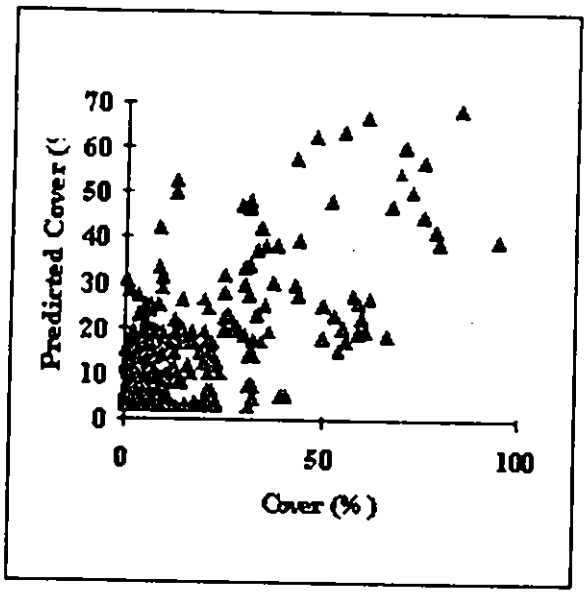
LCP-D = -0.0187 + 0.946 CS-47



Land Cover Map Class D: Saltmarsh
Equivalent CS-1990 Reporting Class: 47 (Saltmarsh)

FIGURE 3: FIT OF PROPORTIONAL COVER FROM THE LAND COVER MAP WITH VALUES PREDICTED BY LINEAR REGRESSION OF EQUIVALENT CS-1990 REPORTING CATEGORIES

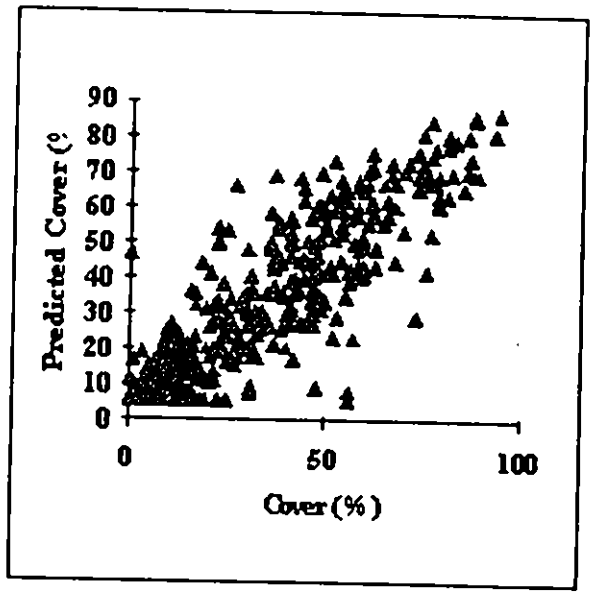
LCP-E = 3.14 + 0.742 CS-29 + 0.66 CS-30 + 0.651 CS-27 + 0.476 CS-26 + 0.337 CS-35 + 0.153 CS-36



Land Cover Map Class E: Grass Moor

Equivalent CS-1990 Reporting Classes: 29 (Molinia Moor); 30 (Non-molinia moor); 27 (Upland Grass); 26 (Calcareous Grass); 35 (Dry Bogs) (36 (Wet Bogs)

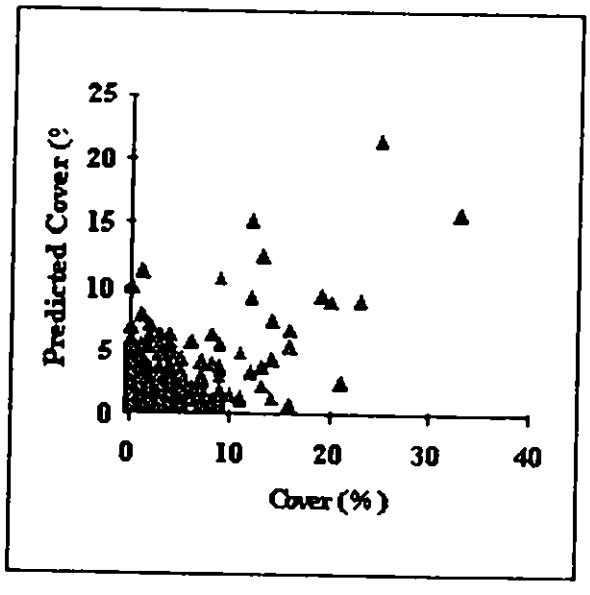
LCP-F=5.54 + 0.891 CS-20 + 0.698 CS-21 + 0.906 CS-22 + 0.806 CS-23 + 0.666 CS-24 + 0.652 CS-25



Land Cover Map Class F: Managed Grass

Equivalent CS-1990 Reporting Classes: 20 (Recreational Grass); 21 (Sown Grass); 22 (Rye Grass); 23 (Managesd Grass); 24 (Weedy Swards); 25 (Unimproved Grass)

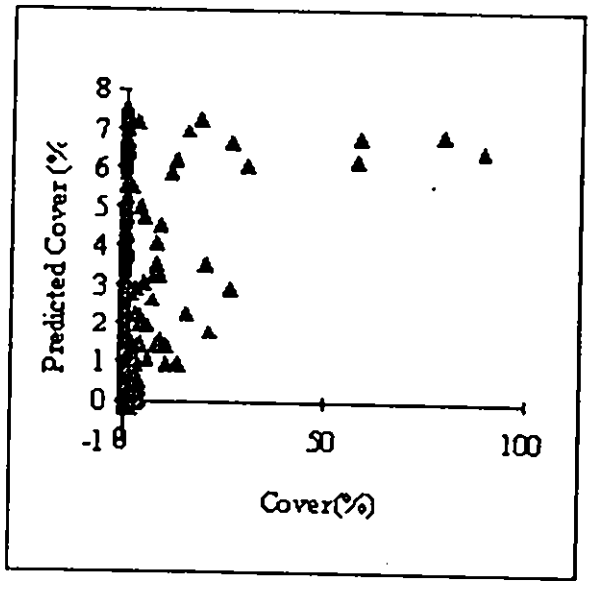
LCP-G = 0.826 + 0.255 CS-16 + 0.17 CS-25 + 0.0686 CS-29 + 0.217 CS-31 + 0.355 CS-45 + 0.201 CS-49



Land Cover Map Class G: Marsh/R. Grass

Equivalent CS-1990 Reporting Classes: 16 (Other Crops); 25 (Un-improved Grass); 29 (Molinia Moor); 31 (Unmanaged Grass); 45 (Wetland); 49 (Hard Coast)

LCP-H = 2.66 + 0.376 CS-32 + 0.489 CS-33 + 0.634 CS-35 + 0.583 CS-36 + 0.139 CS-37 + 0.694 CS-45

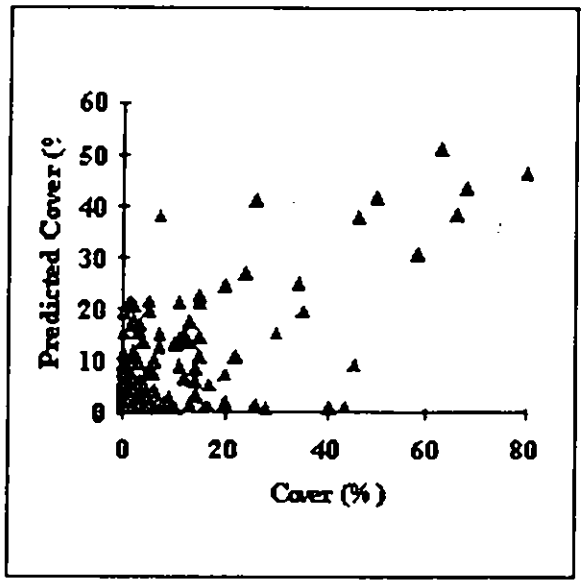


Land Cover Map Class H: Open Heath

Equivalent CS-1990 Reporting Classes: 32 (Dense Heath); 33 (Open Heath); 35 (Dry Bogs); 36 (Wet Bogs); 37 (Conifer Woodland) ;45 (Wetland)

FIGURE 3: FIT OF PROPORTIONAL COVER FROM THE LAND COVER MAP WITH VALUES PREDICTED BY LINEAR REGRESSION OF EQUIVALENT CS-1990 REPORTING CATEGORIES

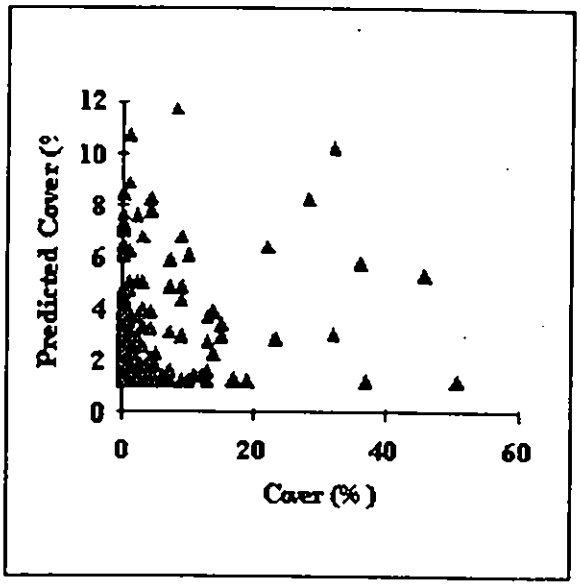
LCP-I = 0.721 + 0.565 CS-32 + 0.427 CS-33



Land Cover Map Class I: Dense Heath

Equivalent CS-1990 Reporting Classes: 32 (Dense Heath); 33 (Open Heath)

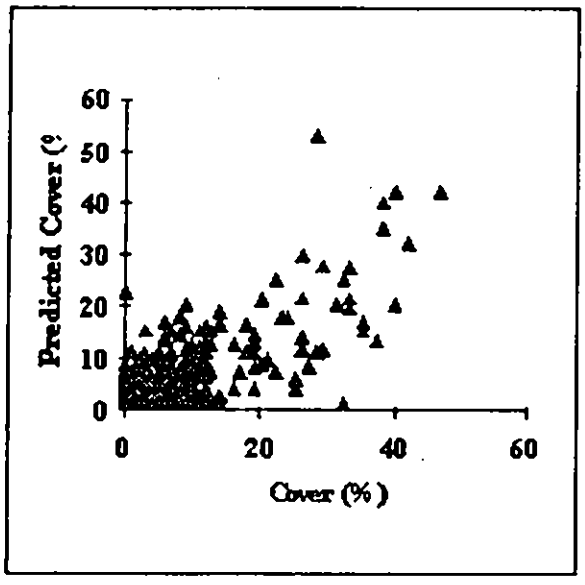
LCP-J = 1.2 + 0.145 CS-27 +0.0747 CS-30 + 0.143 CS-34



Land Cover Map Class J: Bracken

Equivalent CS-1990 Reporting Classes: 27 (Upland Grass); 30 (Non-Molinia Moor); 34 (Berry-bush Heath)

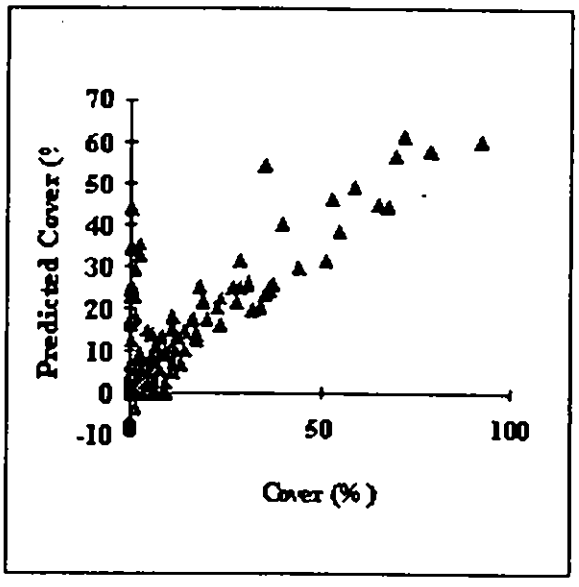
LCP-K = 1.54 + 0.252 CS-38 + 0.86 CS-39



Land Cover Map Class K: Deciduous Broadleaved Woodland

Equivalent CS-1990 Reporting Classes: 38 (Mixed Woodland); 39 (Broadleaved Woodland)

LCP-L = -0.251 + 0.615 CS-37 + 0.353 CS-38 - 0.906 CS-41

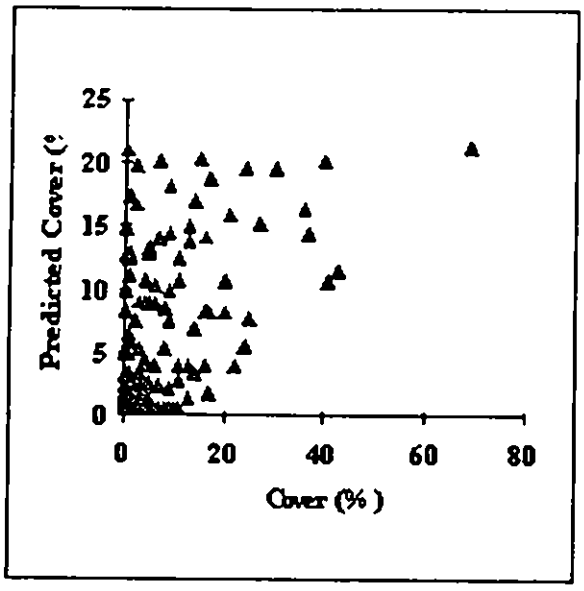


Land Cover Map Class L: Conifer Woodland

Equivalent CS-1990 Reporting Classes: 37 (Coniferous Woodland); 38 (Mixed Woodland); 41 (Felled Woodland)

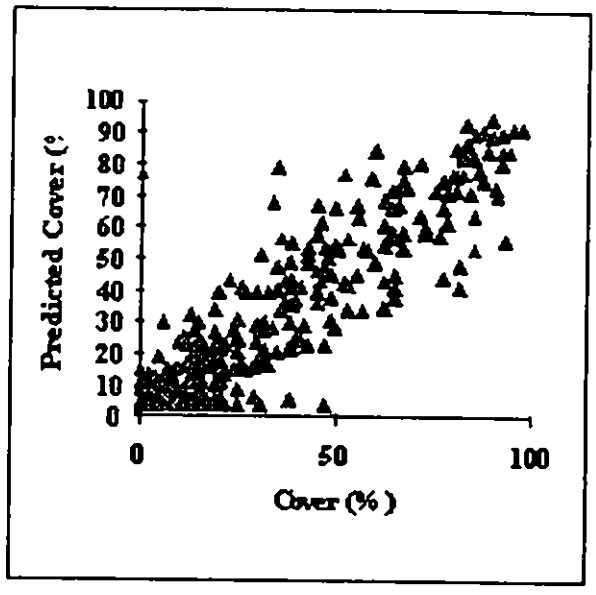
FIGURE 3: FIT OF PROPORTIONAL COVER FROM THE LAND COVER MAP WITH VALUES PREDICTED BY LINEAR REGRESSION OF EQUIVALENT CS-1990 REPORTING CATEGORIES

LCP-M = 0.669 + 0.207 CS-36



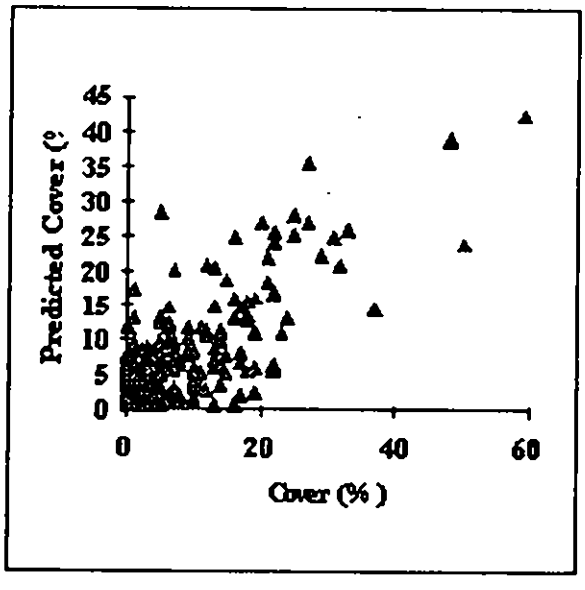
Land Cover Map Class M: Bogs
Equivalent CS-1990 Reporting Class: 36 (Wet Bogs);

LCP-N = 4.02 + 0.966 CS-1 +0.821 CS-2 + 0.857 CS-8 + 0.907 CS-13 + 1.01 CS-14 + 0.909 CS-18



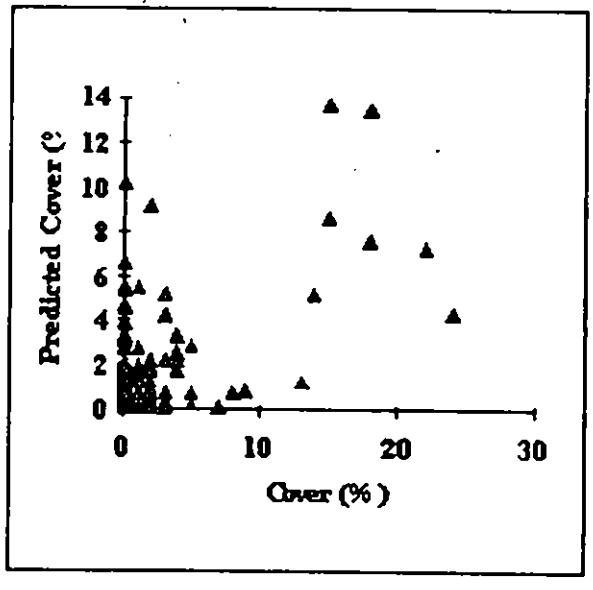
Land Cover Map Class N: Tilled Land
Equivalent CS-1990 Reporting Classes: 1 (Wheat); 2 (Barley); 8 (Oil-seed Rape); 13 (Sugar Beet); 14 (Potatoes); 18 (Fallow)

LCP-O = 0.474 + 0.102 CS-1 + 0.853 CS-9 + 0.261 CS-20 + 0.635 CS-54 + 0.281 CS-55



Land Cover Map Class O: Suburban Land
Equivalent CS-1990 Reporting Classes: 1 (Wheat); 9 (Crucifer Crops); 20 (Recreational Grass); 54 (Residential Buildings); 55 (Continuous Built)

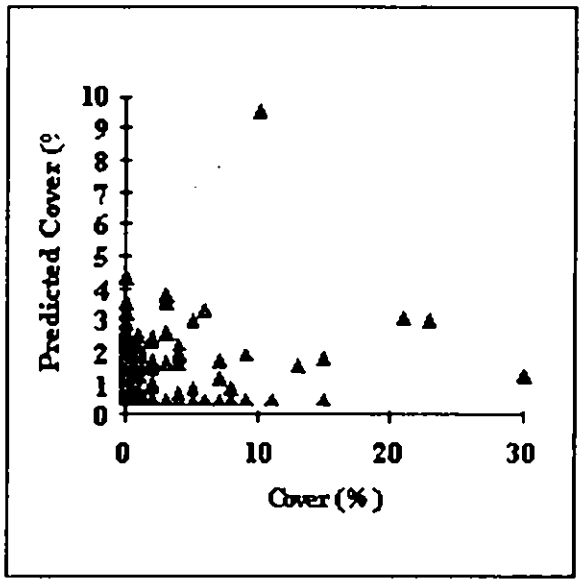
LCP-P = 0.0436 + 0.101 CS-8 + 0.123 CS-17 + 0.245 CS-55



Land Cover Map Class P: Urban Land
Equivalent CS-1990 Reporting Classes: 8 (Oil Seed Rape); 17 (Horticulture); 55 (Continuous Built)

FIGURE 3: FIT OF PROPORTIONAL COVER FROM THE LAND COVER MAP WITH VALUES PREDICTED BY LINEAR REGRESSION OF EQUIVALENT CS-1990 REPORTING CATEGORIES

LCP-Q = 0.49 + 0.192 CS-17 + 0.0201 CS-36 + 0.037 CS-30 + 0.0555 CS-43

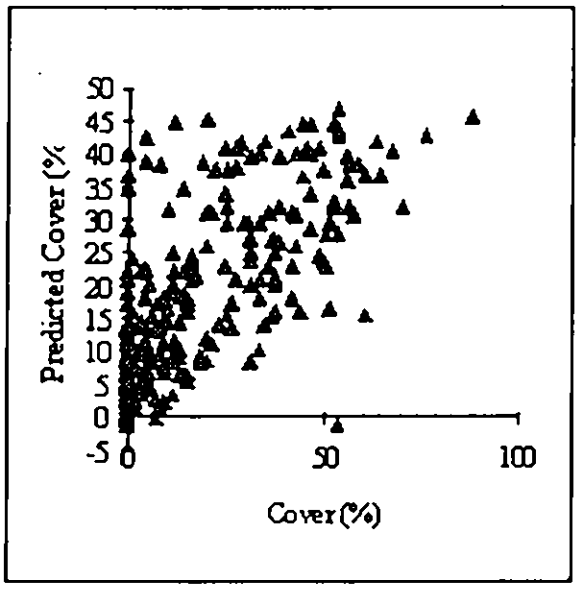


Land Cover Map Class Q: Inland Bare Ground

Equivalent CS-1990 Reporting Classes: 17 (Horticulture); 36 (Wet Bogs); 30 (Non Molinia Moor); 43 (Still Water)

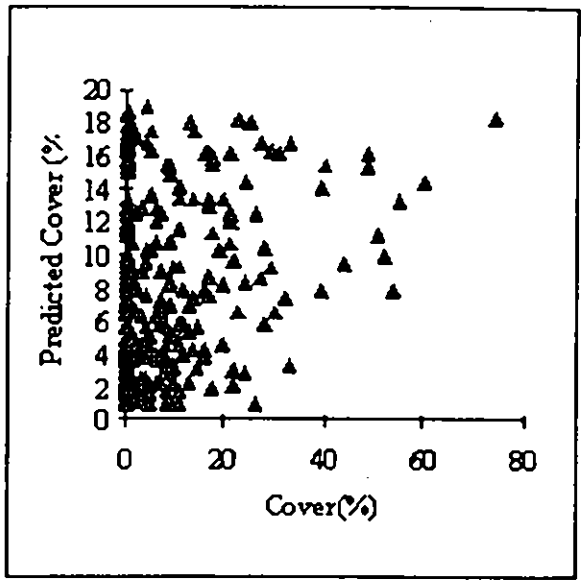
FIGURE 4: FIT OF PROPORTIONAL COVER FROM CS-1990 FIELD SURVEY WITH VALUES PREDICTED BY LINEAR REGRESSION OF EQUIVALENT LAND COVER MAP CATEGORIES

CS-1 = -1.2 + 0.494 LCP-N



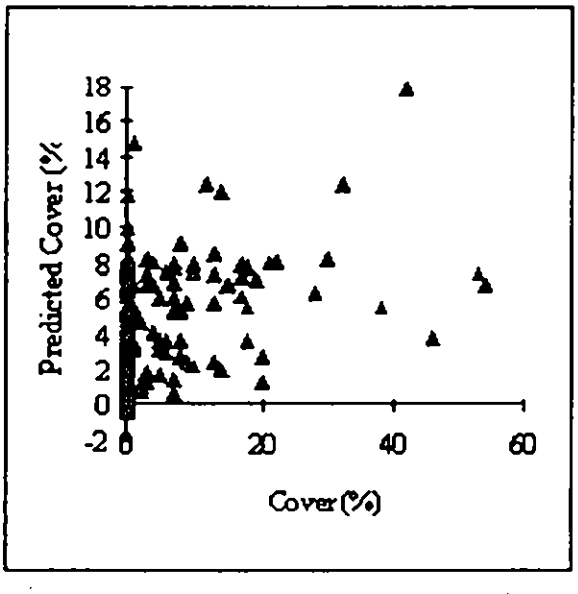
CS-1990 Reporting Class 1: Wheat
Equivalent LCP Class: N (Tilled Land)

CS-2 = 0.941 + 0.185 LCP-N



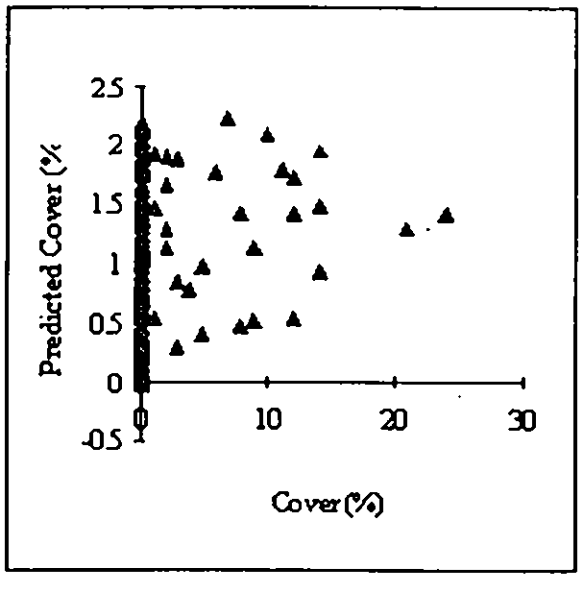
CS-1990 Reporting Class 2: Barley
Equivalent LCP Class: N (Tilled Land)

CS-8 = -0.516 + 0.0918 LCP-N + 0.534 LCP-P



CS-1990 Reporting Class 8: Oil Seed Rape
Equivalent LCP Classes: N (Tilled Land); P (Urban Land)

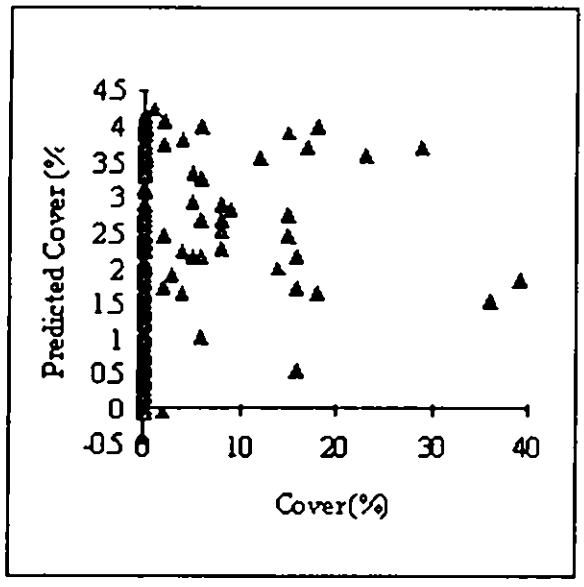
CS-10 = -0.042 + 0.0233 LCP-N



CS-1990 Reporting Class 10: Peas
Equivalent LCP Class: N (Tilled Land)

FIGURE 4: FIT OF PROPORTIONAL COVER FROM CS-1990 FIELD SURVEY WITH VALUES PREDICTED BY LINEAR REGRESSION OF EQUIVALENT LAND COVER MAP CATEGORIES

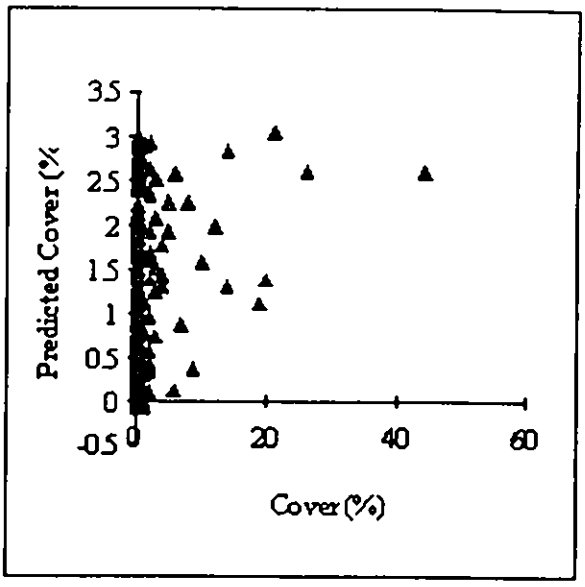
CS-13= -0.109 + 0.446 LCP-N



CS-1990 Reporting Class 13: Sugar Beet

Equivalent LCP Class: N (Tilled Land)

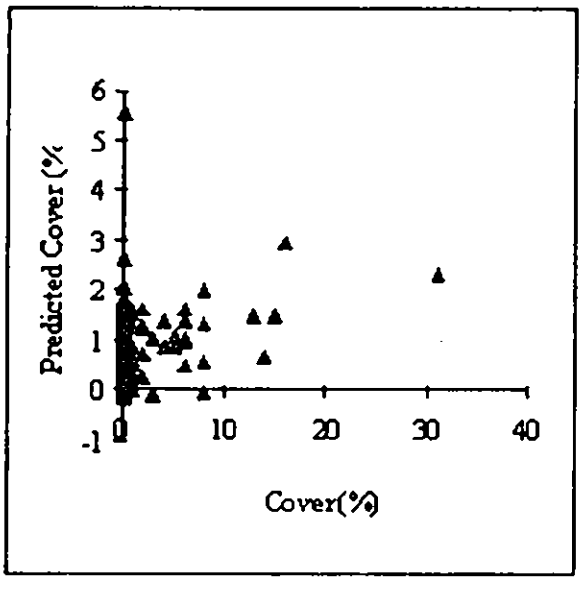
CS-14 = -0.088 + 0.0323 LCP-N



CS-1990 Reporting Class 14: Potatoes

Equivalent LCP Class: N (Tilled Land)

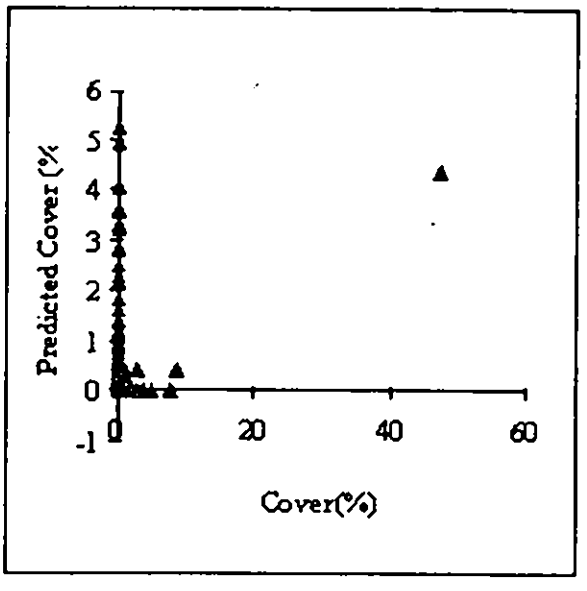
CS-16 = -0.205 + 0.0188 LCP-N + 0.0854 LCP-G + 0.0798 LCP-D



CS-1990 Reporting Class 16: Other Field Crops

Equivalent LCP Classes: N (Tilled Land); G (Marsh / Rough Grass); D (Saltmarsh)

CS-17 = -0.036 + 0.22 LCP-P + 0.109 LCP-Q

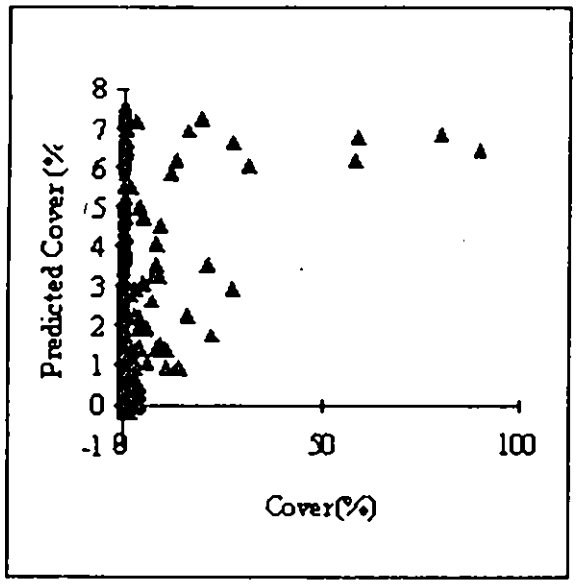


CS-1990 Reporting Class 17: Horticulture

Equivalent LCP Classes: P (Urban Land); Q (Inland Bare Ground)

FIGURE 4: FIT OF PROPORTIONAL COVER FROM CS-1990 FIELD SURVEY WITH VALUES PREDICTED BY LINEAR REGRESSION OF EQUIVALENT LAND COVER MAP CATEGORIES

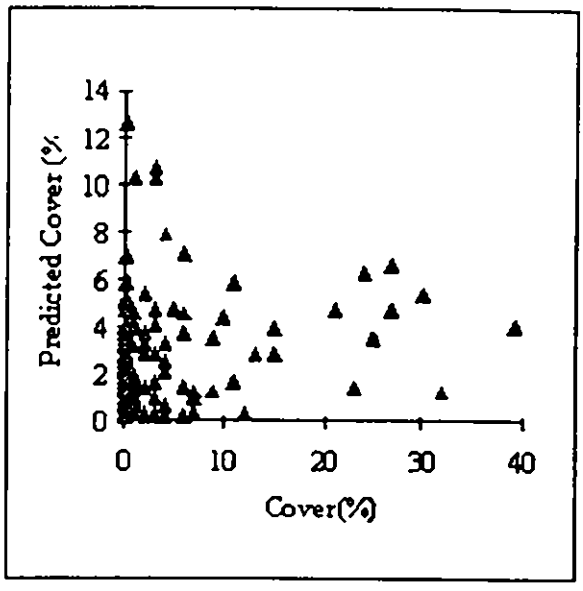
CS-18= -0.244 + 0.0802 LCP-N



CS-1990 Reporting Class 18: Fallow

Equivalent LCP Class: N (Tilled Land)

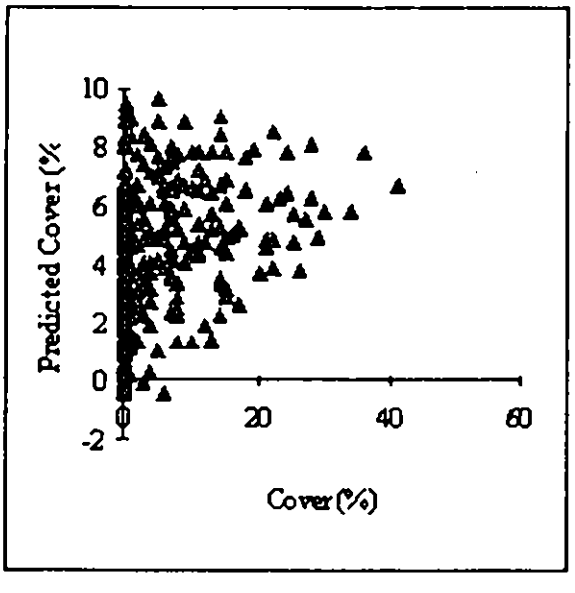
CS-20 = 0.175 + 0.209 LCP-O



CS-1990 Reporting Class 20: Recreational Grass

Equivalent LCP Class: O (Suburban Land)

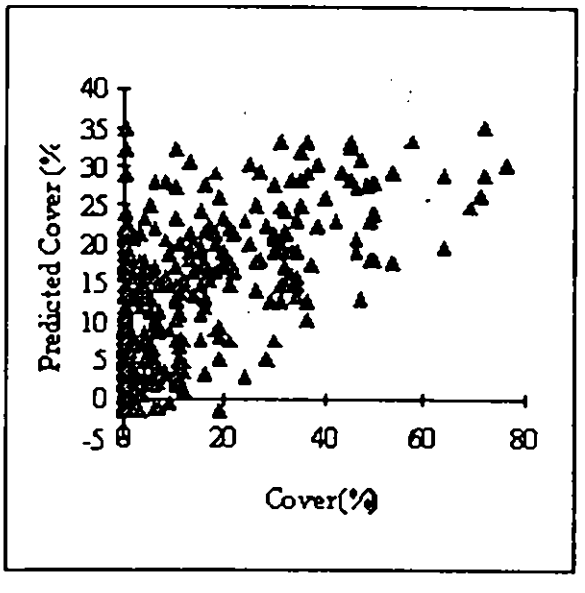
CS-21 = -0.442 + 0.106 LCP-F + 0.0336 LCP-N



CS-1990 Reporting Class 21: Recently Sown Grass

Equivalent LCP Classes: F (Managed Grass); N (Tilled Land);

CS-22 = -1.7 + 0.393 LCP-F

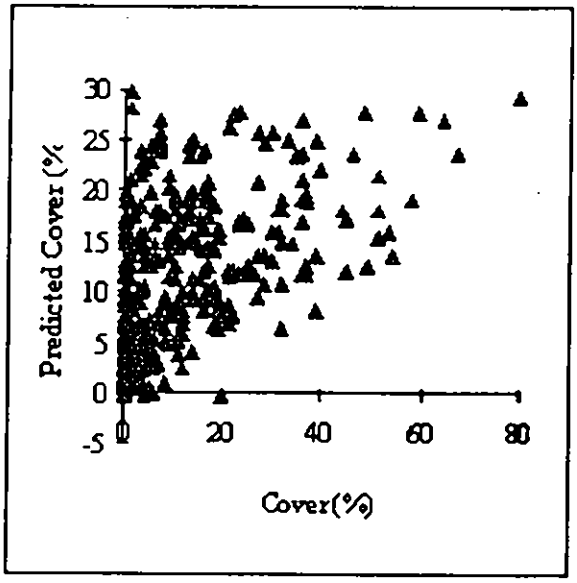


CS-1990 Reporting Class 22: Rye Grass

Equivalent LCP Class: F (Managed Grass)

FIGURE 4: FIT OF PROPORTIONAL COVER FROM CS-1990 FIELD SURVEY WITH VALUES PREDICTED BY LINEAR REGRESSION OF EQUIVALENT LAND COVER MAP CATEGORIES

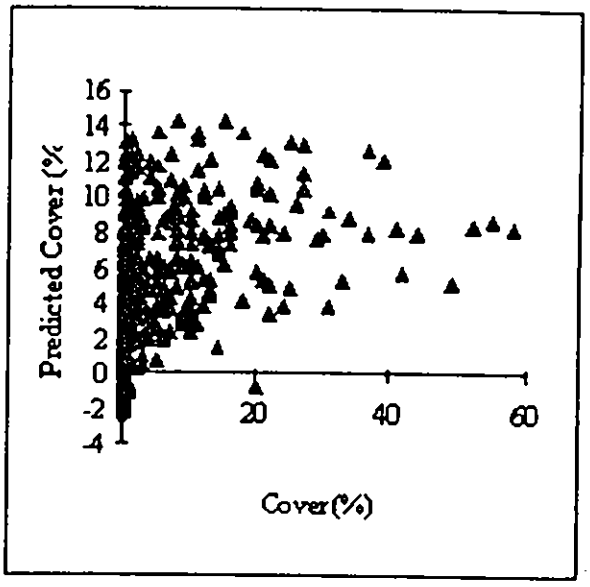
CS-23= -0.377 + 0.319 LCP-F



CS-1990 Reporting Class 23: Managed Grass

Equivalent LCP Class: F (Managed Grass)

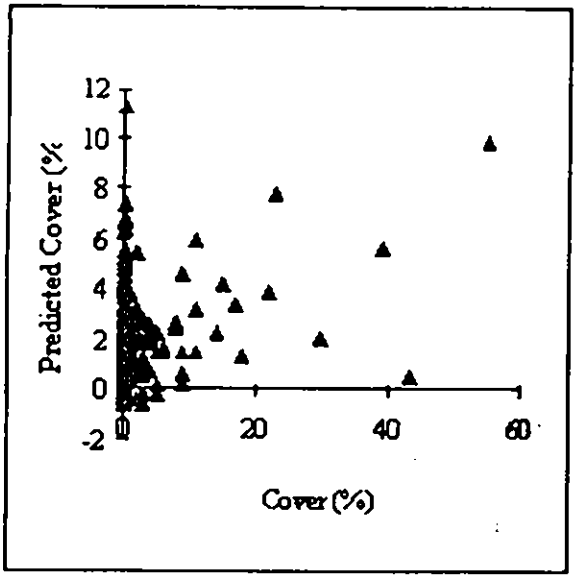
CS-24 = 1.74 + 0.135 LCP-F - 0.0429 LCP-N



CS-1990 Reporting Class 24: Weedy Swards

Equivalent LCP Classes: F (Managed Grass); N (Tilled Land)

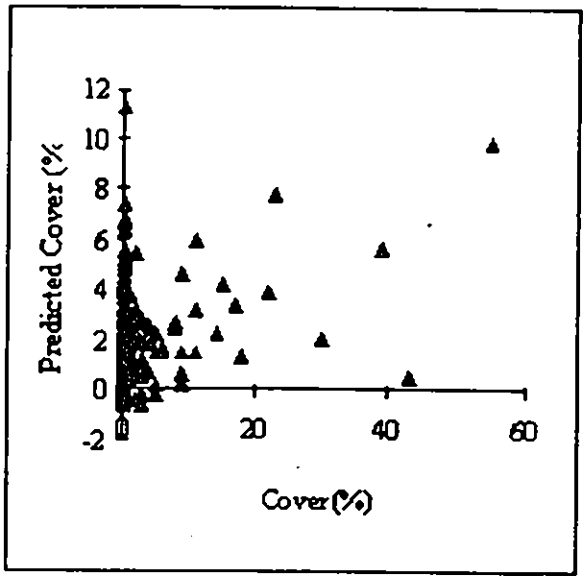
CS-25 = -0.593 + 0.031 LCP-F + 0.338 LCP-G



CS-1990 Reporting Class 25: Unimproved Grass

Equivalent LCP Classes: F (Managed Grass); G (Marsh / Rough Grass)

CS-27 = 0.372 + 0.14 LCP-E + 0.141 LCP-J + 0.189 LCP-G

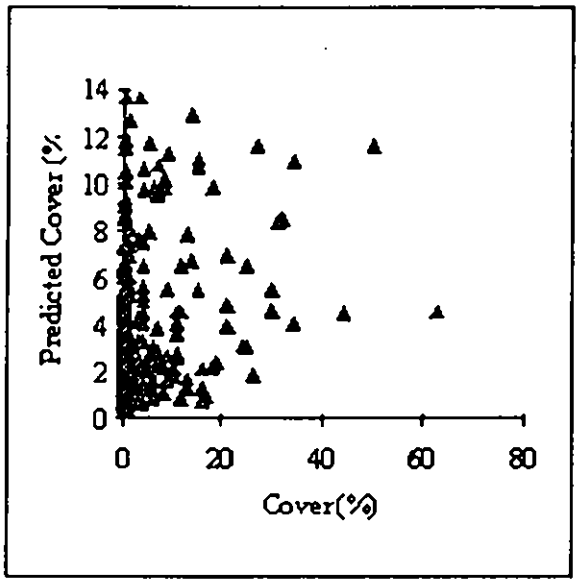


CS-1990 Reporting Class 27: Upland Grass

Equivalent LCP Classes: E (Grass Moor); G (Marsh / Rough Grass)

FIGURE 4: FIT OF PROPORTIONAL COVER FROM CS-1990 FIELD SURVEY WITH VALUES PREDICTED BY LINEAR REGRESSION OF EQUIVALENT LAND COVER MAP CATEGORIES

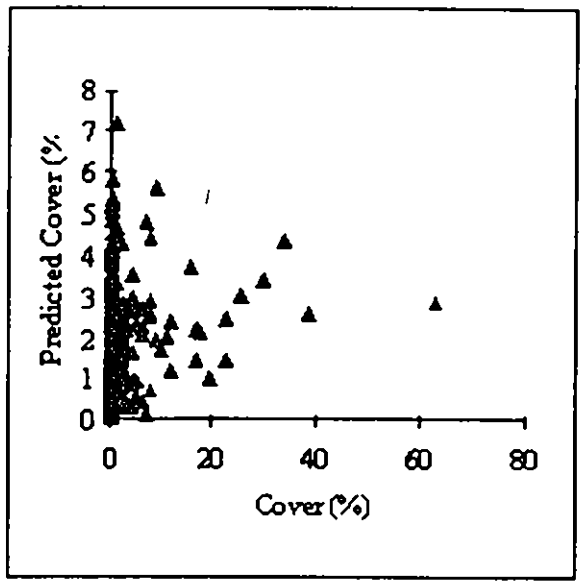
CS-28= 0.068 + 0.0545 LCP-E + 0.0824 LCP-I + 0.0694 LCP-K



CS-1990 Reporting Class 28: Bracken

Equivalent LCP Classes: E (Grass Moor); K (Deciduous Wood)

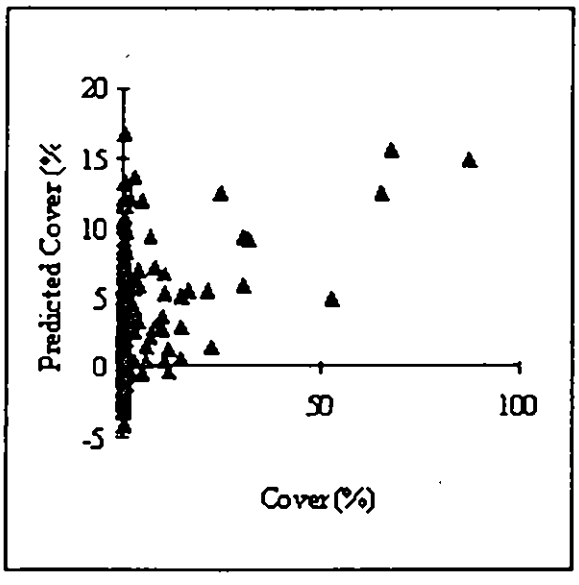
CS-29 = -0.804 + 0.184 LCP-E + 0.301 LCP-G - 0.143 LCP-J



CS-1990 Reporting Class 29: Molinia Moor

Equivalent LCP Classes: G (Marsh / Rough Grass); J (Bracken)

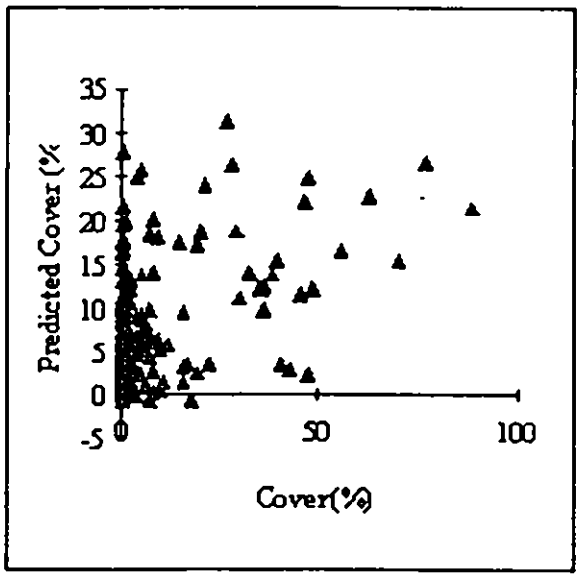
CS-30 = -0.771 + 0.335 LCP-E + 0.579 LCP-Q



CS-1990 Reporting Class 30: Non-Molinia Moor

Equivalent LCP Classes: E (Grass Moor); Q (Inland Bare Ground)

CS-31 = 1.42 - 0.0162 LCP-H + 0.093 LCP-G - 0.0209 LCP-E

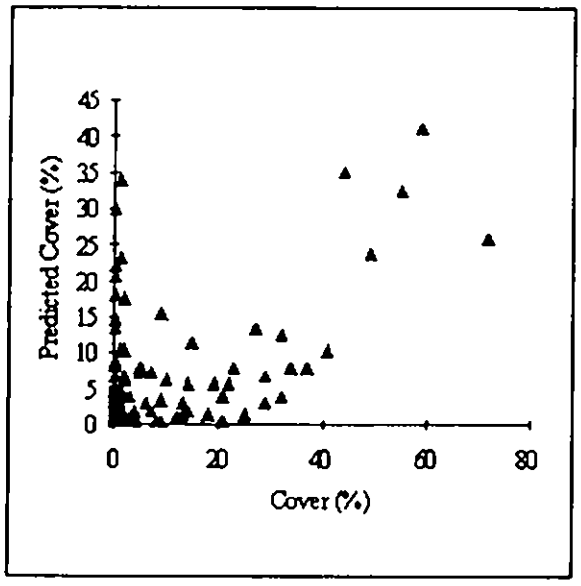


CS-1990 Reporting Class 31: Unmanaged Grass

Equivalent LCP Classes: H (Open Heath); G (Marsh / Rough Grass); E (Grass Moor)

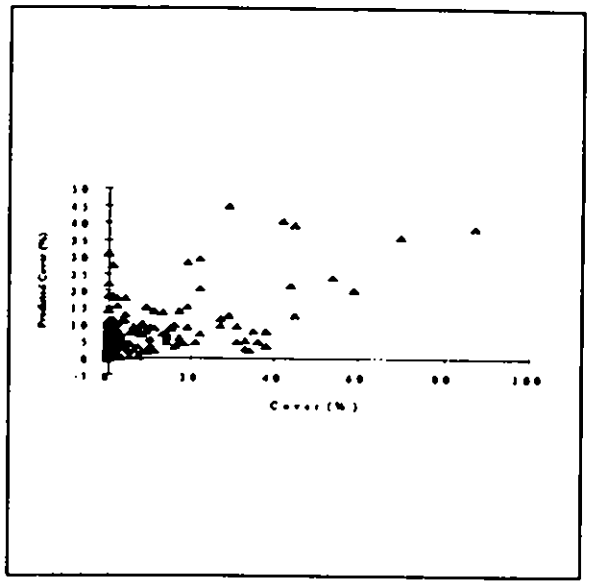
FIGURE 4: FIT OF PROPORTIONAL COVER FROM CS-1990 FIELD SURVEY WITH VALUES PREDICTED BY LINEAR REGRESSION OF EQUIVALENT LAND COVER MAP CATEGORIES

CS-32= 0.245 + 0.511 LCP-I



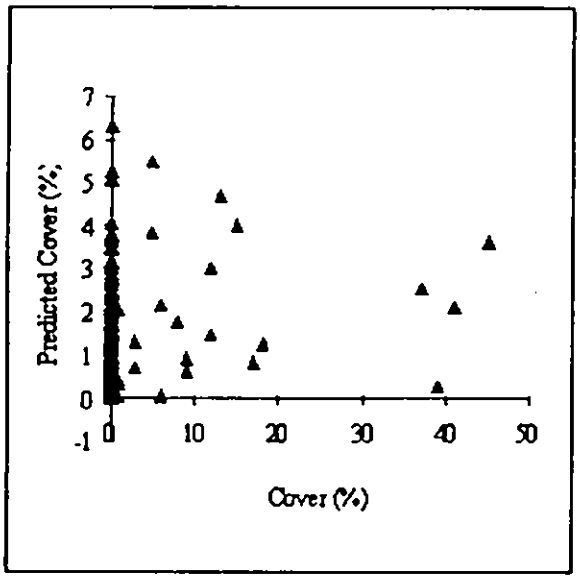
CS-1990 Reporting Class 32: Dense Heath
Equivalent LCP Class: I (Dense Heath)

CS-33 = -0.304 + 0.554 LCP-I + 0.107 LCP-H + 0.203 LCP-J



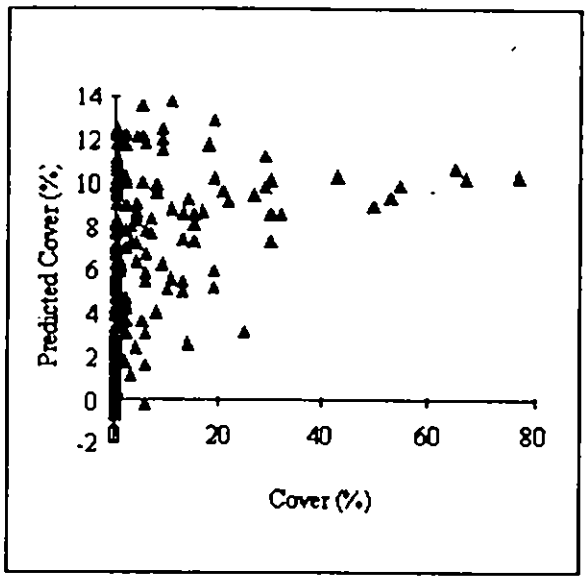
CS-1990 Reporting Class 33: Open Heath
Equivalent LCP Classes: I (Dense Heath); H (Open Heath); J (Bracken)

CS-34 = -0.031 + 0.0797 LCP-I + 0.0401 LCP-E



CS-1990 Reporting Class 34: Berry-bush Heath
Equivalent LCP Classes: I (Dense Heath); E (Grass Moor);

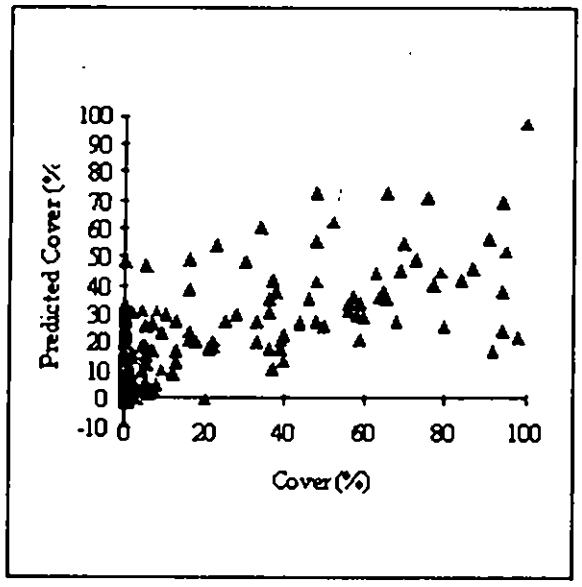
CS-35 = -0.663 + 0.111 LCP-E + 0.155 LCP-H



CS-1990 Reporting Class 35: Drier Northern Bogs
Equivalent LCP Classes: E (Grass Moor); H (Open Heath);

FIGURE 4: FIT OF PROPORTIONAL COVER FROM CS-1990 FIELD SURVEY WITH VALUES PREDICTED BY LINEAR REGRESSION OF EQUIVALENT LAND COVER MAP CATEGORIES

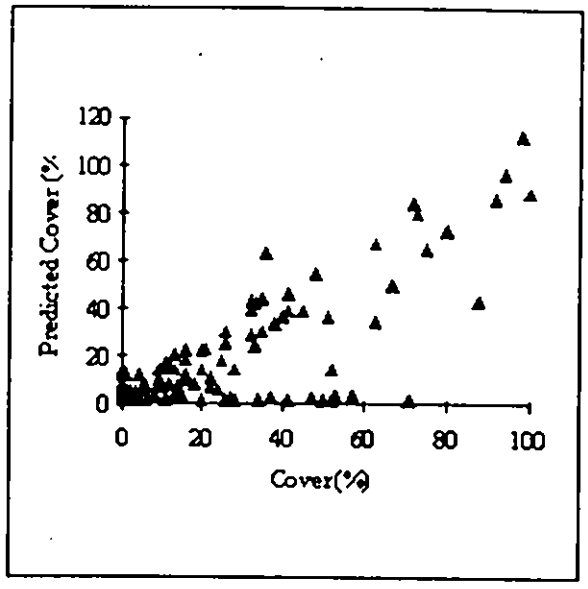
CS-36= -2.11 + 0.126 LCP-E + 0.428 LCP-H + 1.33 LCP-M



CS-1990 Reporting Class 36: Wet Heaths and Bogs

Equivalent LCP Classes: E (Grass Moor); H (Open Heath); M (Bogs)

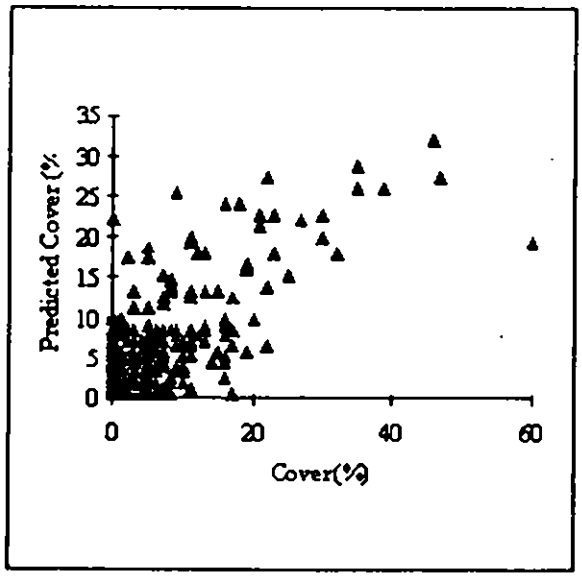
CS-37 = 1.53 + 1.2 LCP-L



CS-1990 Reporting Class 37: Conifer Woodland

Equivalent LCP Class: L (Conifer Woodland)

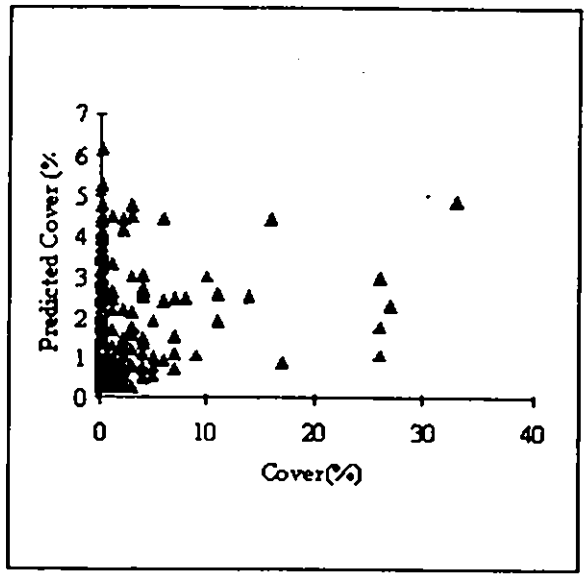
CS-38 = 0.261 + 0.0531 LCP-L + 0.0955 LCP-K



CS-1990 Reporting Class 38: Mixed Woodland

Equivalent LCP Classes: L (Conifer Woodland); K (Deciduous Woodland);

CS-39 = 0.365 + 0.675 LCP-K

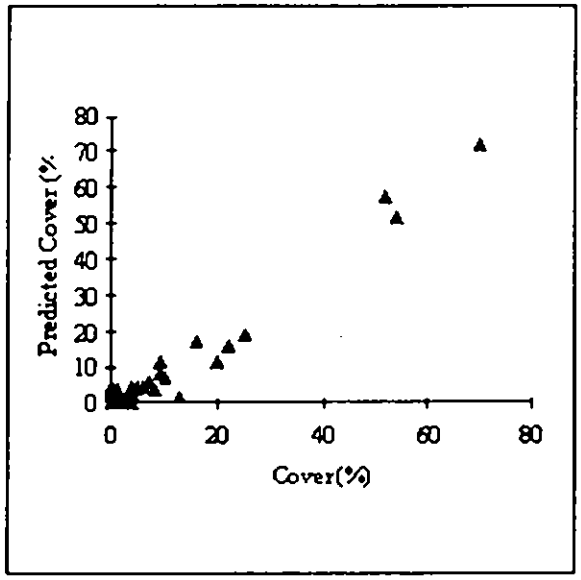


CS-1990 Reporting Class 39: Broadleaved Woodland

Equivalent LCP Class: K (Deciduous Woodland)

FIGURE 4: FIT OF PROPORTIONAL COVER FROM CS-1990 FIELD SURVEY WITH VALUES PREDICTED BY LINEAR REGRESSION OF EQUIVALENT LAND COVER MAP CATEGORIES

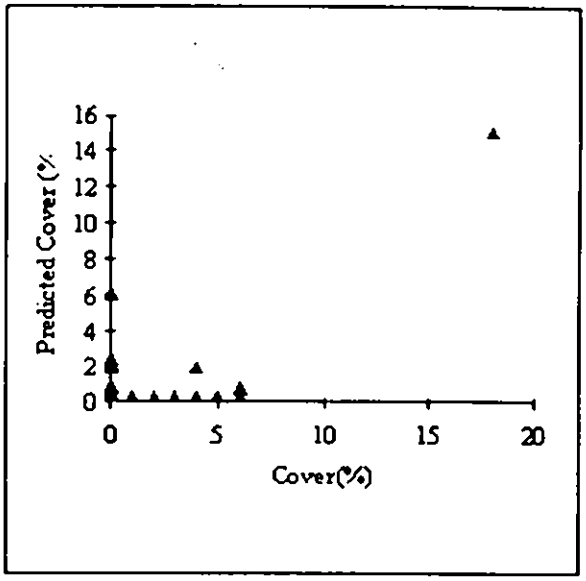
CS-43= 0.134 + 1.12 LCP-B



CS-1990 Reporting Class 43: Still Water

Equivalent LCP Class: B (Inland Water);

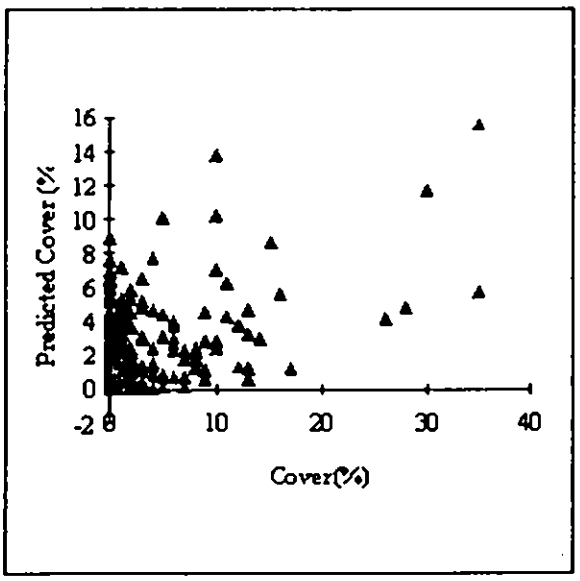
CS-44 = 0.296 + 0.205 LCP-D



CS-1990 Reporting Class 44: Running Water

Equivalent LCP Class: D (Saltmarsh)

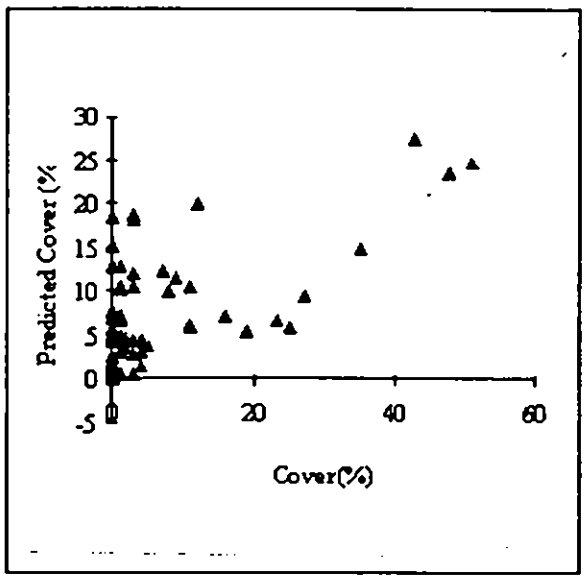
CS-45 = -0.027 + 0.468 LCP-G + 0.057 LCP-E



CS-1990 Reporting Class 45: Wetland

Equivalent LCP Classes: G (Marsh / Rough Grass); E (Grass Moor)

CS-46 = -0.123 + 0.106 LCP-A + 0.717 LCP-C

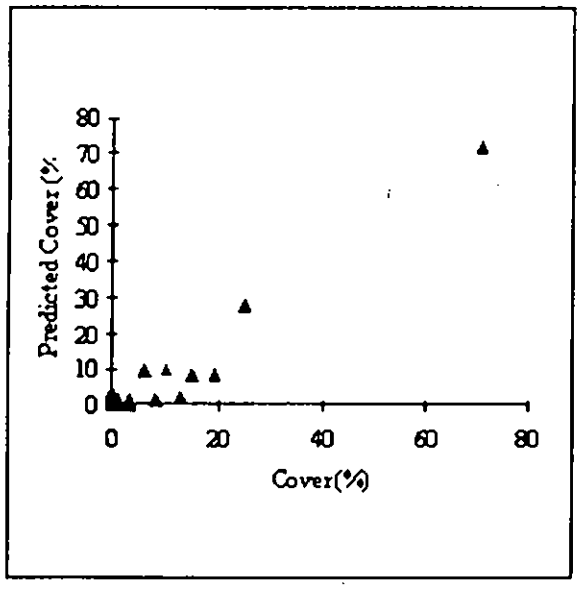


CS-1990 Reporting Class 46: Soft Coast

Equivalent LCP Classes: A (Sea/Estuary); C (Beach/Flats)

FIGURE 4: FIT OF PROPORTIONAL COVER FROM CS-1990 FIELD SURVEY WITH VALUES PREDICTED BY LINEAR REGRESSION OF EQUIVALENT LAND COVER MAP CATEGORIES

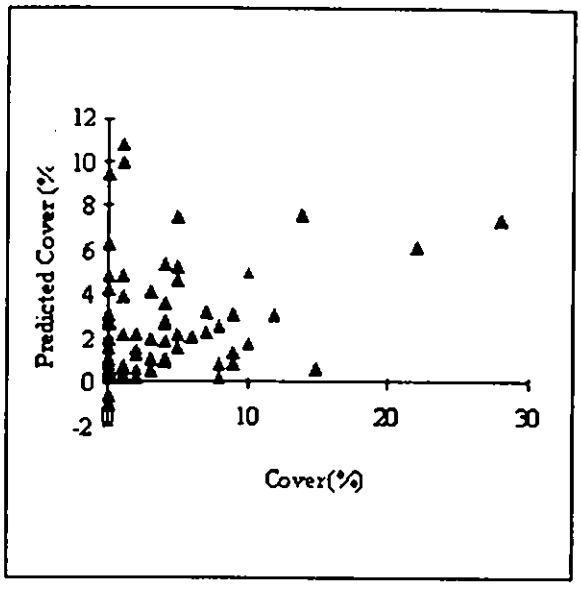
CS-47= 0.0394 + 0.994 LCP-D



CS-1990 Reporting Class 47: Saltmarsh

Equivalent LCP Class: D (Saltmarsh)

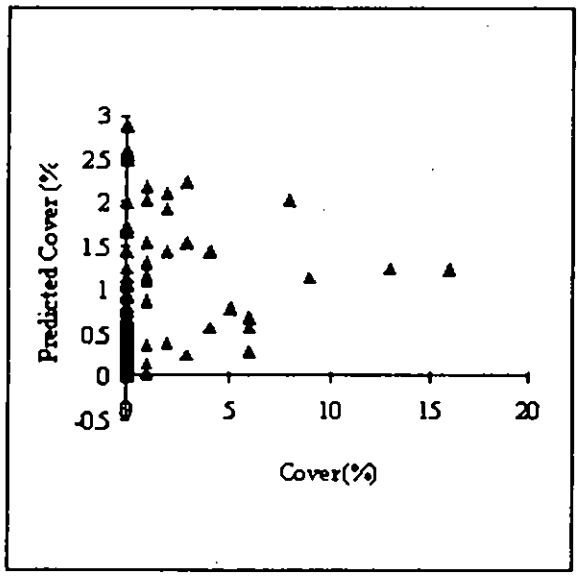
CS-49 = 0.209 + 0.277 LCP-C + 0.0458 LCP-A - 0.119 LCP-D



CS-1990 Reporting Class 49: Hard Coast

Equivalent LCP Classes: C (Beach/Flats); A (Sea/Estuary); D (Saltmarsh)

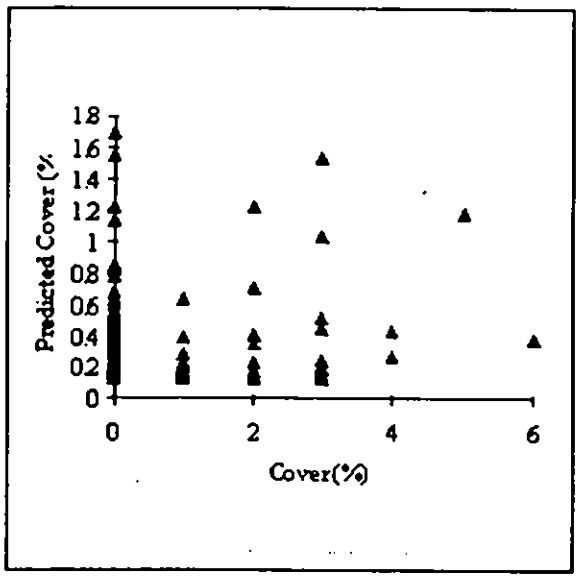
CS-50 = -0.0005 + 0.0595 LCP-C + 0.0261 LCP-A + 0.0067 LCP-H



CS-1990 Reporting Class 50: Maritime Vegetation

Equivalent LCP Classes: C (Beach/Flats); A (Sea/Estuary); H (Open Heath)

CS-51 = 0.121 + 0.0117 LCP-D + 0.0575 LCP-P

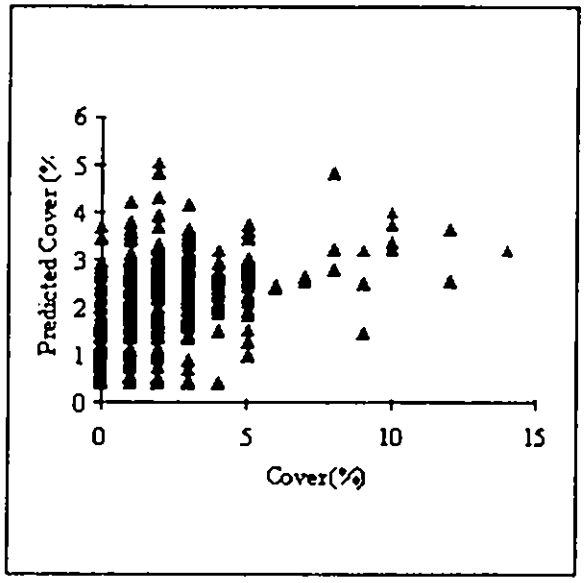


CS-1990 Reporting Class 51: Railway

Equivalent LCP Classes: D (Saltmarsh); P (Urban Land)

FIGURE 4: FIT OF PROPORTIONAL COVER FROM CS-1990 FIELD SURVEY WITH VALUES PREDICTED BY LINEAR REGRESSION OF EQUIVALENT LAND COVER MAP CATEGORIES

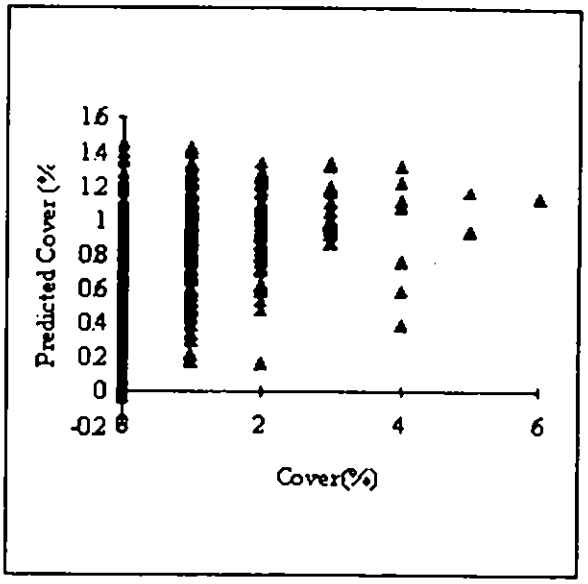
CS-52= 0.408 + 0.0665 LCP-O + 0.0252 LCP-F + 0.024 LCP-N



CS-1990 Reporting Class 52: Road

Equivalent LCP Classes: O (Suburban Land); F (Managed Grass); N (Tilled Land)

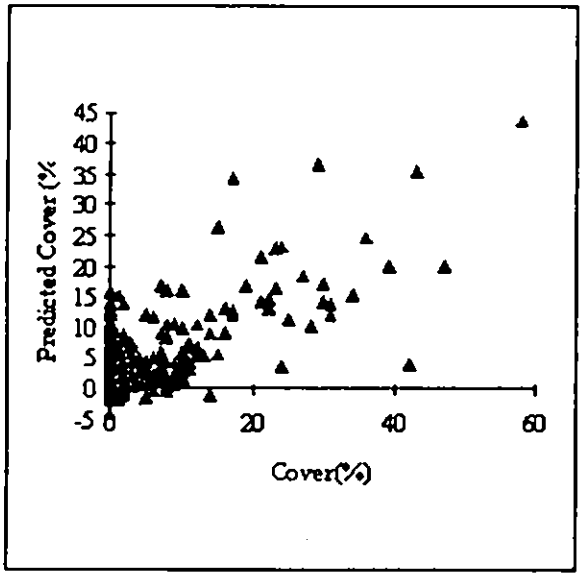
CS-53 = -0.0409 + 0.0135 LCP-A + 0.0153 LCP-F + 0.114 LCP-N



CS-1990 Reporting Class 53: Agricultural Buildings

Equivalent LCP Classes: A (Sea/Estuary); F (managed Grass); (Tilled Land)

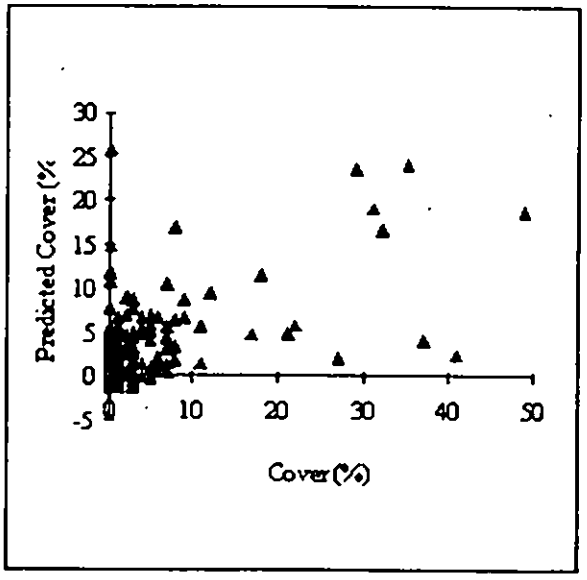
CS-54 = 0.658 + 0.734 LCP-O - 0.0319 LCP-N



CS-1990 Reporting Class 54: Residential Buildings

Equivalent LCP Classes: O (Suburban Land); N (Tilled Land)

CS-55 = 0.454 + 0.192 LCP-O - 0.0207 LCP-N + 0.984 LCP-P

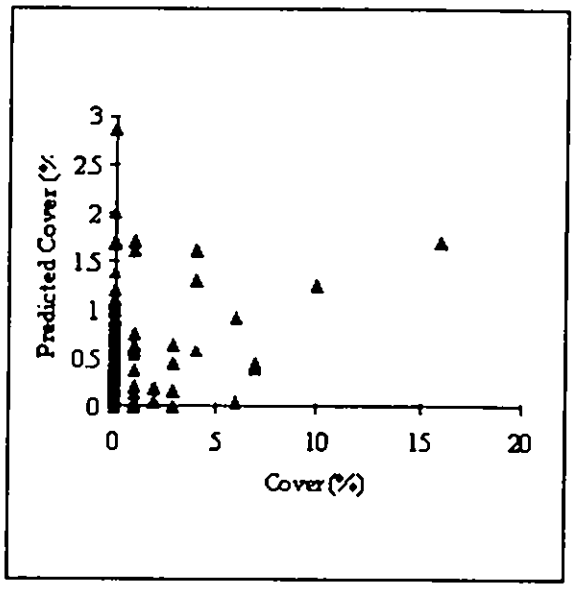


CS-1990 Reporting Class 55: Other Buildings

Equivalent LCP Classes: O (Suburban Land); N (Tilled Land); P (Urban Land)

FIGURE 4: FIT OF PROPORTIONAL COVER FROM CS-1990 FIELD SURVEY WITH VALUES PREDICTED BY LINEAR REGRESSION OF EQUIVALENT LAND COVER MAP CATEGORIES

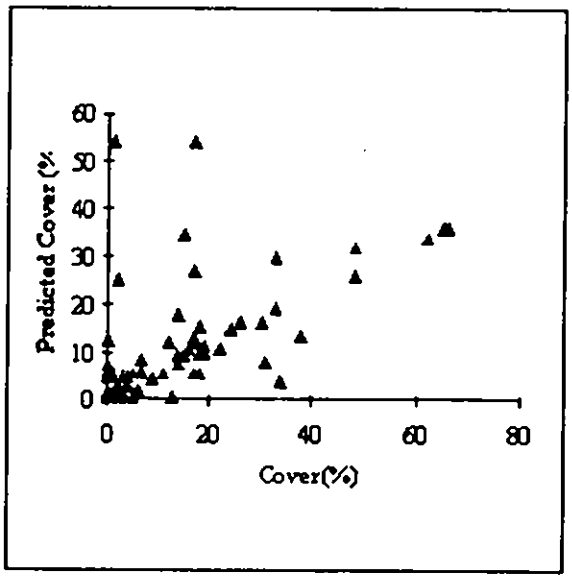
CS-56= 0.0016 + 0.0337 LCP-O + 0.06 LCP-C



CS-1990 Reporting Class 56: Waste and Derelict Land

Equivalent LCP Classes: O (Suburban Land); C (Beach/Flats)

CS-59 = 0.475 + 0.531 LCP-A



CS-1990 ReportingClass 59: Sea

Equivalent LCP Class: A (Sea/Estuary)

7.4.4 **Inter-calibration of Countryside Survey 1990 Field Survey *vs* Monitoring Landscape Change - Areal Features.** The results of this inter-calibration, using the point-grid sampling scheme described in paragraph 4.3.2, are presented in Table 19. Entries in bold face in Table 19b indicate 'matches' between corresponding categories in the two systems. These direct matches total 578, indicating a 57.8% correspondence between the field survey and the aerial photo-interpretation methods adopted in Monitoring Landscape Change (cf 48.4% in the corresponding inter-comparison with the Land Cover Map in Table 13). Table 19c shows the correspondence between each category in MLC and corresponding CS-1990 Reporting Classes and Table 19d show the equivalent percentage composition of CS-1990 categories in terms of MLC classes. Together, these Tables provide a quantitative basis for inter-relating estimates of land cover from the two surveys.

Tables 19c and 19d show a similar pattern in the relationships between the field survey and the aerial photo-interpretation to that observed in the case of the satellite-based Land Cover Map (cf Tables 12c and 12d). Most land mapped in the field as under arable crops was assigned to the MLC category 'Ploughed & Crops'. However, MLC mapped as ploughed land 28% of areas identified in the field as managed grassland and 22% of weedy swards. There was similar confusion between crops and grassland in the Land Cover Map. It is likely that this is due, at least in part, to seasonal rotation patterns in intensively managed grassland. There is confusion between rough grass (MLC) and mixed woodland (CS-1990), between freshwater marsh (MLC) and saltmarsh (CS-1990) and between the heathland categories. The Land Cover Map actually out-performs MLC in the recording of saltmarsh. These effects may well be due to differences in terminology and definition. Correspondence in the woodland categories is about 80% (conifers) and 60% (broadleaved). The Land Cover Map does not separately distinguish mixed stands, so direct comparison is difficult, but MLC appears to perform marginally better.

7.4.5 **Inter-calibration of Countryside Survey 1990 *vs* MAFF Agricultural and Horticultural Census.** The geographic units used to undertake this inter-calibration were the regions created by the Department of the Environment by aggregation of counties for the primary purpose of reporting regional statistics. Smaller units than this (eg individual counties) would have resulted in large standard errors in the estimates of land cover from CS-1990. The regions, and their constituent counties, are listed in Table 20. Note that they differ from the regions designated by MAFF and reported in the published Census data.

TABLE 19 CALIBRATION OF CS-1990 FIELD SURVEY vs MONITORING LANDSCAPE CHANGE USING 25-POINT GRID

19a Individual point counts

MLC / Field Survey	Urc	Bldg	Trans	Coast	Farm	Inland	Sand	Salt	Bare	Quar	Rough	Market	Urban	Improved	Smooth	Rough	Neglected	Rough	Orch	Fruit	Bracken	Coarse	Peat	Blanket	Upland	Heather	Dense	Orchards	Scrub	Mixed	Broad	Conif	Total
Urc		2												3	1							1									1	1	1
Bldg		1	13								3																				1		18
Road		16	33						1		72		2	33	3	14	10		2		2	1				1	1	1		1	19	5	217
Agric. Bldgs.		48	1								2			5			1		1												5		63
Res. Bldgs.		267									7		2	19		5	6		2											4	16	1	329
[illegible]		83								10	9	5	20	7		4	2		2												5		156
[illegible]				230		8	2				2			1		1																	244
[illegible]						85	3				1			1		1						1		7	8	1							105
[illegible]	1		3			5								17		1	2			3						3					9	2	38
[illegible]				67			21	7	3							1		2		4						2							107
Hard coast				18			7		35		1				1	7					2	2				1							72
Saltmarsh				1			6	16	1											18													42
Inland rocks									1													2				4							7
White land		2	1							3	4	1	5	5			1		4														26
Hard cross		2				1								1		2																	6
[illegible]		1								6				1							1	2											11
[illegible]										1	1099			12		1	3											3		1	1	1121
[illegible]						2				1	516	1		19		2	3		1														545
[illegible]											141					1																	42
[illegible]											13																						13
Mine											15			1		1																	17
Transformers											24			7																			31
Kale											19			2																			21
Oilseed rape											201			5																			206
Other crucifers											16																						16
[illegible]											54			2			2														1		59
[illegible]											69			1																			80
[illegible]											1																						1
[illegible]											113			1																			114
[illegible]											52			1															1				54
Other roots											3											1											4
Other field crops											44			2																			48
Horticulture		1									6	15																					22
Barn grass		1									237		1	92		3	8																342
Rye grass		5								1	339		1	475	1	13	61				2			1						1	7		907
[illegible]		5	1			1					244	1	3	451	15	39	93				1	6			16		1			11	3	881
[illegible]		5	2								4		57	19		15	2					1					2		1	6	1	115
[illegible]		3					1		1		97		2	19	116	17	69		1			3			7	12				4	4	440
[illegible]								1	8					5	4	78	5	1				6			2							26
[illegible]											159															1							170
Forest														1		1						9				2				3	2	18
Wetland							2		1		4			8	11	13	17			16	5	33	8	21	21					5	5	170
Unimp. grass		5	6			1	1	1	3		36		3	17		30	11	1	4		1	3	1				1		2	6	2	135
Unimp. grass		1	1						1		9			38	6	15	39	3		4		1			6	1				5		130
Calc. grass										1	13			9	7	16	9													2		57
[illegible]									1	1	6			31	33	20	47			1	8	88		12	23					7	2	278
[illegible]														3	10	14	1				36	31		2	30	1			1	6	5	141
[illegible]							4								12	2						57										18
[illegible]									11		1			5	14	4	6		2	4	4	212		16	47					2	4	331
[illegible]									2		1			3	4	3		1		2		58		8	14					1	11	109
Wet bog				1					24						10	6	2			1	8	376		265	156					2	8	859
Dry bog									6					1	40		2		1			103		76	63					1	5	298
Berry-heath heath									2		1				10						1	33		1	18							1
Open heath									26	1					8		5				7	87		24	197				5		7	387
Dense heath															8	1		3				38		3	172	1			1			225
[illegible]											2	2																					22
[illegible]											4			5																			148
[illegible]											18	3		12																			398
[illegible]											3			2																			105
Total	1	454	63	319	1	103	47	25	129	27	3553	28	106	1509	222	278	418	19	23	53	88	1158	14	449	809	4	10	25	1	94	450	673	11078

TABLE 19 CALIBRATION OF CS-1990 FIELD SURVEY vs MONITORING LANDSCAPE CHANGE USING 25-POINT GRID

196: Correspondence, per thousand points sampled

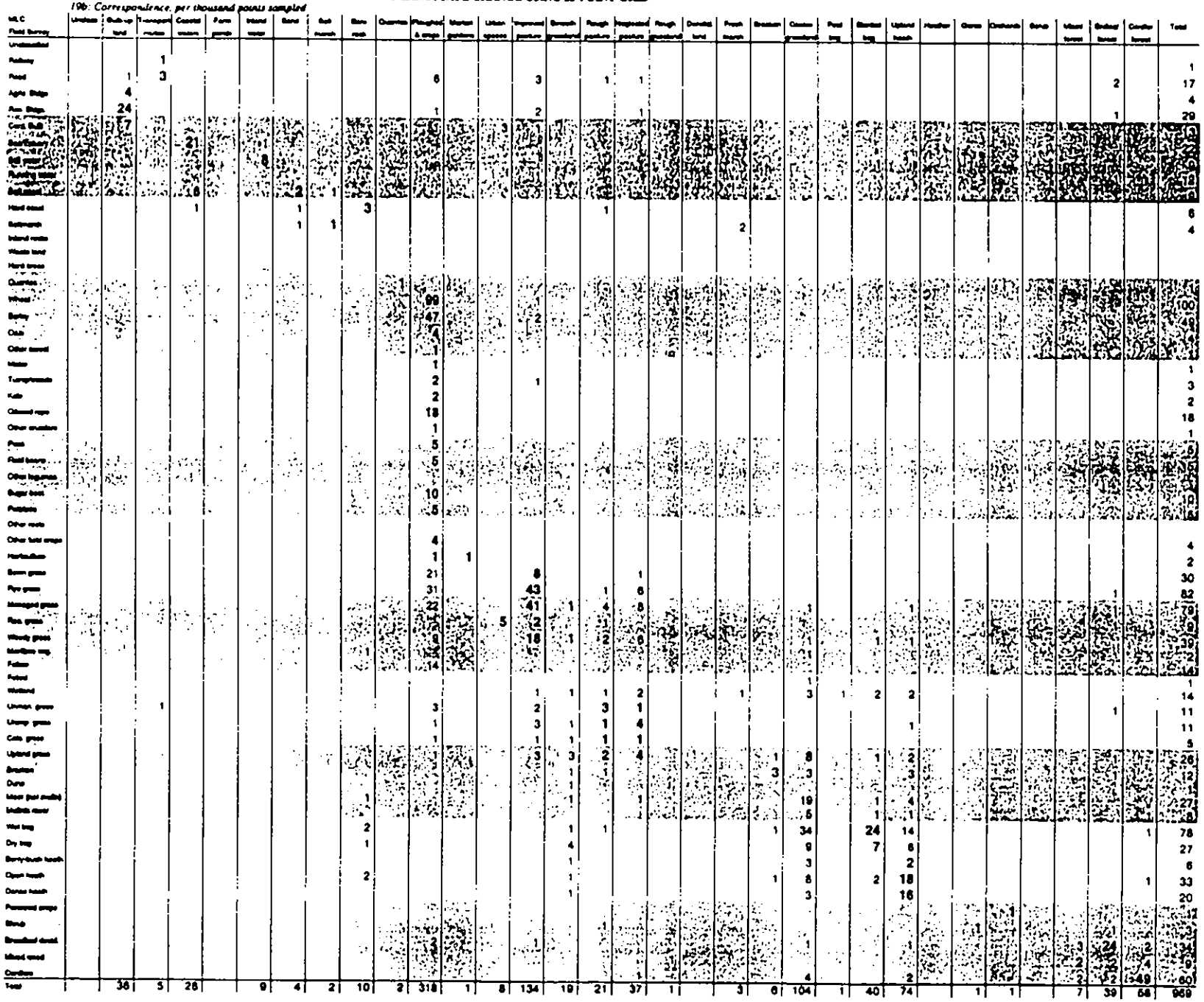


TABLE 19 CALIBRATION OF CS-1990 FIELD SURVEY vs MONITORING LANDSCAPE CHANGE USING 25-POINT GRID

19c: Proportional composition (%) of MLC classes in terms of CS-90 Reporting Categories

MLC / Field Survey	Unclass.	Built-up land	Transport routes	Coastal waters	Farm ponds	Inland water	Sand	Salt marsh	Bare rock	Quarries	Ploughed & crops	Market gardens	Urban open	Improved grassland	Semi-nat. grassland	Rough pasture	Neglected pasture	Rough grassland	Derelict land	Fresh marsh	Bracken	Coarse grassland	Peat bog	Shorter heath	Upland heath	Heather	Gorse	Orchards	Bare	Mixed forest	Shelter forest	Conifer forest
Unclassified																																
Railway			21																													
Road		4	52						1		2		2	2	1	5	2		9		2					25	10	4		1	4	1
Agric. Bldgs		11	2																4											1		
Res. Bldgs		59											2	1		2	1		9										4	4		
Other built		18								37		18	27						9											1		
Inland quarry				72		18	4		2																							
Inland tidal				201		183	6																	2	1							
Tidal mud				105		5														6	1											
Saltmarsh				21			45	28	2							1				8	2									2		
Hard coast				5			15		27							3					2											
Saltmarsh							13	64	1											34												
Inland rocks									1																							
Waste land			2							11		4	5						17													
Hard cross						1										1																
Cereals										22																						
Potatoes										14	31			1																		
Beans										4	15	4		1		1			4													
Other arable											1																					
Maize																																
Turnip/swede											1																					
Kale											1																					
Oilseed rape											6																					
Other arables																																
Leys											2																					
Set aside											2																					
Orchard/nursery																																
Fallow land											3																					
Grass leys											1																					
Other rocks																												4				
Other field crops											1																					
Horticulture												54																				
Short grass											7		1	6		1	2															
Rye grass		1								4	10		1	31		5	15				2									1	2	
Improved grass						1					7	4	3	30	7	14	22				1	1			1		10			2		
Rough grass													54	1		5											20			1		
Marsh grass							2		1		3		2	13	7	8	17		4			1		2				4			1	1
Heather/gorse								4	5						2	2						1										
Bracken											4					2	5															
Fallow																	1															
Woodland							4		1													1									1	
Unmix. grass		1	10			1	2	4	2		1		3	1	5	5	4			30	6	3	57	5	3						1	1
Unmix. grass			2						1					3	3	5	9	18		8			7					4		2	1	
Calc. grass										4				1	3	6	2								1	25					1	
Upland grass									1	4				2	15	7	11			2	9	7		3	3						2	
Bracken									1						5	5					41	3			4	25				1	1	1
Gorse							9								5	1																
Rough / hedgerow									9	4					6	1	1		9	8	5	18		4	6							1
Tidal mud									2						2	1		5		4	1	5		2	2							2
Wet bog									19						5	2				2	9	32		59	19							1
Dry bog									5						18				4			9		17	8							1
Berry-bush heath									2						5						1	3			2							
Open heath									20	4					4		1				8	8		5	24					5		1
Dense heath															4			18				3		1	21	25				1		
Grassland crops											7																	64				
Arable crops																3		5	4		2						60	4		1	3	
Mixed deciduous	100								1		1	11		1	1	2		5	9		5	1	36		1			4		32	60	3
Mixed wood										4			1		1	1		32			3									21	4	8
Conifers															1	2	2	58				4			3					29	4	80
Total	100	98	103	99		101	100	100	104	102	99	102	101	95	100	98	95	100	99	102	99	100	100	101	99	100	100	100		99	96	99

TABLE 19 CALIBRATION OF CS-1990 FIELD SURVEY vs MONITORING LANDSCAPE CHANGE USING 25-POINT GRID

1Wd: Proportional Composition (%) of CS-90 Reporting Classes in terms of MLC Categories

MLC / Field Survey	Unclass	Built-up land	Transport routes	Coastal waters	Farm ponds	Inland water	Sand	Salt marsh	Bare rock	Quarries	Ploughed & stubble	Market gardens	Urban spaces	Improved pasture	Semi-improved grassland	Rough pasture	Neglected pasture	Rough grassland	Derelict land	Fresh marsh	Bracken	Coarse grassland	Peat bog	Blanket bog	Upland heath	Heather	Gorse	Orchards	Scrub	Inland forest	Broadleaf forest	Conifer forest	Total
Unclassified		200												300	100							100									100	100	900
Railway		6	72								17																				6		101
Road		7	15								33		1	15	1	6	5		1		1										9	2	98
Agric. Bldgs		78	2								3			8			2		2												8		101
Res. Bldgs		81									2		1	6		2	2		1											1	6		101
Cont. Bldg		53								6	6	3	19	4		3			1														[illegible]
Sea/Estuary				94		3	1		1		1										4												[illegible]
Still water				4		81	3				1			1		1						21		8	1								[illegible]
Running water		3	8			14					2			19		3	6			8					8							6	[illegible]
Salt coast				63			20	7	3		2			1				2		4		2			2								[illegible]
Hard coast				22			10		49		1				1	10					3	3			1								100
Saltmarsh				2			14	38	2											43													99
Inland rocks									14													29			57								100
Waste land		8	4							12	15	4	19	19			4		15														100
Hard snow		33				17								17		33																	100
Quarries		9								55	[illegible]			9							9	18											[illegible]
Wheat											88			1																			[illegible]
Barley											95			3			1																[illegible]
Oats											88					2																	[illegible]
Other cereal											100																						[illegible]
Maize											88			6		6																	100
Turnip/swede											77			23																			100
Kale											90			10																			100
Oilseed rape											98			2																			100
Other crucifers											100																						100
Peas											92			3			3																[illegible]
Field beans											88			2																			[illegible]
Other legumes											100																						[illegible]
Sugar beet											99			1																			[illegible]
Potatoes											98			2																			[illegible]
Other roots											75											25											100
Other field crops											96			4																			100
Horticulture		5									27	68																					100
Sown grass											69			27		1	2																99
Rye grass		1									37			52		1	7														1		99
Managed grass		1									28			61	2	4	11					1			1								[illegible]
Rec. grass		4	2								3		50	17		13	2					21											[illegible]
Woody grass		1									22			44	4	4	18					3		2	3								[illegible]
Maritime veg.								4	23					4	15	19		4				23		8									[illegible]
Fallow											94			3			3					2			1								[illegible]
Fallow														6		6						50			11						17	11	101
Wetland							1		1		2			5	6	8	10			9	3	19	5	12	12						3	3	99
Unman. grass		4	4			1	1	1	2		27		2	13		22	8	1	3		1	2	1						1	4	1	100
Undrg. grass		1	1						1		7			29	5	12	30	2		3		1			5	1					4		102
Calc. grass										2	23			16	12	28	18														4		101
Upland grass											2			11	12	7	17				3	31		4	8							1	[illegible]
Bracken									1					2	7	10	1				28	22		1	21	1			1		4	4	[illegible]
Dune							22								67	11																	[illegible]
Moor (not heath)									3					2	4	1	2		1	1	1	64		5	14							1	[illegible]
Mixed moor									2		1			3	14	3		1		2	3	53		7	13							10	[illegible]
Wet bog									3						1	1					1	44		31	18							1	100
Dry bog									2						13		1					35		26	21							2	100
Berry-bush heath									200		100				1000						100	3300		100	1800								6600
Open heath									7						2		1				2	24		7	54					1		2	100
Dense heath															4				1			16		1	76								98
Perennial crops											9	9		6																			[illegible]
Shrub											8			10	2	17	4	2	2														[illegible]
Broadleaf decid.		1									5	1		3	1	1	1					2	1		2								[illegible]
Mixed wood	1	3	1							1			1		2	2		6			3												[illegible]
Conifers																1	1					8			4							80	[illegible]

TABLE 20 UK ECONOMIC REGIONS RELATED TO THE COUNTIES OF ENGLAND, SCOTLAND AND WALES

Region	Counties
Northern Scotland	Orkney
	Shetland
	Western Isles
	Highland
South East Scotland	Grampian
	Tayside
	Central
	Fife
	Lothian
South West Scotland	Strathclyde
	Borders
	Dumfries & Galloway
Northern England	Cumbria
	Northumberland
	Durham
	Cleveland
	Tyne & Wear
North East England	Yorkshire
	Humberside
	Derbyshire
	Nottinghamshire
North West England	Lancashire
	Merseyside
	G. Manchester
	Cheshire
	Staffordshire
Midlands	Shropshire
	Hereford & Worcester
	Gloucester
	West Midlands
	Leicestershire
	Warwickshire
	Northamptonshire
	Oxfordshire
	Buckinghamshire
East Anglia	Lincolnshire
	Norfolk
	Suffolk
	Cambridgeshire
	Bedfordshire
	Hertfordshire
	Essex
South East England	Wiltshire
	Berkshire
	Hampshire
	Surrey
	Greater London
	West Sussex
	East Sussex
	Kent
	Isle of Wight
South West England	Cornwall
	Devon
	Somerset
	Avon
	Dorset
North Wales	Gwynedd
	Clwyd
	Powys
South Wales	Dyfed
	Gwent
	South Glamorgan
	Mid Glamorgan
	West Glamorgan

The approach adopted was similar to that used in the third of the inter-calibrations of CS-1990 Field Data with the Land Cover Map (see Paragraph 7.4.3) - except that areal estimates of land cover within the above 12 regions were utilised, as compared with data from 508 1 km squares. Certain other features of the analysis should also be noted.

The MAFF Census (and its regional variants) record only agricultural holdings, while CS-1990 sampled all rural land. In general, land managed for agricultural purposes was common to both systems. However certain categories of land, notably woodland and rough grazings, are included in the MAFF Census, but only when they occur on the land described in the Census return. In many of the ITE land classes, woodland under non-agricultural ownership and rough pasture under common grazing are much more extensive than the same land cover types on agricultural holdings. It was therefore decided to restrict this particular inter-calibration strictly to the main agricultural land uses indicated in Table 21.

Stepwise regression of all CS-1990 reporting categories against the MAFF land cover classes resulted in many associations which, though statistically significant, were neither meaningful nor useful. For example, estimates from CS-1990 of the cover of potatoes and recreational grass were significant at the 1% level as predictors of winter barley in the MAFF Census, while there was a statistically significant association between the MAFF record of horticultural crops and oilseed rape and the CS-1990 estimate of sugar beet!

To avoid these spurious correlations, the multiple linear regression models were computed using predictors which were chosen on *a priori* grounds. For example, in the case of the regression model for wheat in CS-1990, all cereal crops in the MAFF Census were considered as candidate predictors. The results of these multiple linear regressions are presented in Table 21.

Bearing in mind the considerable differences in methodology between the two surveys, correlations between them are remarkably high, at least for the more ubiquitous crops. Countryside Survey is particularly effective in predicting the extent of wheat, potatoes, oilseed rape and sugar beet. Estimates from CS-1990 of the coverage of horticultural crops, root crops and long-term leys are all significant at the 99% confidence level.

Conversely, regression of summary data from the MAFF Census returns against cover estimates for corresponding crops from CS-1990 showed strong positive correlations, also at the 99% confidence level (Table 21b), though grassland categories were only weakly associated, perhaps reflecting the very different classification principles adopted in the two systems.

TABLE 21 CALIBRATION OF CS-1990 FIELD SURVEY AND MAFF AGRICULTURAL AND HORTICULTURAL CENSUS FROM SUMMARY STATISTICS

21a Coefficients of regression: MAFF Classes regressed against CS-1990 Reporting Categories

MAFF / Field Survey	Wheat	Winter Barley	Spring Barley	Oats	Mixed Corn	Potatoes	Hort. culture	Orchards	Small Fruit	Nursery Stock	Bulbs & Flowers	Turnips / Swedes	Kale	Field Beans	Peas	Stockfeed / Fodder Beet	Oilseed Rape	Sugar Beet	Other Crops	Fallow	Recently Sown Grass	Long Term Grass
Wheat	1.21	0.6																				
Barley				0.09																		
Oats			7.53																			
Maize	-10.9	-3.7																				
Other Cereal	-7.9	-7.9			0.313																	
Potatoes						1.62							0.2									
Horticulture							1.32	0.8	0.18	0.09	0.07											
Turnips / Swede												1.1	0.3									
Kale																						
Field Beans														1.46	0.7				0.2			
Peas																						
Oilseed Rape														0.1			1.0					
Sugar Beet																		1.5	0.1			
Other Crops													2.43	-13.3		11.5			4.3			
Fallow																						
Sown Grass																						-9.57
Rye Grass																						4.1
Managed Grass																						
Recr. Grass																					1.0	
Weedy Grass																						
Unimp. grass																						
Calc. grass																						
Upland grass																						
Constant	-2141	584	5338	400	1027	-4741	6780	-318	596	359	242	-2567	526	-2420	432	2877	183	-14440	-351		-44744	268529
R-squared	99.7	97.8	39.3	37.5	72.7	85.5	13.4	95.3	59.2	73.1	15.2	72.6	89.7	99.6	90.5	48.3	82	92.3	99.2		43.3	77.9

Bold face text indicates results significant at >99%

TABLE 21 CALIBRATION OF CS-1990 FIELD SURVEY AND MAFF AGRICULTURAL AND HORTICULTURAL CENSUS FROM SUMMARY STATISTICS

21b Coefficients of regression: CS-1990 Reporting Categories regressed against MAFF Classes

MAFF / Field Survey	Wheat	Winter Barley	Spring Barley	Oats	Mixed Corn	Potatoes	Horti-culture	Orchards	Small Fruit	Nursery Stock	Bulbs & Flowers	Turnips / Swedes	Kale	Field Beans	Peas	Stockfeed / Fodder Beet	Oilseed Rape	Sugar Beet	Other Crops	Fallow	Recently Sown Grass	Long Term Grass	Constant	R-squared
Wheat	0.9																							
Barley		0.8	0.4																				28655	97.2
Oats		0.04	0.04																				39130	89.3
Maize					1.72																		2426	84.8
Other Cereal	0.05	-0.1			0.8																		272	45.6
Potatoes						0.5						-0.4											489	99.2
Horticulture								1.1			0.9												5631	89.8
Turnips / Swede												0.6											288	96.9
Kale															0.3								3351	72.6
Field Beans														0.2					1.3				2033	78.5
Peas																							825	88.4
Oilseed Rape																	0.8						42718	90.5
Sugar Beet																		0.4	1.7				6219	88.2
Other Crops															1.5				2.1				5126	98.8
Fallow																							1453	90.5
Sown Grass																								
Rye Grass																					0.6	0.2	15102	63.4
Managed Grass																					0.4		109711	43.3
Recr. Grass																								
Weedy Grass																						0.3	46830	39
Unimp. grass																								
Calc. grass																								
Upland grass																								

Bold face text indicates results significant at >99%

The match between estimates of crop cover from the MAFF Census and from CS-1990 depends on rather different factors from the comparisons involving data derived from remote sensing and aerial photography described earlier. The MAFF data are derived from questionnaire returns from farmers. Assuming no qualitative or quantitative errors in these returns, any one field should be recorded identically in both systems. Other than the need to identify crops in the field at various stages in their development, there are none of the classification or interpretation steps entailed in Monitoring Landscape Change and in the compilation of the Land Cover Map. Errors resulting from mis-classification should therefore be minimal.

Consequently, the major differences are likely to derive from the radical differences in approach of the two surveys (complete census *vs* sparse sample) and from nomenclatural differences, of which the treatment of managed grassland is the most obvious example.

7.4.6 **Inter-calibration of ITE Land Cover Map *vs* MLC**. This was carried out using the same point-grid sampling technique as was used in the inter-calibration of these two datasets with CS-1990 field survey data, reported in paragraphs 7.4.2 and 7.4.4. The results of the inter-calibration, showing the correspondence between 17 Land Cover Map classes and 31 MLC categories, are presented in Table 22. A total of 11360 points, from 455 1km squares, were compared. In Table 22b, the cells are shown as proportions per thousand points sampled. Entries in bold face in Table 22b indicate 'matches' between corresponding categories in the two systems. These direct matches total 514, indicating 51.4% correspondence between the Land Cover Map (compiled by semi-automatic classification of satellite data) and Monitoring Landscape Change (from aerial photo-interpretation).

Tables 22c and 22d record individual cell counts as a percentage of the row and column totals, respectively. These Tables indicate how a given land category in one survey is apportioned in the second system; in effect, they record simple linear transforms which can be used to inter-convert land cover estimates between the two.

The results largely confirm the previous inter-comparisons involving the CS-1990 field survey data. They suggest that there is a significant over-estimate of built-up land in the Land Cover Map; a large proportion of land mapped from satellite as 'suburban' or 'urban' was recorded by the photo-interpreters as ploughed or cropped.

TABLE 22 CALIBRATION OF MLC vs ITE LAND COVER MAP USING 25-POINT GRID

22a Individual point counts

Land Cover Map / MLC	Unclass.	Suburban	Urban	Sea/ Estuary	Inland water	Beach/ Mudflat	Salt marsh	Inland Bare	Tilled land	Managed grass	Marsh/ r. grass	Bracken	Grass moor	Bogs/ flushes	Open heath	Dense heath	Brdleaf Decid	Conifer wood	Total
Unclassified																		1	1
Built-up land	10	173	14	4		2		6	84	102	9	2	18	1	13	3	9	4	454
Transport routes		13	1			1		3	26	10	2		2		1		3	1	63
Coastal water	4	1		225	2	46	3	1	1	6	1			1	9	3	2	3	308
Farm ponds																			1
Inland water	3	2	2	6	57	1		1	7	2	2	1	4	4	5	6	5	1	103
Sand	2		3	12	3	12	3			2	1		6	1	1	1	1		47
Saltmarsh	1	1		3		5	10		1	2			1		1				25
Bare rock	6	2		15		17		11		4	2	1	14	9	36	12	1		130
Quarries		4	7			1		1	5	3	1			1	3				27
Ploughed/crops	113	187	30	26	3	4	3	32	1967	902	53	19	76	5	59	4	54	16	3553
Market gardens	1	2	1					2	12	6	1						3		28
Urban spaces	3	6	1			4		1	12	66	3		5		1		3	1	106
Improved pasture	50	19	5	21		1		3	132	1037	30	21	58	3	33	6	73	9	1501
Smooth grass	12					2		1	2	39	8	25	61	5	76	8	3	1	243
Rough pasture	11	14	2	2		6	1	2	22	116	18	6	27	3	32	2	14	3	281
Negl. pasture	8	4		4		1			28	255	22	10	41	1	17	12	22		415
Rough grassland		2				2			3	4	2	1	1		3		4		22
Derelict land	2	6	1						2	7	1		1		1	3	2		23
Fresh marsh						6	19			6	5		1						37
Bracken	9	3							3	12	4	28	12	4	12	4	15	2	108
Coarse grass	32	4	1	5	1	5		22	22	81	26	53	381	91	464	56	21	12	1277
Peat bog									1	1	2		1		9				14
Blanket bog	2				2			7		10	10	8	83	73	245	20	3		463
Upland heath	15	1		3	2	5		9	6	42	15	25	128	32	382	181	24	1	871
Heather									2	1	1								4
Gorse		2								5		1	1			1			10
Orchards		1							5	18						1			25
Scrub																			
Mixed forest		1							11	11		6	1		18	16	30	20	94
Brdleaf forest	8	11	1	2				1	52	90	11	9	24	7	29	23	174	12	454
Conifer forest	14	8						4	28	34	6	3	61	21	60	43	63	328	673
Total	306	467	69	328	70	121	39	107	2434	2874	236	219	1008	262	1500	373	531	416	11360

TABLE 22 CALIBRATION OF MLC vs ITE LAND COVER MAP USING 25-POINT GRID

22b: Correspondence, per thousand points sampled

Land Cover Map / MLC	Unclass.	Suburban	Urban	Sea/ Estuary	Inland water	Beach/ Mudflat	Salt marsh	Inland Bare	Tilled land	Managed grass	Marsh/ r. grass	Bracken	Grass moor	Bogs/ flushes	Open heath	Dense heath	Brdleaf Decid	Conifer wood	Total
Unclassified																			
Built-up land	1	15	1					1	7	9	1		2		1		1		39
Transport routes		1							2	1									4
Coastal water				20		4				1					1				26
Farm ponds																			
Inland water				1	5				1										7
Sand				1		1							1						3
Saltmarsh							1												1
Bare rock	1			1		1		1					1	1	3	1			10
Quarries			1																1
Ploughed/crops	10	16	3	2				3	173	79	5	2	7		5		5	1	311
Market gardens									1	1									2
Urban spaces		1							1	6									8
Improved pasture	4	2		2					12	91	3	2	5		3	1	6	1	132
Smooth grass	1									3	1	2	5		7	1			20
Rough pasture	1	1				1			2	10	2	1	2		3		1		24
Neglect pasture	1								2	22	2	1	4		1		2		35
Rough grassland		1								1									2
Derelict land										1									2
Fresh marsh						1	2			1									4
Bracken	1									1		2	1		1		1		7
Coarse grass	3							2	2	7	2	5	34	8	41	5	2	1	112
Peat bog															1				1
Blanket bog								1		1	1	1	7	6	22	2			41
Upland heath	1							1	1	4	1	2	11	3	34	16	2		76
Heather																			
Gorse																			
Orchards		2								2									2
Scrub																			
Mixed forest									1	1		1			1	1	3	2	10
Brdleaf forest	1	1							5	8	1	1	2	1	3	2	15	1	41
Conifer forest	1	1							2	3	1		5	2	5	4	6	29	59
Total	26	39	5	27	5	8	3	9	212	252	20	20	87	21	132	33	44	35	978

TABLE 22 CALIBRATION OF MLC vs ITE LAND COVER MAP USING 25-POINT GRID

22c: Proportional Composition (%) of Land Cover Map Classes in terms of MLC Categories

Land Cover Map / MLC	Unclass.	Suburban	Urban	Sea/ Estuary	Inland water	Beach/ Mudflat	Salt marsh	Inland Bare	Tilled land	Managed grass	Marsh/ r. grass	Bracken	Grass moor	Bogs/ flushes	Open heath	Dense heath	Brdleaf Decid	Conifer wood
Unclassified																		
Built-up land	3	37	20	1		2		6	3	4	4	1	2		1	1	2	1
Transport routes		3	1			1		3	1		1						1	
Coastal water	1			69	3	38	8	1							1	1		1
Farm ponds																		
Inland water	1		3	2	81	1		1			1			2			1	
Sand	1		4	4	4	10	8						1					
Saltmarsh				1		4	26											
Bare rock	2			15		14		10			1		1	3	2	3		
Quarries		1	10			1		1										
Ploughed/crops	37	40	43	8	4	3	8	30	81	31	22	9	8	2	4	1	10	4
Market gardens			1					2									1	
Urban spaces	1	1	1			3		1		2	1						1	
Improved pasture	16	4	7	6		1		3	5	36	13	10	6	1	2	2	14	2
Smooth grass	4					2		1		1	3	11	6	2	5	2	1	
Rough pasture	4	3	3	1		5	3	2	1	4	8	3	3	1	2	1	3	1
Negl. pasture	3	1		1		1			1	9	9	5	4	1	1	1	4	
Rough grassland						2					1							
Derelict land	1	1	1															
Fresh marsh						5	49				2							
Bracken	3	1									2	13	1	2	1	1	3	
Coarse grass	10	1	1	2	1	4		21	1	3	11	24	38	35	31	15	4	3
Peat bog											1				1			
Blanket bog	1				3			7			4	4	8	28	16	5	1	
Upland heath	5			1	3	4		8		1	6	11	13	12	25	49	5	
Heather																		
Gorse																		
Orchards										1								
Scrub																		
Mixed (pres)												3		1	1	2	6	5
Brdleaf forest	3	2	1	1				1	2	3	5	4	2	3	2	6	33	3
Conifer forest	5	2						4	1	1	3	1	6	8	4	12	12	79
Total	101	97	96	102	99	101	102	102	96	96	98	99	99	99	99	102	103	99

TABLE 22 CALIBRATION OF MLC vs ITE LAND COVER MAP USING 25-POINT GRID

22d: Proportional Composition (%) of MLC Classes in terms of Land Cover Map Categories

Land Cover Map / MLC	Unclass.	Suburban	Urban	Sea/ Estuary	Inland water	Beach/ Mudflat	Salt marsh	Inland Bare	Tilled land	Managed grass	Marsh/ r. grass	Bracken	Grass moor	Bogs/ flushes	Open heath	Dense heath	Brdleaf Decid	Conifer wood	Total
Unclassified																		100	100
Built-up land	2	38	3	1				1	19	22	2		4		3	1	2	1	99
Transport routes		21	2			2		5	41	16	3		3		2		5	2	102
Coastal water	1			73	1	15	1			2					3	1	1	1	99
Farm ponds																			
Inland water	3	2	2	6	55	1		1	7	2	2	1	4	4	5		5	1	101
Sand	4		6	26	6	26	6			4	2		13	2	2		2		99
Saltmarsh	4	4		12		20	40			4	8		4		4				100
Bare rock	15	2		12		13		8		3	2	1	11	7	28	9	1		102
Quarries		15	26			4		4	19	11	4			4	11			4	102
Ploughed/crops	3	5	1	1				1	55	25	1	1	2		2		2		99
Market gardens	4	7	4					7	43	21	4						11		101
Urban spaces	3	6	1			4		1	11	62	3		5		1		3	1	101
Improved pasture	3	1		1					9	69	2	1	4		2		5	1	98
Smooth grass	5					1			1	16	3	10	25	2	31	3	1		98
Rough pasture	4	5	1	1		2		1	8	41	6	2	10	1	11	1	5	1	100
Neglect pasture	2	1		1					7	61	5	2	10		4		5		98
Rough grassland	1	9				9			14	18	9	5	5		14		18		101
Derelict land	9	26	4						9	30	4		4		4		19		99
Fresh marsh						16	51			16	14		3						100
Bracken	8	3							3	11	4	26	11	4	11	4	14	2	101
Coarse grass	3							2	2	6	2	4	30	7	36	4	2	1	99
Peat bog									7	7	14		7		64				99
Blanket bog								2		2	2	2	18	16	53	4	1		100
Upland heath	2					1		1	1	5	2	3	15	4	44	21	3		102
Heather									50	25	25								100
Gorse	1	20								50		10	10				10		100
Orchards		4							20	72							4		100
Scrub																			
Mixed forest		1							12	12		6	1		9	6	32	21	100
Brdleaf forest	2	2							11	20	2	2	5	2	6	5	38	3	98
Conifer forest	2	1						1	4	5	1		9	3	9	6	9	49	99

The low correspondence between areas of sea and estuary may be due in part to differences in tidal state, but the large range of MLC categories which are confused with the Land Cover Map class 'Sea' indicate problems of mis-registration. MLC performed relatively poorly against CS-1990 in identifying saltmarsh, and this is confirmed in Tables 22c and 22d. Similarly, problems in mapping bracken accurately from satellite imagery were noted earlier and are borne out here. Confusion between arable crops and managed grassland is probably due in some measure to differences in timing of image acquisition with respect to the patterns of crop rotation; this feature was noticed in relation to the earlier comparisons of both Land Cover Map and Monitoring Landscape Change with CS-1990 field survey and provides a salutary reminder that it is not always simple to differentiate even between seasonal and 'permanent' crops. There are significant differences in interpretation of semi-natural vegetation cover between the two surveys, especially in their treatment of rough grassland, bog and moorland. Some of this is due to the differences in nomenclature and definition which become apparent when definitions of the classes employed in the two systems are examined in detail. Correspondence between areas mapped as deciduous woodland is low. Many areas mapped in the Land Cover Map as deciduous forest appear in MLC as grassland and coniferous wood; once again, this is due, at least in part, to differences in definition. Monitoring Landscape Change adopts tight criteria (of minimum parcel size, minimum canopy cover) in determining when woodland qualifies as 'High Forest'. In the Land Cover Map, the woodland dichotomy is essentially 'deciduous *vs* evergreen', while in Monitoring Landscape Change, the primary distinction is between broadleaved and deciduous species.

7.4.7 **Inter-calibration of Countryside Survey 1990 Field Survey *vs* Monitoring Landscape Change - Linear Features.** The results of this analysis are presented as Figures 5 - 8. 1021 km of linear features from 298 1 km squares were mapped as hedgerow from aerial photo-interpretation using the methods adopted in Monitoring Landscape Change. In the same 298 1 km squares, the CS-1990 field survey identified 951 km hedgerow. 657 km (or about 65%) were classified as 'Hedge' in both surveys Figures 5 and 6 illustrate how the remaining 35% boundary features were treated in the two systems.

There are, of course, mapping errors associated with both approaches. In the field, the assignment of features to a particular category is often subjective. For example, it is necessary to make judgements about precisely when a derelict hedge degrades into a line of scrub or trees. The CS-1990 field guide provides assistance, but there are inevitable small differences in interpretation between surveyors. However, these errors are likely to be small in comparison with errors associated with the interpretation of linear features from aerial photography.

FIGURE 5 CATEGORISATION IN MONITORING LANDSCAPE CHANGE OF FEATURES MAPPED AS HEDGEROW IN CS-1990

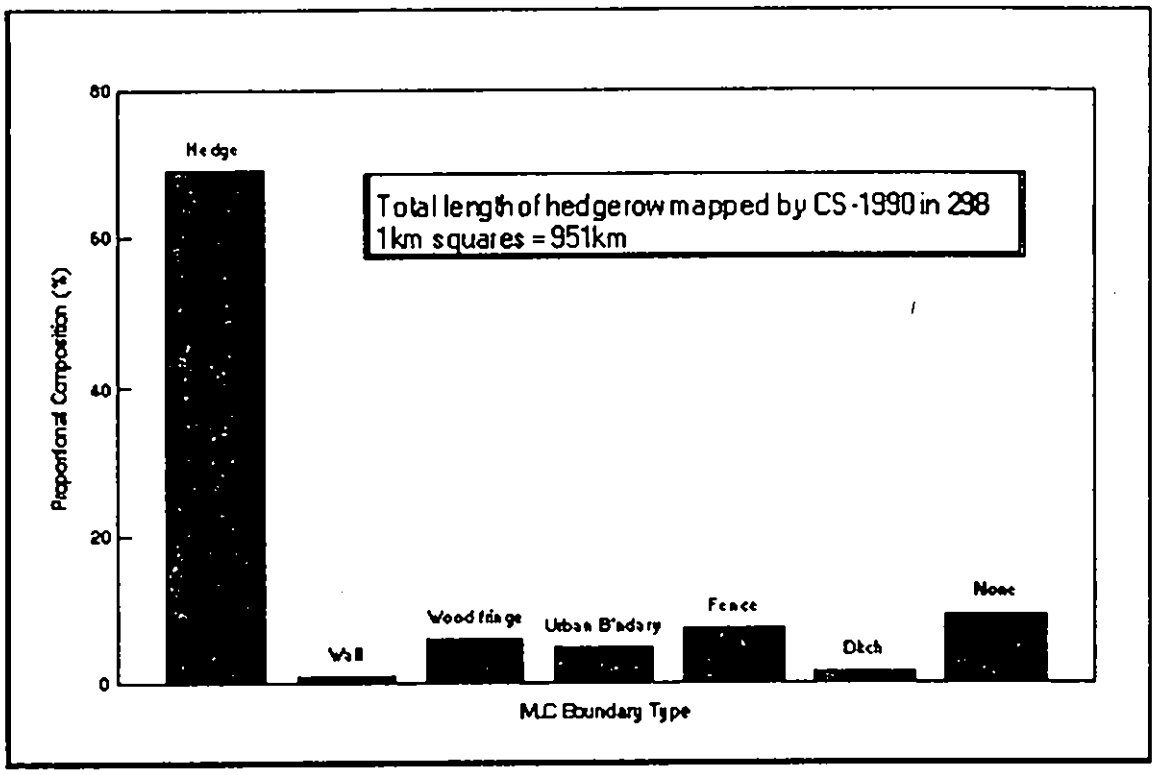


FIGURE 6 CATEGORISATION IN CS-1990 OF FEATURES MAPPED AS HEDGEROW IN MONITORING LANDSCAPE CHANGE

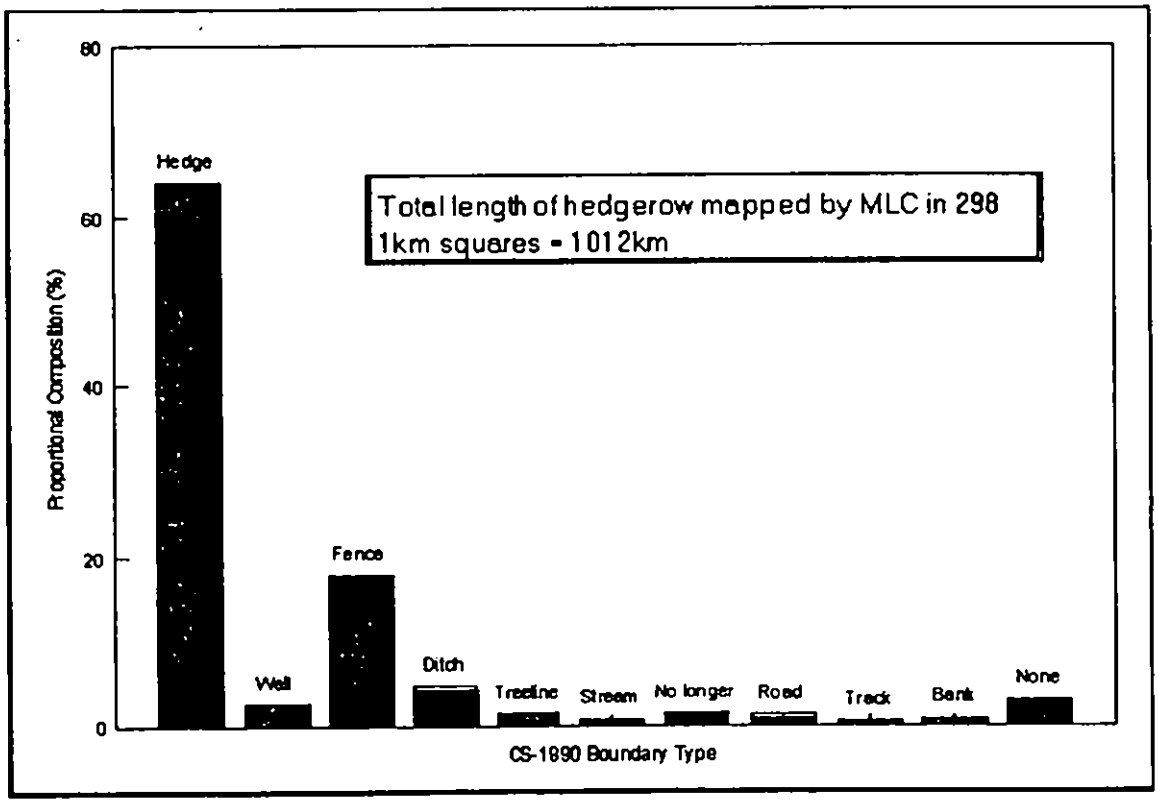
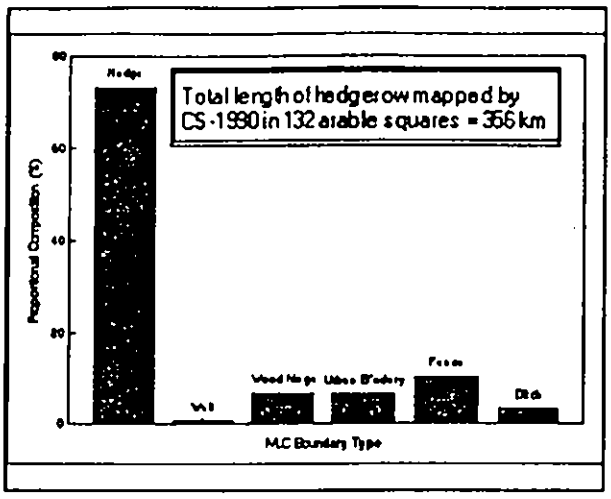
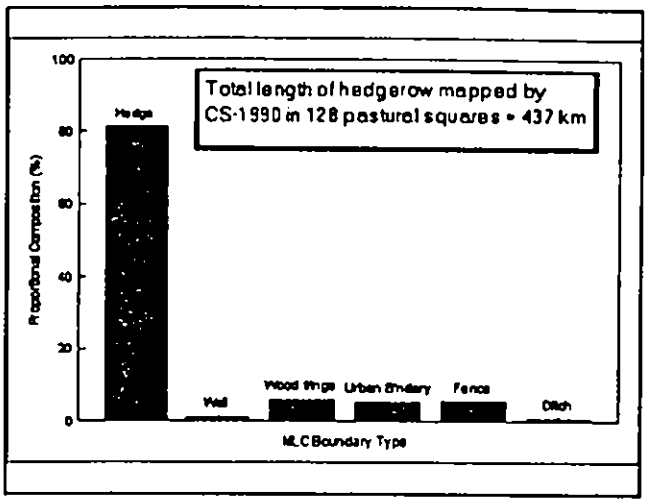


FIGURE 7 CATEGORISATION, BY LANDSCAPE TYPE, IN MONITORING LANDSCAPE CHANGE OF FEATURES MAPPED AS HEDGEROW IN CS-1990

(a) Arable Landscapes



(b) Pastural Landscapes



(c) Marginal Upland Landscapes

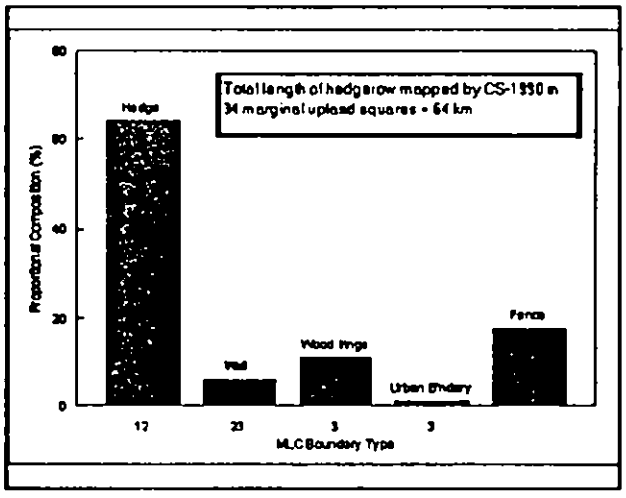
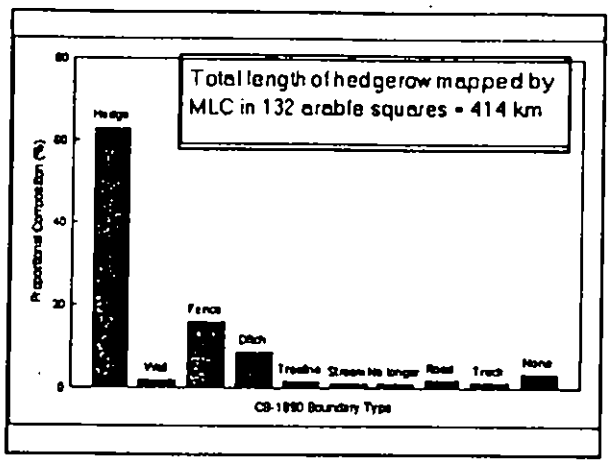
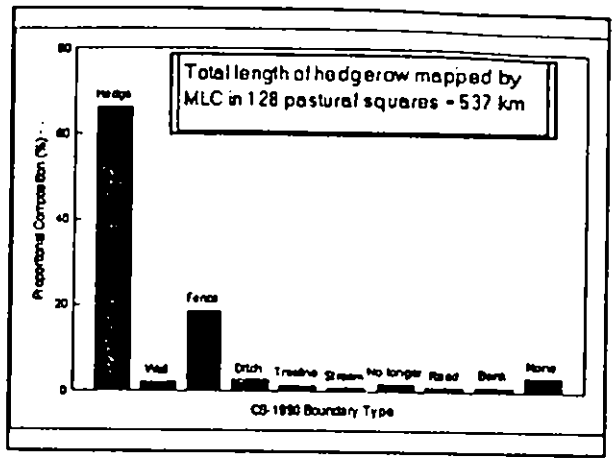


FIGURE 8 CATEGORISATION, BY LANDSCAPE TYPE, IN CS-1990 OF FEATURES MAPPED AS HEDGEROW IN MONITORING LANDSCAPE CHANGE

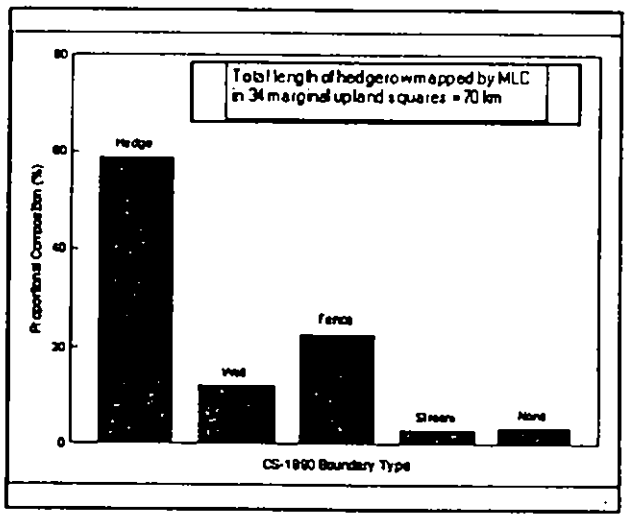
(a) Arable Landscapes



(b) Pastural Landscapes



(c) Marginal Upland Landscapes



Assuming therefore that the field data record is substantially accurate, it would appear that errors of both omission and commission result from the use of aerial photo-interpretation to map hedgerow and that these are of comparable magnitude (ca 35%). From Figure 5, we see that 294 km of boundary mapped in CS-1990 as 'Hedgerow' was recorded from aerial photo-interpretation as other linear features. For 9% of the total, no linear feature was apparent from photo-interpretation; 7% were mapped as 'Fence', probably because the hedge was too inconspicuous to be properly identified; 11% were mapped as a boundary with woodland or built areas (ie the photo-interpretation failed to recognise the hedge).

Figure 6 shows that the major source of errors of commission were fencelines, which MLC mapped as hedge. These accounted for 18% of the mis-classification; the sum effect of this was as great as all the other observed differences recorded in Figure 6.

All observed differences should not be attributed to errors in photo-interpretation. Some are likely to be the result of actual changes (eg hedgerow removal) between the time of aerial survey and the visit of the field team. Others will derive from differences in definition, particularly those relating to boundary conditions (examples include the transition between continuous hedge and tree or scrub lines and decisions on the dominant boundary feature, for example, where a rudimentary or relict hedge and ditch or bank coincide).

Figures 7 and 8 break down the data from the previous two Figures by the major landscape types (Arable, Pastural and Marginal Upland). Insufficient hedgerow features were recorded in Upland squares to permit their inclusion. Few systematic differences of note emerge, except that aerial photo-interpretation appears to miss a smaller proportion of the 'CS-1990 hedges' in lowland landscapes (73% - 81%) than in the marginal uplands (64%), see Figure 7. This may reflect on the state of repair of hedges in upland landscapes which could result in greater difficulty in mapping them from aerial survey.

7.5 DEFINITION OF LAND COVER CATEGORIES OF NATIONAL IMPORTANCE

The contract requested the preparations of standard definitions of land cover categories, corresponding to features of national importance. The intention was that these definitions should draw upon the earlier documentation exercise and on the data analysis undertaken in the course of this study.

The Baseline Classification (see Table 5 and Appendix 2) was compiled to underpin the inter-comparisons between land classifications described previously. The compilation of this classification addressed many of the issues implicit in the requirement for a set of defined land cover categories of national importance. In particular, it was necessary to consider overlap between the definition of similar land categories in different surveys and to derive unambiguous definitions for the chosen classes, while avoiding conflict with existing practice, as far as was reasonably possible.

Given this background, it was decided to adopt the Baseline Classification as a foundation for proposals for a national standard land cover nomenclature. However, the Baseline Classification is too detailed in certain areas for use in this capacity. The proposed standard nomenclature consists of a more manageable subset of the Baseline categories and this nomenclature, together with the chosen definitions, is presented as Table 23.

TABLE 23 DEFINITIONS OF LAND COVER CATEGORIES OF NATIONAL IMPORTANCE

1. TILLED AND FALLOW LAND

Includes land under annual tillage including cereals, brassicas, root crops, legumes, other non-horticultural field crops and horticulture, (including flowers). Also includes ploughed and fallow land, including permanent tumbledown setaside. Includes some land with perennial crops, such as strawberries and some flowers. Excludes all ley grassland and land with woody perennial crops.

1.1 LAND PARCELS WITH A SINGLE CROP SPECIES

Cereals, brassicaceae (except horticulture), legumes, roots and non-brassica allies (including sugarbeet and potatoes) and other non-horticultural field crops (eg linseed and sunflower).

1.2 HORTICULTURE

Characterised by small plots of widely differing crop types within a small area, often several crops within one field. Includes flowers, other horticultural crops, such as cauliflower, lettuce, celery, strawberries, and crops grown under cloches and low plastic tunnels.

1.3 NON-CROPPED

Land ploughed but with no crop apparent at the time of survey. Includes fallow land, (whether unused as a part of agricultural rotation, rotational set-aside or permanent tumbledown setaside) and agricultural land where the former use has been temporarily neglected (for up to 3 years) but for which there is no obvious intended change of use.

TABLE 23 DEFINITIONS OF LAND COVER CATEGORIES OF NATIONAL IMPORTANCE

2. CROPLAND WITH WOODY PERENNIAL CROPS

2.1 ORCHARD
Areas with planted broadleaved trees which are, or have been, used for the harvesting of tree fruit crops. They often form a distinct block and display a highly organised (often grid) pattern.

2.2 VINEYARD

2.3 HOPS

2.4 SOFT FRUIT
For example currants, blackberries and raspberries

2.5 TREES AND SHRUBS - NURSERY STOCK
Includes fruit trees, bushes and canes for transplanting. Also includes shrubs, conifers, hedging plants, Christmas trees, ornamental trees and roses grown as nursery stock.

3. GRASS

Includes parkland, tall herbs and bracken but excludes saltmarsh and unimproved dune grassland, (classified as Soft coast - 8.2) and swampy grassland, (classified as Wetland - 7.3).

3.1 RECREATIONAL AND SIMILAR NON-AGRICULTURAL MOWN GRASS
Includes large (>1 ha) areas of amenity grass such as parks and large lawns, playing fields, golf courses, and other non-agricultural mown grass, such as airfields, race courses, gallops and grassed camp sites and caravan parks. Where non-intensive, this use can produce swards characteristic of unimproved grassland - 3.3.

3.2 INTENSIVE AND AGRICULTURALLY IMPROVED GRASS
Re-seeded grassland, intensively managed (eg drained, fertilised and mown) for agricultural purposes.

3.3 PERMANENT NON-INTENSIVE GRASS
Unimproved or little-improved grasslands in an enclosed situation, containing many palatable grasses but without agricultural improvement by the use of fertilisers, pesticides, drainage or reseeding so as to significantly alter the sward composition. Usually with a pH of between 5.5 and 7.0. Excludes Calcareous Grass - 3.4, Acid Grass - 3.5 and Moorland - 3.6 but includes most traditional Hay-Meadows. A comparatively rare category, containing species such as *Conopodium majus*, *Plantago lanceolata*, *Lotus corniculatus* etc.

TABLE 23 DEFINITIONS OF LAND COVER CATEGORIES OF NATIONAL IMPORTANCE

3.4 SEMI-NATURAL CALCAREOUS GRASS
Unimproved, often unenclosed, grasslands found on calcareous soils (pH >7.0) and with a high proportion of calcicole species of limestone, chalk, dunes and machair. These grasslands have not undergone agricultural improvement by way of the application of fertilizers, pesticides, drainage or reseeding so as to significantly alter the sward composition. Typical species include *Bellis perennis*, *Lotus corniculatus*, *Linum catharticum*, *Thymus druceii*, *Poterium sanguisorba*, and *Briza media*.

3.5 ACID GRASS (NON-MOORLAND) AND BRACKEN
Unimproved natural grassland most frequently in an upland situation but with a high proportion of palatable grasses and usually on a mineral soil (pH <5.5). These grasslands have not undergone agricultural improvement by way of the application of fertilizers, pesticides, drainage or reseeding so as to significantly alter the sward composition. Typical species include *Festuca ovina*, *Agrostis tenuis*, *Anthoxanthum odoratum*, *Galium saxatile*, often with bracken. Moorland - 3.6 types are excluded from this category. Includes areas of herbaceous vegetation dominated by *bracken (Pteridium aquilinum)*.

3.6 MOORLAND AND MOUNTAIN GRASS
Coarse unimproved upland grass in a moorland setting (usually unenclosed), normally dominated by species such as *Nardus*, *Molinia*, *Deschampsia flexuosa*, *Juncus squarrosus*. Soils usually have a peaty top. These grasslands have not undergone agricultural improvement by way of the application of fertilizers, pesticides, drainage or reseeding so as to significantly alter the sward composition.

3.7 UNMANAGED LOWLAND GRASSLAND AND TALL HERBS
Swards dominated by false oat grass and couch; herbaceous semi-natural vegetation, often in wet or disturbed positions; dominated by tall herbs (eg *Artemisia vulgaris*, *Anthriscus sylvestris*, *Epilobium hirsutum*, *Heracleum sphondylium*, *Urtica dioica*, etc) but with grasses present; areas of vegetation typical of the margins of water bodies, including such species as *Phaleris arundinacea*, *Eupatorium cannabinum*, *Mentha aquatica*, *Lycopus europaeus*, *Filipendula ulmaria*, *Lythrum salicaria* etc., often including tall herbs but excluding emergent macrophytes.

TABLE 23 DEFINITIONS OF LAND COVER CATEGORIES OF NATIONAL IMPORTANCE

4. HEATHLAND AND BOG

4.1 HEATHLAND

Land dominated by (>25% cover) dwarf shrubs. Dominant shrub species are invariably *Calluna* or *Vaccinium*. Heathland is traditionally divided by context into lowland types, usually characterised by dry soils, and moorland, often on peat substrates. Includes also heath on consolidated and flattened sand dunes and lowland wet heath, where the ericoid element is high

4.2 BOGS

Bogs occur on deep peat (>0.5 m thick) with the water table at or just below the surface. Generally they are ombrotrophic (fed only by direct precipitation). Minerotrophic (fed by ground water or streams) "bogs" in upland situations are included here if they are on deep peat, otherwise they are classed as flush within the Wetland category (7.3). Includes *Trichophorum*-dominated wet heath. May be further sub-divided into:

4.2.1 Drier northern bogs

Mostly with much *Eriophorum vaginatum* and often *Vaccinium myrtillus*, *Rubus chamaemorus* and extensive peat hags.

4.2.2 Saturated bogs

Including very wet heaths with low ericoid cover; typically with pools in winter; vegetation characterized by *Trichophorum*, *Eriophorum angustifolium*, *Erica tetralix* (low cover), *Narthecium*, *Racomitrium lanuginosum*, *Cladonia uncialis*

TABLE 23 DEFINITIONS OF LAND COVER CATEGORIES OF NATIONAL IMPORTANCE

5. WOODLAND AND SHRUBLAND

5.1 WOODLAND
Areas of trees (not coppiced and where rotational felling is still in operation) >5 m high, unless newly planted or felled, covering >0.25 ha, with a crown cover of more than 25%. Includes wooded dunes.

5.1.1 Conifer Woodland
Woodland where 80% or more of the tree canopy is of coniferous species.

5.1.1.1 Deciduous Conifer Woodland
In the British context, this class applies only to larch.

5.1.1.2 Evergreen Conifer Woodland

5.1.1.2.1 Evergreen conifer plantation
In which planted trees make up >30% of the total. Regular planting distances and uniform age structure is characteristic.

5.1.1.2.2 Semi-Natural Evergreen Conifer Woodland
Stands of irregularly spaced coniferous trees of which at least 70% originate from natural regeneration. Includes Caledonian forest, self-sown pine and yew (*Taxas baccata*).

5.1.2 Mixed woodland
Mixtures of coniferous and broadleaved species (semi-natural or planted), where both comprise >20% of the canopy cover. Blocks or lines of coniferous or broadleaved trees wider than two trees are recorded separately if each parcel is >0.25 ha.

5.1.3 Broadleaved woodland
Woodland where 80% or more of the tree canopy is of broadleaved species.

5.1.3.1 Deciduous Broadleaved Woodland

5.1.3.1.1 Plantation Deciduous Broadleaved Woodland
In which planted trees make up >30% of the total. Regular planting distances and uniform age structure is characteristic.

5.1.3.1.2 Semi-Natural Deciduous Broadleaved Woodland
Stands of trees where >70% do not originate from planting. Includes self-sown exotics.

5.1.3.2 Evergreen Broadleaved Woodland
Woodland with >50% broadleaved evergreen species (eg *Quercus ilex*). Rare in GB.

TABLE 23 DEFINITIONS OF LAND COVER CATEGORIES OF NATIONAL IMPORTANCE

5.2 MANAGED COPPICE
Coppice woodland with rotational felling still in operation. May be further subdivided to distinguish:

5.2.1 Coppice-with-Standards
Stands of coppiced trees that may or may not originate from planting, with scattered trees left to grow to maturity as timber trees amongst the coppiced underwood.

5.2.2 Pure Coppice
Stands of coppiced trees where no trees are left to grow to maturity.

5.3 SHRUB
Consists predominantly of shrubby species, (even if >5 m tall) often with tree regeneration and brambles. Canopy cover >50%.

5.3.1 Shrub on Dry or Moist Ground
Includes species such as *Crataegus monogyna*, *Prunus spinosa*, *Salix cinerea*, (except as in 5.3.2) *Rosa canina*, *Ulex europaeus*, *Sarothamnus scoparius* and *Juniperus communis*. Includes dune scrub dominated by such species as *Hippophaë rhamnoides*.

5.3.2 Swampy Shrub and Carr
Semi-natural shrub growing on a waterlogged substrate, particularly peat. Species include *Salix* spp., and *Frangula alnus*. Excludes carr woodland which is dominated by such species as *Betula pubescens* and *Alnus glutinosa* and should be classified as Deciduous Broadleaved Woodland - 5.1.3.1.

5.4 FELLED WOODLAND
Areas of felled woodland in which woody regeneration is less than 1 m high; includes felled coppice.

5.5 LAND PLOUGHED FOR AFFORESTATION

6. INLAND ROCKS AND SCREES

Areas where >50% of the land surface is covered by rock, including cliffs, rock outcrops, limestone pavement, scree, block litter and mountain-top debris.

TABLE 23 DEFINITIONS OF LAND COVER CATEGORIES OF NATIONAL IMPORTANCE

7. WETLAND AND WATER

Excluding tree covered swamps, which are classed as woodland if >5 m, and as shrub if <5 m.

7.1 STILL WATER

7.1.1 Lake

Any inland water body >0.25 ha in extent.

7.1.1.1 Open Water in Lake

Includes floating aquatic vegetation with species such as *Nuphar*, *Nymphaea*, *Potamageton* and *Lemna*.

7.1.1.2 Emergent Macrophytes in Lake

Surface plant species characteristic of standing water (eg *Typha latifolia*, *Carex riparia*, *Glyceria maxima*, *Sparganium erectum* and *Phragmites communis*).

7.1.2 Reservoir

Artificial inland water body, usually distinguished by the presence of a dam or embankment.

7.1.2.1 Open Water in Reservoir

Includes floating aquatic vegetation with species such as *Nuphar*, *Nymphaea*, *Potamageton* and *Lemna*.

7.1.2.2 Emergent Macrophytes in Reservoir

Surface plant species characteristic of standing water (eg *Typha latifolia*, *Carex riparia*, *Glyceria maxima*, *Sparganium erectum* and *Phragmites communis*).

7.1.3 Pond

Any inland water body less than 0.25 ha in extent.

7.1.3.1 Open Water in Pond

Includes floating aquatic vegetation with species such as *Nuphar*, *Nymphaea*, *Potamageton* and *Lemna*.

7.1.3.2 Emergent Macrophytes in Pond

Surface plant species characteristic of standing water (eg *Typha latifolia*, *Carex riparia*, *Glyceria maxima*, *Sparganium erectum* and *Phragmites communis*.).

TABLE 23 DEFINITIONS OF LAND COVER CATEGORIES OF NATIONAL IMPORTANCE

7.2 RUNNING WATER

7.2.1 River

Channel of moving water >2.5 m wide, including rivers which have been canalised (eg sections straightened, banks smoothed) but which follow essentially the course of the original channel.

7.2.1.1 Open Water in River

7.2.1.2 Emergent macrophytes in river

Surface plant species characteristic of the edges of running water such as *Glyceria maxima*, *Apium nodiflorum*, *Veronica beccabunga* and *Phragmites communis*.

7.2.2 Canal

Water channels constructed where no watercourse existed previously.

7.2.2.1 Open water in canal

7.2.2.2 Emergent macrophytes in canal

Surface plant species characteristic of the edges of running water such as *Glyceria maxima*, *Apium nodiflorum*, *Veronica beccabunga* and *Phragmites communis*.

7.3 WETLAND

7.3.1 Fen and marsh

Fen is identified as lowland peat, usually dominated by sedges or rushes with tall herbs, often with alder or willow. Marsh comprises nutrient-rich wetland on predominantly inorganic soil, dominated by rushes or sedges with tall herbs. Includes areas of reeds not permanently in water.

7.3.2 Flush

Localised, wet linear or triangular areas of land associated with moving water, (may include small watercourses) on gently sloping ground 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 and small sedges, often with *Sphagnum*.

TABLE 23 DEFINITIONS OF LAND COVER CATEGORIES OF NATIONAL IMPORTANCE

8. COASTAL FEATURES

Excluding wooded dunes, classified as woodland and improved dune grassland, classified as grassland and dune heath, classified as heathland.

8.0 SEA/ESTUARY
Open sea and coastal waters. Includes estuaries inland to the point where the waterway becomes strongly constricted to the normal width of the river.

8.1 INTERTIDAL SOFT COAST WITHOUT VEGETATION
Includes intertidal sand and mud flats, and shores composed of sand, gravel and pebbles.

8.2 VEGETATED SOFT COAST

8.2.1 Salt marsh
Intertidal sand-, silt- or mud-based habitats, colonised by halophytic grasses such as *Puccinellia* spp. and *Spartina* spp., rushes such as *Juncus gerardii* and *Blysmus rufus*, and herbs such as *Limonium* spp., *Aster tripolium*, *Salicornia dolichostachya* and *Triglochin maritima*. Includes all flowering plant communities which are submerged by high tides at some stage of the annual cycle.

8.2.2 Dune
Onshore wind-carried sand deposits arranged in cordons of ridges parallel to the coast. Also inland wind blown sand deposits. Either open or with semi-natural grassland.

8.3 HARD COAST WITH LITTLE OR NO VASCULAR VEGETATION
Including Intertidal seaweed-covered boulders, un-vegetated shores, covered by shattered rocks or boulders, cliffs and outcropping base-rock.

8.4 MARITIME VEGETATION
Vegetation found in coastal situations. Usually herb-rich and with halophytic species present, due to salt spray. Includes cliff-top grassland and semi-open *Armeria* communities of the spray zone.

TABLE 23 DEFINITIONS OF LAND COVER CATEGORIES OF NATIONAL IMPORTANCE

9. TRANSPORT, BUILT, URBAN AND INDUSTRIAL

Excludes any grassland >1 ha in extent.

9.1 TRANSPORT
Roads and railways, including all paved surfaces, track and associated land.

9.2 DISCONTINUOUSLY BUILT LAND
Isolated buildings and groups of buildings where gardens and other areas of vegetation cover comprise >50% of the ground in any 0.25 ha area. May be sub-divided according to categories of use.

- **9.2.1 Agricultural Buildings**
- **9.2.2 Residential Buildings with Gardens**
- **9.2.3 Commercial and Industrial Buildings**
- **9.2.4 Public Services and Facilities**

9.3 CONTINUOUSLY BUILT LAND
Groups of buildings where gardens and other areas of vegetation cover comprise <50% of the ground in any 0.25 ha area.

- **9.3.1 Residential Buildings without Gardens**
- **9.3.2 Commercial and Industrial Buildings**
- **9.3.3 Public Services and Facilities**

9.4 VEGETATED WASTE LAND, DERELICT LAND, ALLOTMENTS

9.5 HARD AREAS WITHOUT BUILDINGS
Includes unvegetated derelict land, building sites car parks, ungrassed recreational grounds and public spaces such as tennis courts, all-weather pitches, etc.

9.6 QUARRIES AND OTHER EXTRACTIVE INDUSTRIES
If vegetated or flooded, these should be classified according to cover.

TABLE 23 DEFINITIONS OF LAND COVER CATEGORIES OF NATIONAL IMPORTANCE

10. LINEAR FEATURES

Including tree lines, hedges, fences, banks, ditches, walls, tracks and streams, but excludes roads, railways and rivers.

10.1 TREE-LINES AND HEDGES

10.1.1 Line of Trees
A single tree in width and at least 20 m long with crown contact.

10.1.2 Line of Shrub
A single shrub width and at least 20 m long with crown contact.

10.1.3 Hedge
Woody vegetation regularly cut to maintain a linear shape.

10.2 WALLS

10.3 FENCES

10.4 BANKS AND DITCHES

10.5 GRASS STRIP
Used where a grass strip separates two fields with no vertical boundary.

10.6 TRACK
Unsurfaced vehicular route. Excludes roads which are tarmac or concrete, see Road - 9.1.2.

10.7 STREAM
A natural water course <2.5 m wide.

8 SUMMARY AND CONCLUSIONS

17 regional, national and international systems for surveying and recording the nature and extent of land use and land cover have been examined and documented, together with a number of variations on individual schemes. The objectives and methods employed in each survey have been recorded in a structured format within a Dictionary of Land Use and Land Cover Surveys, which forms Annex 1 to this Report. This information also forms an integral part of the computerised Countryside Information System (Department of the Environment, 1993). A major element in the Dictionary is a record of the land use and land cover nomenclature employed in the surveys; this record includes published definitions of the terminology used.

Computer software has been implemented to allow the inter-comparison of classifications from any pair of surveys. Each of the 17 target classifications has been explicitly referenced, term-by-term, to a common baseline classification, on the basis of published definitions of the land classes. Relationships between Baseline categories and terms in the 17 target systems are held as digital files. The computer program accesses these files and infers overlap between the target classifications from their explicitly recorded relationships with the Baseline. Selected examples of outputs from this program are included as Annex 2 to this Report. The algorithm has been implemented as part of the Countryside Information System and allows the relationships between any two systems to be explored interactively.

Output from four national land surveys has been examined in order to explore quantitatively how estimates of land use and land cover from them correspond. The systems considered were:

- Field survey from the Countryside Survey-1990;
- the ITE Land Cover Map.
- Monitoring Landscape Change.
- the MAFF Agricultural and Horticultural Census (and its regional variants).

Several approaches were adopted; all showed strong positive correlations between estimates of land cover derived from the different sources. Overall levels of correspondence measured were as follows:

CS-1990 Field Survey *vs* ITE Land Cover Map (Paragraphs 7.4.1 and 7.4.2)	46-54%
CS-1990 Field Survey *vs* Monitoring Landscape Change (Paragraph 7.4.4)	57.8%
ITE Land Cover Map *vs* Monitoring Landscape Change (Paragraph 7.4.6)	51.4%

It is important that these estimates of correspondence are not equated to measures of absolute accuracy. There are errors inherent in any mapping operation, whether the data are collected from ground level or from space. When two surveys, each of which may carry an error of the order of 25%, are compared, the correspondence between them will inevitably be low: the values of 50% to 60% encountered in this study are not unreasonable. Quality control checks carried out as part of the CS-1990 field survey indicated that the recording accuracy of the field surveyors fell in the range 74-83% (Barr *et al*, 1993). Correspondence between two surveys, each operating at this level of accuracy, could easily be in the range 55-70%, since the different surveys are likely to propagate different errors. There are additional factors which may further reduce the correspondence, notably:

- differences in timing, which mean that the different surveys may be recording actual change on the ground;
- differences in spatial resolution, which may mean that one survey is recording features that are below the limits of resolution of the second;
- differences in nomenclature, definition and interpretation (explored in depth in the course of this study) which often mean that nominally equivalent land categories only partially match and that there is legitimate overlap between nominally different classes.

Taking all these factors into account, the data collected in this study suggests that land cover can be mapped from space, from aerial photography or from a stratified ground sampling network, with overall errors of the order of 20 - 30%. (Clearly, estimates for certain land cover classes will be much better than this). The separate analysis of correspondence between field survey and aerial photo-interpretation in the mapping of linear features indicates a level of correspondence that is of the same order as in the case of areal features.

It is self-evident that the desire for 'accurate' (ie error-free) measurement must be tempered by considerations of cost and feasibility and, on this basis, the performance of all three approaches indicated by the above data will be adequate for mapping and compilation of statistics at the broader regional and national scales. However, these results emphasize the need for caution in using datasets of this sort at the local scale (for example, to investigate environmental impacts on specific land parcels).

Finally, the study led to the compilation and successful application of a Baseline Classification of land use and land cover which can inter-relate categories from the various extant land classifications. It became apparent that this Baseline Classification offers a sound basis on which to build a standard nomenclature for describing land cover categories of national importance and that this nomenclature could serve in the future a) to facilitate translation and inter-conversion between land surveys, in the way demonstrated in this study and b) as a common foundation from which to construct specialist classification systems in the future, while ensuring improved compatibility and inter-conversion between them.

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APPENDIX 1

COMPOSITE CLASSIFICATION OF ESA MONITORING SCHEMES

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This Table indicates how each ESA Monitoring Scheme corresponds to the Composite Classification (recorded in the first Column). The entries in the Table are the equivalent class notations in the individual schemes.

	Broads	Penn. Dales	Som'st Levels	South Downs	West Pnwth	Breck	North Peak	Shrops Brders	Suffolk Rivers	Test Valley	Camb. Mts.	Lleyn
1 ARABLE	1.0	11.0	3.0	1.0	7.0	1.0	19.2	1.0	1.0	1.0		1.0
2 GRASSLAND												
2.1 RECREATIONAL GRASS	8.0			2.0/9.0			19.1					
2.2 IMPROVED GRASS	3.0	1.5	1.0	2.0	7.0	2.3	10.3	2.0	2.0	2.0	2.0	1.0
2.3 SEMI-IMPROVED GRASSLAND											2.0	
2.3.1 Semi-improved Acidic Grassland	2.0	1.1/4.1			1.0	2.1	10.1	2.0				3.0
2.3.2 Semi-improved Neutral Grassland	2.0	1.2	2.0			2.2	10.2	2.0		3.0		3.0
2.3.3 Semi-improved Calcareous grassland		1.3		3.0		2.1				3.0		
2.4 SEMI-IMPROVED ROUGH GRASS									2.0			
2.4.1 Semi-improved Acidic Rough Grass							11.1					
2.4.2 Semi-improved Neutral Rough Grass		2.1					11.2					
2.5 UNIMPROVED GRASSLAND									3.0		1.0	
2.5.1 Unimproved Acidic Grassland		4.2	2.0		1.0		9.1	2.0				3.0
2.5.2 Neutral unimproved pasture		1.2	2.0					2.0		4.0		3.0
2.5.3 Unimproved Calcareous Grassland		1.3		4.0						4.0		
2.5.4 Unimp Neutral/calcareous grass mosaic		1.4										
2.5.5 Marsh Rough Grass		2.2					9.2	3.0				2.0

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2.6 BRACKEN			4.0						5.0		1.0	6.0
2.6.1 Continuous Bracken		3.1			4.0		8.1	9.0				
2.6.2 Scattered Bracken		3.2			4.0		8.2					
3 HEATH AND BOG											1.0	
3.1 HEATHLAND								10.0				4.0
3.1.1 Dry Shrub Heath		5.1/5.2			2.0	3.2	1.1		5.0			
3.1.2 Dry Shrub Heath/Grass Mosaic		4.4			3.0	3.1	1.1		5.0			
3.1.3 Dry bilberry/crowberry mosaic							2.1					
3.2 BOG												
3.2.1 Dry Bog												
3.2.1.1 Dry Bog (heather dominant)							1.2/5.0					
3.2.1.2 Dry Bog (non-heather dominant)							3.1/5.0					
3.2.1.3 Dry Bog (grass predominant)							4.1/5.0					
3.2.2 Wet Bog												
3.2.2.1 Wet Bog (shrub predominant)		5.3										
3.2.2.2 Wet Bog (Grass predominant)		4.3					3.2					2.0

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4 TREES WITH GRASS												
4.1 PARKLAND		7.1										
4.2 SCATTERED TREES		7.2										
5 WOODLAND, SCRUB & ORCHARDS	4.0			6.0					4.0			
5.1 BROADLEAVED WOODLAND			8.0		6.0	4.2		4.0		6.0	3.0	8.0
5.1.1 Semi-natural Broadleaved Woodland		8.1					13.1					
5.1.2 Plantation Broadleaved Woodland		8.2					13.2					
5.1.3 Felled Broadleaved Woodland								7.0				
5.2 CONIFEROUS WOODLAND					6.0	4.1		5.0			4.0	9.0
5.2.1 Semi-natural Coniferous Woodland		9.1										
5.2.2 Plantation Coniferous Woodland		9.1					14.1					
5.2.2 Felled Coniferous Woodland		9.2						7.0				
5.3 MIXED WOODLAND					6.0	4.2		6.0				
5.3.1 Semi-natural Mixed Woodland		10.1					15.1					
5.3.2 Planted Mxed Woodland		10.2					15.2					
5.3.3 Felled Mixed Woodland		10.3						7.0				

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5.4 ORCHARDS			7.0			1.0						
5.5 SCRUB			4.0		5.0			8.0			1.0	
5.5.1 Dense Scrub		6.1		5.1			12.1			5.0		5.0
5.5.2 Scattered Scrub	6.0	6.2		5.2/5.3			12.2					5.0
5.6 WITHY BEDS			9.0									
6 UNVEGETATED					10.0		7.0					7.0
6.1 ARTIFICIAL ROCK EXPOSURE		13.1										
6.2 NATURAL ROCK EXPOSURE		13.2										
6.3 INLAND CLIFF		13.3					17.1					
6.4 SCREE		13.4					17.2					
6.5 LIMESTONE PAVEMENT		13.5										
6.6 DISTURBED/BURNT		13.9			8.0							
6.7 ERODED PEAT							6.0	5.0				
6.8 PEAT WORKINGS			5.0									
6.9 MUD FLAT AND SEA SHORE									6.0			

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7 WETLANDS												
7.1 FEN AND MARSH	5.0			7.0					3.0	30/4.0		2.0
7.2 FLUSHES		4.5					16.0					
7.3 REEDBED	6.0			7.0					3.0	7.0		
7.4 RIVER/EMBANKMENT VEGETATION	7.0											
8 WATER		12.1	6.0	8.0	10.0	5.0			7.0	8.0		10.0
8.1 STANDING WATER	9.0						18.1				5.0	
8.2 RUNNING WATER							18.2	11.0				
9 BUILT LAND	10.0			9.0		6.0		12.0	8.0	9.0		11.0
9.1 BUILDINGS		14.0			9.0							
9.1.1 Urban			10.0				20.0				6.0	
9.1.2 Farmsteads			11.0									
9.1.3 Horticultural Buildings			12.0									

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9.2 MINERAL EXTRACTION					10.0							
9.2.1 Mine		13.6										
9.2.2 Quarry		13.7										
9.2.3 Other Mineral Extraction		13.8					17.3					
9.2.4 Spoil												

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ITE NORTH

Edinburgh Research Station
and ITE(N) Directorate
Bush Estate
Penicuik
Midlothian EH26 0QB
Tel. 031 445 4343; Telex 72579
Fax 031 445 3943

Banchory Research Station
Hill of Brathens
Glassel
Banchory
Kincardineshire AB31 4BY
Tel 033 02 3434
Fax 033 02 3303

Merlewood Research Station
Grange-over-Sands
Cumbria LA11 6JU
Tel 05395 32264, Telex 65102
Fax 05395 34705

ITE SOUTH

Monks Wood
and ITE(S) Directorate
Abbots Ripton
Huntingdon
Cambs PE17 2LS
Tel 048 73 381; Telex 32416
Fax 048 73 467

Bangor Research Unit
University College of North Wales
Deiniol Road
Bangor
Gwynedd LL57 2UP
Tel 0248 370045, Telex 61224
Fax 0248 355365

Furzebrook Research Station
Wareham
Dorset BH20 5AS
Tel 0929 551518
Fax 0929 551087

The ITE Research Marketing Officers for ITE North and South are based at Banchory and Monks Wood, respectively.

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