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COUNTRYSIDE SURVEY 2000

MODULE 16: PROGRESS AND FORWARD LOOK

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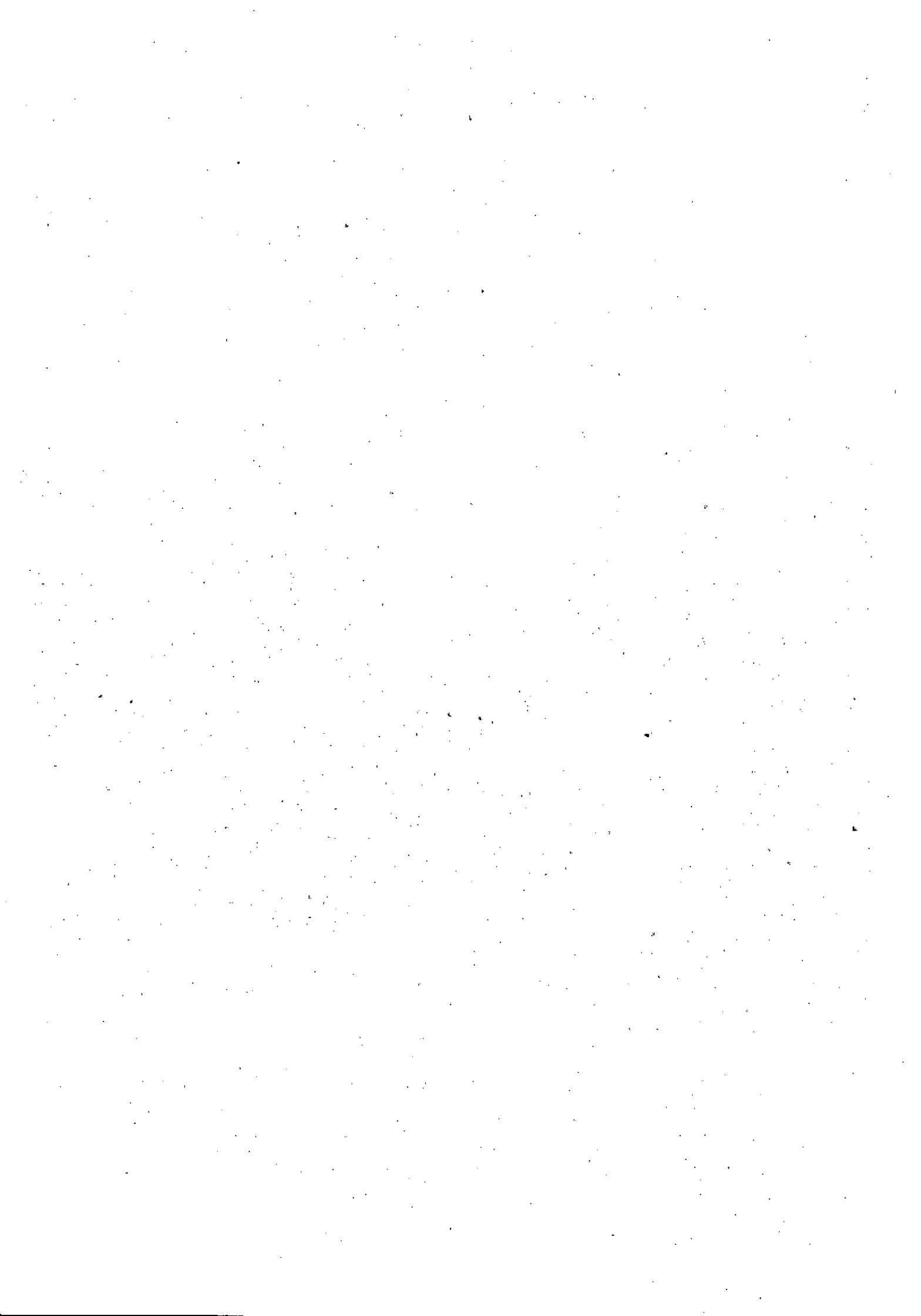
Overall introduction

The tender submitted by NERC for the work covered by Module 16 of CS2000 divided the programme of work into a seven main tasks which were then linked to the objectives of the Module as set out in the invitation to tender. The following report is divided into two parts, each of which is divided in terms of the seven main tasks. Part A covers activities and progress in the period to 31 March 1999 and Part B provides a forward look covering the period 1 April 1999 to 31 March 2002.

AIMS AND OBJECTIVES OF MODULE 16

The main aims of Module 16 are to ensure the co-ordination of the different elements of the work programme of CS2000, the maintenance of liaison with sponsors and policy customers and the dissemination and critical evaluation of the Countryside Survey results to encourage their appropriate use inside Government, amongst its advisors and in the non-government organisations, so as to improve the quality of decisions affecting the countryside.

These aims can be divided into the following specific objectives:

1. To liaise with policy customers and to draw out from the results the main points of significance for the countryside and wildlife policies.
2. To be aware of the developing policy agenda and other related research and monitoring activities and ensure that the presentation of results is responsive to changing demands.
3. To liaise between NERC, DETR, the members of the CS2000 Joint Management Team and the sponsors of CS2000 modules, to ensure the overall co-ordination of the work programme.
4. To provide secretariat functions for the CS2000 Joint Management Team and Advisory Group.
5. To develop awareness amongst the user community of progress in CS2000 through the production of a regular newsletter and maintenance of a Web site.
6. To develop and promote common reporting approaches and standards for all CS2000 modules and to maintain an overview of all CS2000 outputs and products.
7. To identify and promote opportunities for using CS2000 data in consultation with policy customers and other users. Including initiatives undertaken as part of the National Biodiversity Network.
8. To co-ordinate, edit and produce a summary report on the results of CS2000.
9. To co-ordinate the publicity and other events related to the launch of CS2000 and the presentation of results with officials representing DETR, NERC and other sponsors.
10. To organise an Away-day to review the policy implications of the survey results.

PART A

ACTIVITIES AND PROGRESS 1 APRIL 1998 TO 31 MARCH 1999

Part A: The period 1 April 1998 to 31 March 1999.

A1. Programme management, co-ordination and integration – Task 1 (Objective 1.2.3)

A1.1 Management responsibilities

Management responsibilities were assigned as set out in the tender document. Prof Hornung has acted as overall Programme Manager and Co-ordinator and as Leader of Module 16. A Module Leader was appointed for each Module (Table 1) although in the case of Module 6, the Module was split into two components with leaders for each Module. Miss Sarah Stapleford has handled all financial matters associated with Module 1; the finances of all other Modules have been handled from the site at which the module is based. The Director ITE has been briefed at regular intervals on progress and resource utilisation of Modules led from within ITE and his authorisation has been required for all significant changes in resources for these Modules.

Table 1. Module Leaders for the components of the CS2000 programme

Module 1	C J Barr	(ITE Merlewood)
Module 2	M Furse	(IFE Wareham)
Module 3	C J Barr	(ITE Merlewood)
Module 4	C J Barr	(ITE Merlewood)
Module 6 (Soil quality)	H Black	(ITE Merlewood)
Module 6 (N in Calluna)	V Kennedy	(ITE Merlewood)
Module 7	R Fuller	(ITE Monks Wood)
Module 8	R Fuller	(ITE Monks Wood)
Module 10	M Morecroft	(ITE Merlewood/Wytham)
Module 11	R G H Bunce	(ITE Merlewood)
Module 13	T Moffat	(ITE Monks Wood)
Module 16	M Hornung	(ITE Merlewood)

A1.2 The development of the modules

The scope of Module 16 was initially defined in the invitation to tender for the programme of work that included Modules 1, 8, 10, 11, 13 and 16. The full CS2000 programme however, includes further Modules which, since their initiation, have been included within the co-ordination and integration role of Module 16. The development of the various Modules is outlined below.

A scoping study for the CS 2000, carried out for the Department by Drs Haines-Young and Swanick, had as one of its aims the development of an outline programme of work for possible inclusion in a future CS2000. A modular approach to CS2000 was recommended and a list of 16 possible modules was identified (Table2).

Table 2. The 16 possible modules identified by the scoping study, 11 of which are underway.

Module 1 - Survey of broad habitats and landscape features
Module 2 - Survey of freshwater habitats
Module 3 - Survey of agricultural key habitats
Module 4 - Survey of uplands in England and Wales
Module 5 - Survey of breeding birds
Module 6 - Survey and analysis of soils (now soil quality and pollution impacts)
Module 7 - Land Cover Map 2000
Module 8 - Airborne scanner applications
Module 9 - Integration of sample and census data
Module 10 - Links to the Environmental Change Network
Module 11 - Links to Northern Ireland Countryside Survey
Module 12 - Links to monitoring agri-environment schemes
Module 13 - Scientific support and information management
Module 14 - Drivers of countryside change
Module 15 - Ecological processes of change
Module 16 - Programme coordination and policy liaison

In parallel with the scoping study, the ITE established a CS2000 planning project to consider technical issues associated with a future field survey. A jointly funded (DETR/NERC) project was carried out to examine alternative procedures for analysis of remotely sensed data for the production of land cover maps. IFE carried out a jointly funded (EA/NERC) scoping study in preparation for a future survey of freshwaters.

The CS2000 scoping study did not define any of the modules in detail. Work programmes and specifications were developed either in the parallel discussions of the ITE planning group, the dedicated scoping study on freshwaters or in separate discussions between NERC and funders. The development of the different modules therefore proceeded at different rates.

Thus, in early 1998, the Department invited NERC to tender for a programme of work largely built around a field survey but also including exploratory work on the potential of *casi* and LIDAR remote sensing and modules to cover data management and integration of the various elements of the work programme. This tender included, therefore Modules 1, 8, 10,11,13 and 16. Funding for this package of work was agreed between DETR and NERC in April 1999.

Separate contract negotiations covered Module 7 and included a consortium of funders: DETR, EA, MAFF, SNH, SO, CCW, WO and NERC. Funding was agreed in June 1999.

Funding for Module 2 was agreed, with a consortium, involving DETR, EA, SNH and NERC, in August 1999.

MAFF agreed funding for Modules 3 and 4 in June 1999.

Module 6 eventually comprised two components, related respectively to assessment of soil quality and examination of the pollutant N impacts on heathland. The former was expanded considerably from the work considered in the scoping study, to include work on soil biota: funding was agreed with DETR (Land and Water Quality), EA and NERC. The pollutant-related work had not been considered during the scoping study and arose from separate discussions with the Air Quality Division of DETR; funding was provided by DETR (Air Quality) and NERC.

Thus, by the start of CS2000 in April 1999 specifications and work programmes had been agreed, or were the subject of ongoing discussions, for modules 1, 2, 3, 4, 6, 7, 8, 10, 11, 13 and 16. Specifications and work programmes have now been finalised and funding is in place for all these modules; contracts have been exchanged for the majority.

As can be seen from the above, funding for a number of the modules was only confirmed after the programme of work had been defined and started. Although funding for Module 16 is covered by contracts related to the package of work comprising modules 1, 8, 10, 11 and 13, it was expanded by agreement with NERC to cover co-ordination and integration of all the modules. Similarly, Module 13 is co-ordinating data management from all the active modules, including those not funded by DETR.

A1.3 Progress of the CS2000 programme.

Summaries of progress with each of the modules are provided in Annex 1. The following presents the situation in brief.

Modules 2, 3, 4, 6, 10, and 11 are on schedule.

The planned field programme for Module 1 was not completed in summer 1999 and plans are in hand to complete the outstanding squares in summer 1999. Entry and validation of data from the sample squares completed in 1998 is on schedule. It is anticipated that data entry and validation for the squares surveyed in 1999 will be completed in financial year 1999/00, allowing the original schedule for data analysis to be maintained.

Module 7 has suffered delays due to problems with identifying suitable satellite imagery, as a result of the bad weather in summer 1998. However, following a period of development and trials, automated methods of data processing are about to be implemented and these will allow the original delivery schedules to be maintained.

Module 8 is behind schedule as a result of technical problems with LIDA and *casi* data acquisition. The sample squares being used in this Module are to be reflown in spring 1999.

There were delays with development of the data model in Module 13 but this is now complete and data capture and validation is in progress. Some adjustments have been made to the timing of components of the work programme so as to ensure that data analysis and production of data products are completed to the agreed schedule.

A1.4 Management responses to the main delays/problems.

A monthly summary of progress in Module 1 was submitted to the programme co-ordinator and ITE management. When it was clear that the survey would not be completed during the 1998 field season, a number of options were considered within ITE and then put to the Department. The agreed response to the delays was to extend the planned survey season until October, to retain a number of the survey teams for additional weeks and to place a number of experienced ITE staff in the field. It was decided to concentrate effort in the additional survey period in England and Wales to ensure completion of the survey squares in these countries. Proposals were also developed for completion of the survey in summer 1999.

Delays in entering spatial data resulted from a longer than expected run-in period for short term staff and the inexperienced ITE staff drafted onto this activity. The response was to extend the contracts of the short term staff to ensure that the delays were minimised and did not produce knock-on delays in the analysis phase.

The delays in the Module 1 field survey had knock-on effects on the freshwater work under Module 2. Following a review of the position, it was decided to extend the field season to ensure completion of the freshwater recording and sampling in 1998; this was achieved by keeping teams in the field until November.

The impacts of the delays in obtaining suitable images in Module 7 has been minimised by putting additional effort into the development for the automated data processing routines.

The original work programme for Module 13 envisaged completing modification and capture of data from the previous surveys before entry and capture of CS2000 data. In the event, data activities connected with CS2000 data were initiated ahead of the original schedule. This has necessitated a rescheduling with capture of data from previous surveys and from CS2000 running in parallel. Some delays have arisen but their impact is being overcome by bringing forward development of the web interface and assigning this activity to an additional member of ITE staff.

With the above actions in place, we are confident that we can deliver the main results and reports to the agreed schedule.

A1.5 Co-ordination and integration

A1.5.1 Co-ordination of data collection/sampling. The field survey provided the main focus for co-ordination during the first 8 months of the CS2000 programme. To ensure overall linkage and co-ordination from the outset, Module leaders for Modules 1,3, 4, 7, 8, 10, 11, 13 and 16 attended the Module 1 field training course and a Module Leaders meeting was held during the course. Recording for Modules 3 and 4 was incorporated into the main field and carried out simultaneously with recording for Module 1, and by the same field surveyors. The Module1 field surveyors also carried out the sampling of soil and *Calluna* for Module 6. The timing of visits to sample squares to carry out freshwater surveys was co-ordinated with the visits by the Module 1 field surveyors.

A1.5.2 Co-ordination between Modules. We originally planned to hold periodic meetings of all Module leaders. As noted above, an initial meeting was held during the field training course but, subsequently meetings have been held between Module 16 staff and subsets of other Module leaders. In addition, Module 16 staff have attended as many as possible of the individual Module progress and discussion meetings. Co-ordination of Modules 1, 3, 4, 6, 10, 11, 13 and 16 has been facilitated by the fact that the Module leaders or key staff in the modules are all part of the Merlewood staff. Mr Stark's direct involvement in Module's 1, 3, 4 and 13 has provided a direct link to these modules; he has attended all meetings related to these modules. Prof. Hornung's has attended all station co-ordinators meetings linked to Module 1; been involved in the development of both parts of Module 6 and had roughly fortnightly meetings with the module leaders; has had monthly meetings with the leader of Module 11; has visited the ITE Wytham laboratory twice to review progress with Module 10. Links with the leaders of Modules 2, 7, and 8 have been mainly by telephone, email or letter in addition to brief meeting at the time of the Joint Management Team and Advisory Group meetings. However, Mr Barr has attended some of the Module 7 meetings and reported back to the co-ordinator.

All proposals to modify schedules, procedures or work programmes have been sent to the co-ordinator for comment. Similarly, all reports have been sent to the co-ordinator for comment before being submitted.

A1.5.3 Co-ordination and integration of data analysis and reporting. The emphasis of co-ordination and integration efforts has now moved to consideration of data integration and analysis, reporting and publication. The main move towards integration to date has been through the development of the data model under Module 13: the Countryside Survey Integrated Data System (CIDS). A key aim of Module 13 is the creation of a single database to integrate and link the data collected in each of the CS2000 Modules and earlier surveys. CIDS provides the data model designed to achieve that aim. The model describes the links and data flows between the various raw data sets that will be produced from what might be described as the core modules and the development and dissemination of data products. The core data sets are those derived from Modules 1, 2, 3, 4, and 7. However, data derived from other models is now being incorporated and Module leaders have been asked to ensure that they establish data sets in a form compatible with capture into the integrated database. Thus, data from the two parts of Module 6 has been already been entered into compatible software and linked into the main CS2000 database.

Module 13 and 16 staff have collaborated to identify the data outputs, as opposed to the raw data, from the various modules, as currently identified by Module leaders, and interdependencies between datasets, in terms of data requirements for analysis, identified. The various data and analytical outputs are now being incorporated into a matrix to identify key datasets, the availability of which control the analysis stage of each module, and to ensure synchronisation of activities between modules (Figure 1)

We are also using the information to assess the possible impact of alternative ways of structuring the Summary Report (See section B6 of this report). These exercises may have to be repeated following collation of comments of CS2000 Advisory Group members following presentations and discussions at the 3 March meeting.

FIGURE 1 - CS2000 Data Flow Dependencies

Meetings have also been held to consider analysis of vegetation and spatial data arising from Module 1. Small groups have been established to co-ordinate these analyses.

A1.5.4 Reporting standards. Further considerations concern the adoption of common reporting standards, which will, in turn, influence the analytical programme. A paper was presented to the Advisory Group on the 3rd March (Annex 2) that identified the major issues relating to analysis and presentation of data from Module 1 and on which decisions are needed in the next 6 months if the analytical programme is to keep to schedule. Some of the issues raised also affect Modules 2 and 7. This topic is returned to in Section B of this report and will be the considered by the Reporting Sub-group of the Advisory Group.

A2. Task 2 - Provision of independent advice and policy interpretation (Objectives 1, 2 and 3)

A2.1 The work of the independent adviser has included:

> Attendance at technical meetings for Modules 1, 7 and 13.
> Attendance at Joint Management Team and Advisory Group meetings
> Review of recent ECOFACT outputs, in terms of their relevance to reporting CS2000 data.
> Meetings with DETR and ITE Staff, to consider detailed technical and reporting issues.

A2.2 As part of this work he has presented a paper to Advisory Group on issues arising out the integration of the results from the field survey and LCM2000. Current work concerns strategies for developing a specification for the CS2000 Summary Report. A paper has been prepared so as to stimulate initial discussions of the recently established reporting sub-group.

A2.3 As part of his wider activities, he has advised English Nature on ways in which they can use CS2000 results to develop environmental accounts for habitats, species and landscapes.

A3. Task 3 – Provision of Secretariat for the Advisory Group and joint Management Committee (Objective 4)

A3.1 A secretariat has been provided for both the CS2000 Advisory Group and Joint Management Team, which, for the current reporting period, has comprised three meetings of the Joint Management Team and one meeting of the Advisory Group. All meetings and associated paperwork have been completed to the satisfaction of the Department. Membership of both groups has increased over the period to 18 and 40 for the Joint Management Team and Advisory Group respectively.

A4. Task 4 – Reporting and dissemination of information – CS2000 Newsletter, Web site (Objective 5)

A4.1 *Newsletter.* Two issues of the CS2000 Newsletter have been published (April and December 1998). The first issue of the newsletter was intended to stand alone as a

background to the survey. It featured: the objectives of the programme; component modules; both the policy and science context of the survey; and, the Web site (Module 16). The second issue featured: an explanation of the stratification; freshwater sampling (Module 2); and, the *Calluna* study (part of Module 6). A circulation database has been established by extraction from a number of contacts databases relating to biodiversity issues, ITEs own records and suggestions made by Advisory Group and Joint Management Team members. Just over 1000 copies of each issue have been circulated. Both issues of the newsletter are accessible via the Web Site, including graphics. Proposals for future issues of the newsletter have been presented to the Advisory Group and a feedback questionnaire circulated to all Advisory Group members.

The independent adviser was involved in discussions concerned with the design of the CS2000 Newsletter and has contributed material to the first issue.

A4.2 *Web page.* A web site for the CS2000 programme has been established. It is sited on the CEH web server, but in response to the Department's requirements an independent address has been purchased (www.cs2000.org.uk). The site includes a brief introduction to the survey and comprehensive accounts of each work module. Additional material, including access to newsletters and reports and progress bulletins have been incorporated. The site features visual and textual material. Use of the site has been monitored since its launch in July and is increasing.

A5. Task 5 – Promotion of the use of CS2000 data (Objective 7);

A5.1 The Independent Adviser has, following contacts with English Nature, suggested how work on the use of these data for the development of environmental accounts can be taken forward by a pilot study. In a report for EN, prepared jointly with ITE, recommendations were made on how the conservation status of broad habitats and the wider countryside could be assessed using CS2000 data. A programme of development work was set out for EN that would result in the development of a full set of habitat accounts following publication of the Summary Report in November 2000.

A5.2 The independent adviser has, as part of the follow-up to work for DETR on the CS2000 Scoping Study, considered the relationship of CS2000 and our understanding of the drivers of countryside change. A consultation paper has been prepared.

A5.3 It is proposed that following the completion of the CS2000 Scoping Study Report in March 1999, further information obtained on the drivers issue from the Advisory Group is collected by the independent adviser, in order to shape recommendation on the detailed content of Modules 14 & 15. Papers will be prepared for presentation to the Advisory Group and Joint Management Team.

A6. Task 6: Summary Report (Objective 8)

A6.1 A paper setting out the options for the Summary report has been prepared by the Independent Adviser for presentation at the first meeting of the Reporting Sub-Group (see section B6 of this report).

Task 7 – Review of policy implications of the results (Objective 10)

A7.1 This activity is not scheduled to start until later in the CS2000 research programme. It is considered further in Part B of this report.

PART B

FORWARD LOOK – THE PERIOD 1 APRIL 1999 TO 31 MARCH 2002.

B1. Task 1: Programme management, co-ordination and integration (Objective 3).

B1.1 Management structures.

We propose to maintain the same overall management structure as implemented during the first year of the programme. That is, an overall programme manager and co-ordinator reporting to the Director ITE and to DETR. Separate leaders for each Module with responsibility for the management of their individual Module(s). Technical co-ordinators for specific areas of activity/specialisms.

B1.2 Co-ordination and integration.

B1.2.1 *Data entry and analysis.* Between 1 April 1999 and 31 March 2000 it will be essential to ensure that data entry and analysis progresses to agreed schedules in each the individual Modules. However, we must also ensure that the flow of data and results between Modules takes place to a timetable that enables each Module to complete its respective analyses to agreed schedules. All timetables have to be set to ensure that the draft Summary Report can be delivered by May 2000 and the Summary Report published in November 2000. The topic of the interdependency of the Modules in terms of the availability of data and results has been touched on in the first part of the report (Paragraph A1.5.3). The spreadsheets showing the various streams of data and results from each Module parts, and the links to other Modules will be converted into GANNT charts and will have a crucial role in monitoring progress and identifying potential problems. We propose to update information on progress with data entry and analysis in individual Modules at 2 weekly intervals throughout 1999. The information will be displayed as a series of charts posted on the CS2000 Web site but on a page accessible only to Module Leaders and nominated people in DETR; the maintenance of this Web page will be a responsibility of Mr Stark.

B1.2.2 *Progress reports and milestones.* The contract documents covering each Module include details of reporting schedules and milestones through to the end of the Modules. In most cases the schedule and milestones agreed at the outset are probably still valid but in some cases they require amendment because of changes in priorities or because problems have arisen to date. It is suggested that the milestones and reporting schedules of all Modules funded by the Wildlife and Countryside Division of DETR should be assessed and new schedules defined where necessary by the end of May 1999. The programme co-ordinator will identify, by the 21st April, those Modules for which revision is necessary. The programme co-ordinator will also brief the WACD, and each meeting of the Advisory Group, on any changes to the schedules of Modules not funded by the WACD.

B1.2.3 *Preparation of the Summary Report.* Issues related to the contents and format of the Report are considered later (Section B6) but preparation of the Report to the agreed schedule is dependent on the co-ordination of the delivery of input information from the individual Modules. The tracking of progress with data entry and analysis set out above is a key part of this but those drafting the Report will also require some written material from Module leaders. The required material cannot be defined in

detail until the Advisory Group has agreed the reporting formats and the structure of the report. In the meantime, the generalised draft contents included in the tender document will be used as a basis for briefing Module Leaders about the likely type of material that will be required from them; a draft delivery schedule will also be developed for the text. Once the structure and reporting formats have been agreed, a workshop will be held (most probably in early October) with Module Leaders, other key module staff and the Department to define final text requirements and agree firm delivery schedules. A flow diagram will be prepared showing the delivery schedules and which can be used to track progress. We anticipate, however that a number of the components of the report, as defined in a draft contents, will not be affected by later discussions about reporting formats, for example the relationship between CS2000 and earlier surveys, the structure of the CS2000 work programme and survey methodologies. We propose that drafting of these sections be started ahead of the September meeting of the Advisory Group.

A schedule is also required for clearance of material by the Department and we propose that this be incorporated into the scheduling of delivery of the contributions from Module Leaders.

It is important that the structure and contents agreed for the report in September/October are not subsequently altered significantly; such alterations will have inevitable impacts on the delivery schedule for the report.

B2. Task 2 - Provision of independent advice and policy interpretation (Objectives 1, 2 and 3)

B2.1 It is proposed that the independent adviser explores the links and/or implications of the on-going initiatives, in order to develop links into and with CS2000. These include:

> Millennium Report on Biodiversity
> Indicators of Sustainability Report
> CAP 2000
> Access to the Countryside
> Publication of FC woodland survey information for UK

B2.2 It is proposed that as part of his on-going work on the design of the Summary Report he should, in collaboration with staff at ITE, bring forward more detailed proposals on:

> the reporting of change
> the reporting of confidence limits to estimates of stock and change
> geographical reporting frameworks

With agreement from the Reporting Sub-Group, the next step should be to develop a 'mock up' of the summary report for further discussion during 1999.

B3. Task 3 – Provision of Secretariat for the Advisory Group and joint Management Committee (Objective 4)

A secretariat will continue to be provided for both groups. In addition, ITE will provide a secretariat for the 'Reporting Sub-Group' established by the Advisory Group following their 3/3/99 meeting.

B4. Task 4 – Reporting and dissemination of information – CS2000 Newsletter, Web site (Objective 5)

B4.1 *Newsletter.* A further three newsletters will be produced before the first publication of the main CS2000 results in a summary report in November 2000 (approximate dates for these newsletters are May 1999, Nov 1999 and May 2000). These interim newsletters are an opportunity to disseminate information on methodologies and approach in anticipation of publication of the results. A strategy has been drawn up to ensure that these newsletters build up a comprehensive account of the programme and these proposals will be taken forward, modified in the light of suggestions made by the Advisory Group. The circulation list for the newsletter will be reviewed by including a response slip with the next issue.

B4.2 *Web page.* The web site was originally established to provide information about the survey. Its effectiveness in this will be reviewed in the light of suggestions made by the Advisory Group and analysis of site usage monitoring. A future strategy for the web site will be prepared in the light of this review and in anticipation of the sites likely role in disseminating the results of the survey. This strategy will aim to provide a more integrated introduction to the aims and components of the CS2000 programme, targeted at a general audience. Further, it is proposed to establish a password controlled section to the site, accessible to sponsors of the programme and featuring regularly updated progress charts and minutes to meetings.

B5. Task 5 – Promotion of the use of CS2000 data (Objective 7)

B5.1 Recent discussions, both in the Advisory Group and in respect to Module 13, have emphasized the need for information about the outputs from CS2000 to be made as widely available as possible. In the run-up to publication of CS2000 results organizations will be planning their forward research programmes and so it would be useful for them to have as much information as possible so that CS data can be used as rapidly as possible.

B5.2 In order to promote the use of CS2000 data it is proposed to develop a set of 'user friendly' briefing materials for dissemination via the web, newsletter and workshops and briefing sessions during 2000 & early 2001. ITE and the independent adviser will in collaboration with DETR identify a series of venues at which information about CS2000 can be brought to the attention of potential users (e.g.LURCC). The development of briefing papers should be coordinated with the materials being considered under Module 13, which will set out the nature of the CIDS database.

B5.3 Promotion of CS2000 should be seen as part of the wider reporting strategy for the Survey. The Reporting Sub-Group and the Advisory Group should be asked to help identify how information can best be disseminated throughout their organizations. This strategy will target most of the 'key players', who will have an interest in CS2000 results at a detailed level. The 'interested fringe' and 'wider community' will be targeted via the newsletter and web site, although the use of TV, radio and other newspapers should not be overlooked. The role of the Summary Report in the promotion of CS2000 is discussed elsewhere in this document.

B5.4 It is also clear that, as with CS1990, there is some scope for developing educational materials around the survey. An initial step would be to flag CS2000 in relation to the national curriculum. The development of teaching materials would require resources, however, and the DETR, NERC the other sponsors of CS2000 would need to consider how such an initiative might be supported. Given the long lead-time that will be required to put something in place, planning would need to begin during 1999 if materials were to be available for the academic year starting in 2001.

B6. Task 6 – Communication of results –Co-ordination, editing and production of the Summary Report (Objective 2.1.8) and production of scientific papers

B6.1 Structure of Summary Report: Issues and Options

B6.1.1 Background Issues

1. In an early review of reporting issues arising out of CS1990, Stark (1997) suggested the audience for Countryside Survey data consisted of three elements:

    - **The key players**, namely Government Department, the countryside agencies and research organisations concerned with policy and science issues at broad strategic scales. This group is represented by the sorts of organisation that are members of the CS2000 Advisory Group.

    - **The interested fringe**, including local government organisations, NGOs, academic researchers, environmental consultants and the media. This group also includes Government departments and agencies not directly concerned with countryside policy but to whom CS2000 data are relevant for the development of, say, indicators and other statistical summaries.

    - **The wider community**, including educational users, local naturalists trusts and the wider public.

2. The report went on to emphasise that the way in which Countryside Survey should be different for each group, and that a range of publications and data products was required.

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3. Conclusions about the diverse nature of the audience for CS2000 have been carried over into its specification, which has included requirements for a range of published output. These include not only 'end of contract' reports but also scientific journal articles together with more easily accessible materials for the general reader.

4. The fact that CS2000 will be reported in a number of ways has a number of implications for the design of the CS2000 Summary Report that will start the process of dissemination in November 2000. It could be argued, for example, that:

   (a) Because the Summary Report is part of a broader dissemination strategy, **its main purpose should be to provide a 'way in' to CS2000**, rather than to give an exhaustive account of the results.

   (b) Since the more detailed and specialised aspects of CS2000 will be covered elsewhere, the Summary Report can be **selective** in the issues considered, providing the report gives pointers to these other sources of information.

   (c) Given its general character, the Summary Report can legitimately **focus on results rather than survey methods.**

   (d) The presentation of **results should be accompanied by a provisional interpretation of the findings** of CS2000, so that the general reader can understand the relevance and broad implications of the data.

   (e) Since much of the other initial output will be built around the separate modules that make up the CS2000 work programme the Summary Report should emphasise the links between modules and **present the Survey as an integrated programme.**

5. Points (a) to (e) are suggested as some the key criteria for determining the content of the summary report.

B6.1.2 Options for Summary Report

6. In thinking about the structure of the Summary Report two alternative approaches could be envisaged, namely:

   (a) **A report that reflects the modular structure of CS2000**, in which the various parts of the document present the key outputs from each of the major work packages. Clearly some modules (such as modules 1 & 4) are so close related that they would have to be considered together, but, where possible, this option would attempt to separate the various elements. Table 3 illustrates one way of grouping the material.

(b)   **A report that adopts a thematic structure,** in which the information
from different modules was assembled around a set of key concepts or
issues that have are selected to give the reader an insight into the main
outputs from CS2000. A range of themes could be envisaged, with the
report structured around, say:

> ➤ Major geographical regions (country), or
> ➤ Broad ecological zones (montane, marginal uplands, arable
> lowlands, urban fringe, etc.), or
> ➤ Habitat types, or
> ➤ Policy relevant themes.

Table 4 illustrates one approach based upon groups of Broad Habitats.

7.   In comparing the example structure shown in Table 3 and 4, the format of the
modular approach is more easily imagined, given recent work by the Technical
Planning Groups to define the major reporting elements (see for example,
Paper CSAG4/2 which provides a useful summary for Module 1). In the case
of the thematic approach further elaboration of the type of structure envisaged
is worthwhile.

8.   If the approach based on Broad Habitats is adopted, for example, then each
section could be structured around a particular group of habitats. To a large
extent they each section would have a common format, including such
material as:

(a)   Brief introduction to the character of the broad habitat and associated
environmental issues affecting their conservation status.

(b)   Changes that were detected by previous countryside surveys.

(c)   Presentation of stock and change information by country and
ecological zone, including the presentation of maps showing the extent
of the broad/widespread habitat derived from LCM2000.

(d)   Presentation of indicators of biodiversity for the broad habitat group.

(e)   Review of changes significance in quantitative and qualitative changes
observed, with discussion of *possible* causes and implications for
further work.

(f)   Pointers to what further analysis is a proposed and other relevant
output from CS2000 work programme.

9.   Clearly for some habitats, such as the freshwater, the content would be varied
to accommodate the different types of information coming out of Module 2.
However, in this case an attempt should be made to look at changes in river
corridors as a whole by both drawing on the information collected as part of
Module 2 and the other modules.

10. One disadvantage of the thematic structure built around Broad Habitats is that Module 6, on soils, is difficult to accommodate. This material could be covered in a separate chapter, however, without loss of coherence in the overall structure.

11. A further disadvantage of the thematic structure outline above is that information is split across the different elements. The report can however, provide access to consolidated Tables in an appendix or via CD-ROM.

12. Table 5 sets out some of the advantages and disadvantages of each approach. On balance it would appear that while the modular structure has a number of practical advantages in terms of devolving the workload, it would be more difficult to ensure uniformity of treatment. Moreover, it would be more difficult to present CS2000 outputs in an integrated way by adopting this reporting format. By contrast, while the thematic structure would be more difficult to co-ordinate, it would be easier to present a selective overview of the material using this approach compared to the modular one. It is also likely that the material could be presented in a more accessible and policy relevant way, compared to the modular approach.

13. **It is proposed that a primary task of the CS2000 Reporting subgroup is to consider these options and agree whether the modular or thematic approach should be adopted. Such a decision is fundamental because it will determine the way in which the outputs from the different module are managed in the run-up to the Summary Report.**

14. **On the basis of our initial evaluation a thematic structure based on Broad Habitats is recommended. The concept of general habitat units would be more understandable to users than the modular structure adopted for CS2000. It would also enable a clearer set of policy implications to be developed.**

15. The theme of Broad Habitats also has a number of advantages over the other thematic issues suggested earlier. A country-base reporting structure would for example, probably be repetitive, and in any case results for Wales cannot easily be presented separately from those of England. Similarly, although a set of policy themes could be envisaged, it is unlikely that consensus the selection of issues could easily be achieved. Moreover, it would be forcing CS2000 into a framework that does not map easily onto the structure of the work programme. **The Broad Habitat approach has the advantage that it is policy relevant and reflects the design of the survey.**

B6.1.3 The Issue of Interpretation

16. As recent discussion at the CS2000 Advisory Group has shown there are a variety of opinions on the extent to which presentation of the summary results should be accompanied by interpretation of the material. Given the reaction to the 1990 Main Report, it is clear that some kind commentary is needed so that the relevance of the survey data can be understood. However, in view of the

range of information that will be available from CS2000, it is difficult to be prescriptive about the level of detail that should be attempted.

17. In exploring the issue of how much interpretation should be provided two factors stand out that might help us find an acceptable approach to the problem.

    (a) Compared to the situation in 1990, the interpretation of CS2000 data will be assisted by the information gained by the ECOFACT Project. If the investment made in this programme of research is to be realised, then it would seem unwise not to use the experience wherever possible to provide develop an insight into the implications of CS2000.

    (b) Given that the Summary Report is a 'first view' of the data, interpretations need not be definitive. Indeed it would seem sensible to flag that alternative interpretations may be possible and what further analysis may be needed to develop a full interpretation of the results. For the general reader an understanding of the scientific issues that are posed by the results is likely to be as helpful as an interpretation.

18. **On the basis of (a) and (b) we therefore propose that an interpretation of the results is made,** drawing wherever possible on the results of ECOFACT. However, where necessary, interpretation of CS2000 data might be accompanied by other supporting information that would help substantiate/confirm the trends observed. The provisional nature of the interpretation should however, be stressed in the report, whose aim should be to stimulate debate and further, targeted research.

B6.1.4 Style and Format

19. Experience gained from publication of the results of Countryside Survey 1990 suggests that the Main Report was too detailed and complex in its structure for the general reader. On the other hand, the Summary Report, while more accessible, lacked sufficient detail to be of use except by the 'wider community' (see para 1.). Neither the Summary Report nor the Main Report could be could be used as a reference document for the Survey.

20. Given that a single Summary Report for CS2000 is envisaged, its format must lie somewhere between the style of the publication that accompanied CS1990. As a result, we propose that it is modelled on the approach used by, say, the *UK Biodiversity Action Plan* (HMSO 1994). The format of the Summary report must accommodate colour reproduction, inclusion of 'information boxes' to provide supporting materials, and adopt a simple writing, similar to that found in widely used publications such as *Encarta.*

21. The design and construction of the Summary Report should be seen as one element in the wider dissemination strategy for CS2000. If it is to provide a way in to the data then it should be accompanied by:

(a)   Publication of the summary tables for the UK, Countries and ecological zones.

(b)   Publication of the relevant CIS sample and census tables

The Summary report should make explicit reference to these accompanying materials, which should be available, either on a CD-ROM that accompanies the publication, or downloadable files, via the CS2000 Web Site. Close liaison is therefore required with the timing of outputs from Module 13.

Table 3: A Modular Structure

Introduction & Context

Field Survey

Quantitative Change in the Wider Countryside: Results for broad habitats and landscape features. Data presented for England and Wales, Scotland, Northern Ireland and UK. Also results broken down by ecological zone.

Qualitative Change in the wider Countryside: Results of vegetation survey and analysis of indicators of biodiversity.

Results for freshwater habitats

Results for BAP agricultural key habitats

Links to Environmental Change Network and robustness of change estimates

Quality Control

Survey and Analysis of Soils

Remote Sensing

Land Cover Map 2000

Comparison of sample and census estimates

[Airborne scanner applications]

Access to data and scientific support

Appendix/CD-ROM giving full summary tables and CIS files

Table 4: A Possible Thematic Structure

Introduction and Context

Woodlands
>   *Broad-leaved, mixed and yew woodland*
>   *Coniferous woodland*

Hedgerows, verges and other boundary habitats

Tilled Land and Managed Grass
>   *Arable and horticulture*
>   *Improved grass*
>   *Neutral grass*
>   *[Calcareous grass]*
>   *Acid grass*

>   *This section will include reference to materials on cereal field margins*

Semi-Natural Habitats
>   *Bracken*
>   *Dwarf shrub heath*
>   *Fen, marsh and swamp*
>   *Bogs*
>   *Montane*
>   *Inland rock*

Freshwater habitats
>   *Standing open water and canals*
>   *Rivers and streams*
>   *Ponds*

Coastal habitats
>   *Supra-littoral rock*
>   *Supra-littoral sediment*

Settlement and Transport
>   *Built-up areas and gardens*

The Soil Resource

Access to data and scientific support

Appendix/CD-ROM giving full summary tables and CIS files

Table 5. Advantages and Disadvantages of Modular and Thematic Structure for the CS2000 Summary Report

	Modular structure	Thematic structure
Advantages	➤ By mapping the reporting structure on to the work programme, the preparation of summary report could be devolved, once the grouping of the modules had been agreed. ➤ The rate of progress with each report element would not affect the others. ➤ The content of the different parts of the report would be more easily tailored to suite the different sponsors, in terms of the level of interpretation and key policy messages.	➤ It would have an integrated structure so that the policy messages that can be derived from the results can be presented in a clearer, more balanced way. ➤ The structure of the report might better match what potential users of CS2000 want of the data, rather than the design of the work programme. The summary report would be more accessible to the general reader. ➤ It would be easier to ensure constancy of style and approach across the different elements of the report. ➤ An integrated view of CS2000 could be presented.
Disadvantages	➤ It would be difficult to ensure an even treatment and style across the different elements of the report. ➤ The integrated nature of CS2000 would not be emphasised. ➤ It would be more difficult to balance the treatment given to the different policy messages that might be drawn out of the work. A coherent view of the 'state of the wider countryside' would be more difficult for the general reader to obtain.	➤ Problems of agreeing what the key themes are. ➤ Problems of achieving consensus between the sponsors about content of the sections.

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B7. Task 7 – Review of policy implications of the results (Objective 10)

We note that an Away-Day should be organised to review the policy implications from CS2000 and provide an opportunity for a critical assessment of results by external evaluators and discussion of the policy implications. The results of the review and evaluation will be presented in a report. We propose that the Independent Adviser be responsible for the planning and structuring of the Away-Day and for preparation of the subsequent report. ITE staff will be responsible for the domestic and administrative arrangements in connection with the Away-Day with Mr Gavin Stark acting as contact person for the Independent Advisor.

ANNEX 1

PROGRESS BY MODULES TO THE END FEB 1999

Module title: Module 1 - Field Survey of Broad Habitats and Landscape Features		
Funded by: DETR and ITE (NERC)		
Module leader (s): C. J. Barr		
Start date: Jan 1998	End date: Jun 2001	Period covered by progress report: up to Feb 1999

OBJECTIVES
- To estimate the extent and distribution of widespread habitats in Great Britain
- To characterise widespread habitats in terms of their land cover and botanical composition and to assess changes in these characteristics over time
- To derive indicators of sustainable development for the wider countryside including measures relating to biodiversity, land cover/use and landscape features
- To provide accessible databases containing information about the state of the British countryside for use in a wide range of policy and scientific applications including the detection and forcasting of long term environmental change
- To provide ground reference data for calibration and validation of a satellite-based census of land cover 'Land Cover Map 2000'

SUMMARY OF PROGRESS
- A total of 519 squares (91% of those originally planned) was surveyed in 1998. The main factors contributing to the shortfall in completing squares were the poor weather in summer 1998, time taken obtaining permissions and refusals of permission to survey.
- The number of vegetation plots that were surveyed in any one square depended on the balance of features and habitats that were present in the square. In total 15,714 plots were recorded, making an average of 30 plots per square.
- To date spatial data for 376 squares have been processed. A recent assessment suggests spatial data entry will be completed by early May 1999.
- Data entry for the vegetation data started in August and is on schedule to be completed by April 1999.

REPORTS
Barr, C.J. Feb 1998. First Progress Report to DETR.
Barr, C.J. May 1998. Countryside Survey 2000 Field Handbook 3rd Draft.
Barr, C.J. June 1998. Second Progress Report to DETR.
Barr, C.J. Sept 1998. The sampling strategy for Countryside Survey 2000.
Barr, C.J. Dec 1998. Third Progress Report to DETR.

PROGRESS IN RELATION TO MILESTONES

Date of Milestone	Description of Milestone	Progress
Feb 1998	Finalise module details and documentation; purchase field and analytical equipment	Module details were submitted to DETR in March 1998
Mar 1998	Interim report 1 – final sampling strategy, draft field survey protocols, recording codes and typologies	A report on the sampling strategy for CS2000 was submitted to DETR in Sept 1998.
Dec 1998	Interim report 2 – Outcome of field survey and hedgerow data (if required)	A third progress report was submitted to DETR in Dec 1998
Apr 1999	Interim report 3 – Analytical procedures and reporting frameworks for landscape pattern, land cover accounts, ecological zones and botanical analysis	A specification for the analysis has been drafted and discussed with DETR/JNCC. Development of analysis protocols is underway.
Mar 2000	Interim report 4 - Preliminary results	-
Nov 2000	Draft final report	-
Feb 2001	Final report	-
Mar 2001	Report ready for publication; presentation of report at technical seminar (by end Feb 2001)	-
Jun 2001	Final report published	-

Module title: Module 2 - Survey of Freshwater Habitats		
Funded by: EA, DETR, SNH and IFE (NERC)		
Module leader (s): M. T. Furse		
Start date: Jan 1998	**End date:** June 2001	**Period covered by progress report:** up to Feb 1999

OBJECTIVES
- To provide information on the status and distribution of the macro-invertebrate fauna of streams and rivers in Great Britain.
- To determine and evaluate change by comparison with 1990 survey data relating to the same sites.
- To determine habitat structure and degree of modification of river corridors.
- To undertake a limited diagnostic survey of the chemical character of the water courses to help interpret the results of macro-invertebrate and river habitat surveys.
- To investigate the relationship between the habitat quality and modification of river corridors, the ecological quality of the water course and the condition of the surrounding countryside.
- To derive indicators relating to status and change in watercourse and river habitat quality.

SUMMARY OF PROGRESS
- Reports have been submitted to DETR, EA and SNH to the agreed schedules.
- 432 of the CS2000 sample squares were identified as containing or likely to contain perennial or
- intermittently flowing water course; 426 of these squares were visited, permission for access being refused at the other 6 (3 in Scotland and 3 in England and Wales). One stream had been completely land-filled since 1990
- River Habitat Surveys (RHS) were carried out in each of the 425 remaining squares with stream channels. RHS audits have been undertaken in 25 squares (ca. 6%)
- Macro-invertebrate and water samples were collected from the each of the 405 squares that contained flowing waters at the time of surveying. Replicate macro-invertebrate samples were collected from 43 squares (ca. 11%) and chemical samples from 38 (ca. 9%)
- 19% of the macro-invertebrate invertebrate samples have sorted and 10% have been identified
- All of the water samples have been analysed for pH, total alkalinity and conductivity

REPORTS
Furse, MT and Dawson, FH July 98. R&D Progress Report E1/038/2 for the period 1st April 1998 to 30th June 1998.
Furse, MT and Dawson, FH Oct 98. R&D Progress Report E1/038/3 for the period 1st July 1998 to 30th September 1998.
Furse MT, Dawson FH, Henville P, Irons GP, Gunn RJM and Winder, JM. Nov 1998. Countryside Survey 2000 Field Handbook Module 2: Survey of Freshwater Habitats.
Furse, MT and Dawson, FH Feb 99. R&D Progress Report E1/038/4 for the period 1st October 1998 to 31st January 1999.

PROGRESS IN RELATION TO MILESTONES

Date of Milestone	Description of Milestone	Progress
Sep 1998	Completion of field survey	This is now complete. Additional inputs from EA and IFE have funded a lengthening of the sampling period and collection of additional samples.
Dec 1998	Interim report on field survey	A progress report submitted to the EA has been accepted by the DETR and SNH as an appropriate form of interim report
Jan 1999	IFE/DETR/EA/SNH review meeting to discuss the field survey	Held as an EA Project Board Meeting (Feb 1999).
Dec 1999	Completion of species identification, Interim report on species identification,	-
Apr 2000	Preparation of preliminary results	-
Nov 2000	Production of draft final report	-
June 2001		

Module title: Module 3 - Assessing Hedgerow Characteristics and Species Diversity in Arable Margins in Countryside Survey 2000
Funded by: MAFF
Module leader (s): C. J. Barr

Start date: Apr 1998	End date: Apr 2001	Period covered by progress report: up to Feb 1999

OBJECTIVES

- To determine the current extent and distribution of species-rich arable plant communities and the factors that contribute to their presence in England and Wales and in major regions of each country.
- To analyse the data to give information about the current extent and distribution of species-rich arable communities, and about the factors that contribute to their presence.
- To analyse the data to give information about the current extent and distribution of species rich and other hedgerows in England and Wales and in major regions of each country.
- To determine the extent and distribution of species rich and other hedgerows in England and Wales, and in major regions of each country.
- To analyse hedgerow tree data from 1990 and 1998

SUMMARY OF PROGRESS

- The additional recording of hedgerows and field margins was carried out in all surveyed squares in England and Wales. 569 arable margin plots and 2383 additional hedgerow plots were recorded. Data entry has been started; the data will be integrated into the main CS databases and data structures.

PROGRESS IN RELATION TO MILESTONES

Date of Milestone	Description of Milestone	Progress
mid May 1998	To agree a finalised methodology with the Ministry	This has been agreed.
Oct 1998	Complete field survey	A total of 2965 plots were recorded and documented.
May 1999	Enter and validate data	Data checking and entry has started.
Oct 1999	Analyse dataset	-
Jun 2001	To report the results to the Ministry	-

Module title: Module 4 - Increasing Upland Representation in Countryside Survey 2000		
Funded by: DETR, MAFF, WO and CCW		
Module leader (s): C. J. Barr		
Start date: Apr 1998	End date: Apr 2001	Period covered by progress report: up to Feb 1999

OBJECTIVES
- To ensure that CS2000 provides reliable information about upland broad habitats and landscape features in England and Wales and to produce separate estimates of the stock of these features for England and Wales
- To provide information about the ecological characteristics of the uplands as a whole in order to provide a context for site, habitat or scheme specific monitoring exercises
- To provide information suitable to application to land use and environmental change modelling and forecasting studies, including the UK Climate Impacts Programme
- To establish a baseline for future detection of long term change in the character of the uplands of England and Wales

SUMMARY OF PROGRESS
- The 30 additional upland squares (25 funded by MAFF; 5 by WO/CCW) were all surveyed during 1998 and data entry has started. The data will be integrated into the main CS datasets and structures.

PROGRESS IN RELATION TO MILESTONES (MAFF)

Date of Milestone	Description of Milestone	Progress
mid May 1998	To agree a finalised methodology with the Ministry	This has been agreed.
Oct 1998	Complete field survey	25 additional upland squares were surveyed in England and Wales.
May 1999	Enter and validate data	Data checking and entry has started.
Oct 1999	Analyse dataset	-
Jun 2001	To report the results to the Ministry	-

NB Milestones for WO/CCW have yet to be agreed.

Module title: Module 6 - Soil Quality and Pollution Impacts		
Funded by: DETR (Water and Land Directorate amd Air Quality Directorate), EA and NERC		
Module leader (s): H. Black and V. H. Kennedy		
Start date: Apr 1998	End date: Mar 2001	Period covered by progress report: to end Feb 1999

OBJECTIVES

- To carry out a programme of soil sampling by the CS2000 field surveyors at the locations sampled in the 1978 Countryside Survey.
- To identify and quantify soil meso-fauna by the extraction of returned samples using conventional extraction techniques and to assess soil microbial diversity using the BIOLOG approach.
- To analyse the CS 2000 soil samples for pH and loss on ignition to allow an evaluation of change in these properties over the 20 year period between the 1978 and 1998 surveys.
- To analyse the CS 2000 soil samples for heavy metals and for a suite of organic compounds to establish a large and robust national baseline against which future sampling and analytical programmes could be compared.

Foliar nitrogen of Calluna
- To establish whether there are regional patterns of nitrogen concentrations in heather leaves
- To compare such regional patterns of nitrogen concentrations in heather leaves with regional patterns of UK atmospheric nitrogen deposition
- To assess whether nitrogen concentrations in heather leaves can be used to identify areas of the UK where excess nitrogen deposition is likely to trigger a decline in the heather communities.

SUMMARY OF PROGRESS

Soil quality
- 997 soil samples were collected (644 from England and Wales and 353 from Scotland) for soil fauna and microbiological analysis, and 994 samples (641 from England and Wales and 353 from Scotland) for pH carbon and heavy metal analysis. Soil fauna have been extracted from all the 997 samples and stored and alcohol. The samples for microbiological organic analysis have all been frozen at –86°C. The soils for chemical analyses have all had pH measured on a sub-sample, the remaining sample dried and ground; pH and loss on ignition has been measured on the ground sample and heavy metal analysis initiated. Locational, data, pH and loss on ignition for all samples have been entered into an ACCESS database linked to the main CS2000 database. The information is also available by Land Class and country.

Foliar nitrogen of Calluna
- The work is slightly ahead of schedule. A brief progress report was submitted in November to the co-ordinator of the DETR-NERC Umbrella project on the Impacts of Atmospheric Pollution.
- Field surveyors submitted 178 Calluna samples to Merlewood from sample squares distributed from Cornwall to the North of Scotland. On arrival at the laboratory samples were checked, current years growth separated, air dried and milled to pass through a 0.7 mm sieve. The initial plan was for sub-samples of the ground Calluna to be analysed for total N and P but it has been possible to extend the analytical programme to include total C, K, Ca and Mg. To date all samples have been analysed for N and P; the measured values range from 0.08 to 2.3% N and from 0.043 to 0.20% P. Analyses for the additional elements have all been started

REPORTS

Black H. July 1998. MASQ Monitoring and assessing soil quality. DETR Funded Projecr. CS2000 Module 6: Soils and Pollution. First Quarterly Report. Pp 12.

Black H. Nov. 1998. MASQ Monitoring and assessing soil quality. DETR Funded Project. CS2000 Module 6: Soils and Pollution. Second Quarterly Report. Pp 12

H Black and V H Kennedy. Jan. 1999. COUNTRYSIDE SURVEY 2000. Module 6. Soil Quality and Pollution Impacts. In; ITE Contract Report to the Department of the Environment, Transport and the Regions. COUNTRYSIDE SURVEY 2000. Second Integrated Progress Report. Complied by M. Hornung

Black H. Feb. 1999. MASQ : Monitoring and Assessing Soil Quality. ITE Contract Report To the Environment Agency COUNTRYSIDE SURVEY 2000 Module 6. Progress report to February 1999.

Kennedy VH. Nov 1998 Progress report 1

PROGRESS IN RELATION TO MILESTONES - SOILS

Date of Milestone	Description of Milestone	Progress
May 98	Finalise sampling strategy, develop sampling and analytical procedures	
Jun 98	Progress report to Land and Water Quality Directorate	Submitted June 1998
Oct 98	Complete field sampling; progress report to Land and Water Quality Directorate	Submitted Oct 1998
Jan 99	Progress report to Land and Water Quality Directorate	Submitted Jan 1999
Mar 99	Complete pH and loss on ignition; all samples processed; report to Land and Water Quality Directorate on Phase I & II	All samples have been processed for pH and loss on ignition.
Mar 99	Fieldwork summary tables and chemical properties scoping study to the Environment Agency	Fieldwork tables have been completed and scoping study initiated
Every 3 months from Feb 99	Progress reports to the EA	Report 1 - Submitted Feb 1999
May 2000	Soil acidity database	pH measurements completed on all 1998 soil samples
May 2000	Soil organic matter and carbon database	LOI measurements completed on all 1998 soil samples
Jan 2001	Soil biota database	All biota samples from 1998 field season extracted/stored for analyses
Jan 2001	Organics database	All organics samples from 1998 field season stored for analyses
Jan 2001	Heavy metal database	All soil samples from 1998 field season prepared and stored for analyses
Jan 2001	Draft Technical Report	-
Jan 2001	Draft Project Report	-
Mar 2001	Final Technical Report	-

PROGRESS IN RELATION TO MILESTONES - CALLUNA

Date of Milestone	Description of Milestone	Progress
Mar 1998	Finalise sampling strategy, develop sampling and analytical procedures	
Oct 1998	Complete field sampling; progress report to Air Quality Directorate	Report submitted in Nov 1998
Mar 1999	Report to Air Quality Division; complete chemical analysis	Work is ahead of schedule; analysis is completed for N and C and additional analyses are being carried out for P, K and Ca.
Sep 1999	Final Report to Air Quality Division; complete data interpretation	-

Module title: Module 7 – Land Cover Map 2000		
Funded by: DETR, MAFF, WO, CCW, EA, SNH, SO and ITE (NERC)		
Module leader (s): R. M. Fuller		
Start date: Apr 1998	End date: Mar 2001	Period covered by progress report: to end Feb 1999

OBJECTIVES
- To undertake a census of the land cover/widespread habitats of Great Britain at the turn of the Millenium
- To apply the best appropriate satellite imagery and automated image processing techniques in order to achieve a classification accuracy of 90% for target classes
- To produce and make available, under licence, a range of geographically referenced data outputs on land cover characteristics, tailored to Consortium needs
- To calibrate and validate satellite-derived classifications against ground reference data, published results of the correspondence analyses and provide a guide to their interpretation

SUMMARY OF PROGRESS
- ITE has purchased winter Landsat Thematic Mapper (TM) imagery and matching summer TM and Indian Research Satellite (IRS) III-C imagery of England and Wales. Work in Scotland has been delayed until next year, when the availability of imagery of winter-summer 1998-99 will be known. A DEM for all Britain has been purchased for pre-processing, knowledge-based corrections, and post-processing refinements.
- The Target cover classes defined for classification in LCM2000 have been matched to the widespread Broad Habitats. These classes have been refined in discussions with users. Further Subclasses and Variants will be included to allow relation to NLUSS and other classifications. The LCM2000 team, in 1998, recorded 6 reconnaissance surveys mostly in lowland and marginal land, to cover the image acquisitions. Additional field-based workshops with upland survey teams of the conservation agencies will ensure the best match with upland Broad Habitats, prior to the 1999 field reconnaissance surveys.
- Pre-processing elements of LCM2000 and CLEVER-Mapping have been made operational. Atmospheric corrections have been implemented for removal of haze on the TM images; the software has been modified to deal adequately with the reduced bandset of IRS. Procedures to correct the differential illuminations of north- and south-facing slopes have been written by the Cambridge University Geography Department (CUGD) under a subcontract of LCM2000: the newly acquired DEM provides the necessary data for appropriate illumination-compensation. Issues of geo-correction and resampling have been addressed prior to operational application.
- The image-segmentation software, developed by CUGD in CLEVER-Mapping, has been made operational over full satellite scenes by Laser-Scan Limited (LSL). The per-segment classification procedures have been made operational by ITE with all the refinements prototyped in the CLEVER-Mapping project: this includes the ability to build polygons from the raster-based segments, to train per-polygon, to analyse training data before use, to selectively draw training pixels from the images, based upon core-pixels of the polygon, to classify per-polygon, and to record all potential classes and their probabilities. LSL IGIS software has been made freely available to LCM2000, with only the costs of software support to be paid. All the necessary procedures for LCM2000 are now in place.
- Most elements of the processing stream have been built into semi-automated tools to use in later operational mapping. This has delayed the production of sample final outputs while the time has been invested in such automation. This investment will pay dividends in the production phase, when processing times per-scene are likely to be substantially reduced and more time can be spent on knowledge-based procedures, validation and the development of CS2000 integration.

REPORTS
Fuller RM, Gerard FF, Hill RA, Smith GM and Thomson AG, July 1998. First Progress Report.
Fuller RM, Smith GM, Hill RA, Thomson AG and Gerard FF, Oct 1998. First Interim Report incorporating the Second Quarterly Progress Report.

PROGRESS IN RELATION TO MILESTONES

Date of Milestone	Description of Milestone	Progress
Sep 1998	Interim report 1 – Image acquisitions assessed, ground reconnaissance completed for 4 scene pairs	Report submitted in Oct 1998.
Mar 1999	Interim report 2 – Mapping completed for 6 scene pairs, Winter 1998-99 image search completed.	Report in preparation. Mapping underway for 6 scene-pairs. Winter image search completed to January acquisitions
Sep 1999	Interim report 3 – Routine production completed for 12 scene pairs, image acquisitions for year 2 assessed, ground reconnaissance completed for 10 scene pairs	-
Feb 2000	Preliminary results for use in Summary Report	-
Mar 2000	Interim Report 4 – Production completed for 18 scene pairs	-
Sep 2000	Final report complete detail on production. Final scene pairs analysed, results of validation	-
Nov 2000	Final report completed. Analyses completed, overall validation/calibration stats generated. Launch prepared and delivered	-

PROGRESS BY MODULES TO END FEB 1999

Module title: Module 8 - Airborne Scanner Applications		
Funded by: DETR and ITE (NERC); data contributed by EA		
Module leader (s): R. M. Fuller		
Start date: Apr 98	End date: Dec 99	Period covered by progress report: to end Feb 1999

OBJECTIVES
- Evaluate the use of airborne scanning (casi, LIDAR) to measure the extent and identify the spatial patterns of land cover, linear landscape features and widespread habitats in example survey squares;
- Derive accurate height information, using LIDAR, which would allow definition of slope, run-off patterns, identification and measurement of individual trees, hedgerows and ditches and help in the textural identification of areas of semi-natural vegetation.
- Assess the extent to which casi and LIDAR information can be used to supplement the CS2000 field survey for the landscapes surrounding the example squares so that patterns observed within the squares can be placed in their wider landscape context;
- Compare the casi and LIDAR imagery with the satellite data and resulting products, to assess the value that the higher resolution can contribute to synoptic surveys of the countryside.
- Assess the feasibility and accuracy of detecting landscape change using casi and LIDAR information and assess how the airborne sensors may be used in conjunction with field survey and satellite remote sensing in future re-surveys.
- Evaluate the accuracy of methods and above products in the survey of independent examples of squares (for which ground reference data are unseen).

SUMMARY OF PROGRESS
- Eight CS2000 field sites have been have been flown by the Environment Agency (EA), recording data with the casi and LIDAR instruments. The sites were flown between August and September 1998, due to poor weather conditions during the early summer. Data quality checking has revealed errors relating to the nature of the instruments, and to flying and weather conditions at the time of data collection. Thus, the EA have scheduled all eight field sites to be re-flown with the repaired LIDAR instrument, in February 1999.
- A seven-stage data processing flow-line has been proposed, involving data import and error detection, cloud and shadow masking, normalisation, geometric and topographic correction, image segmentation and object-oriented classification. To date, data import and error detection is complete, methods of cloud masking, normalisation and geometric correction are operational, trials of topographic correction software have been delayed by the z-displacement in the LIDAR data, whilst image segmentation tests have demonstrated promising results.

REPORTS
Fuller, R.M., Hill, R.A., & Veitch N. 1998. Airborne Scanner Applications: Classification of airborne casi and LIDAR data of selected CS2000 sample squares. First Interim Report, CSCL/Int1.
Hill, R.A., Fuller, R.M., and Veitch, N., 1998. Airborne Scanner Applications: Classification of airborne casi and LIDAR data of selected CS2000 sample squares. Second Interim Report, CSCL/Int.2.

PROGRESS IN RELATION TO MILESTONES

Date of Milestone	Description of Milestone	Progress
Jun 1998	Interim Report 1 – Finalised site selection and instrumentation	Completed and delivered.
Nov 1998	Interim report 2 – Outcome of data collection operations and proposed analysis	Completed and delivered.
Dec 1998	Pre-proccessing – Production of digital terrain maps and casi colour images	Preliminary outputs but full production awaiting new LIDAR acquisitions.
May 1999	Interim report 3 – Progress with developments and analyses	-
Sep 1999	Draft scientific paper – technical evaluation	-
Sep 1999	Draft final report – Summary report and recommendations	-
Oct 1999	Final report – delivered to DETR, ready for publication	-
Late 1999	Published report – to be agreed with DETR	-

Module title: Module 10 – Environmental Change Network Link		
Funded by: DETR and ITE (NERC)		
Module leader (s): M. D. Morecroft		
Start date: Jan 1998	**End date:** Nov 2000	**Period covered by progress report:** up to Feb 1999

OBJECTIVES
- To repeat vegetation monitoring undertaken at ECN sites in 1998 and 1999 using protocols compatible with CS2000;
- To determine the relationship observed between the annual fluctuations in vegetation at ECN sites and prevailing weather conditions;
- To assess the extent to which vegetation monitoring in CS2000 is affected by year-to-year variations in weather, and;
- To review the protocols of vegetation monitoring at ECN sites with respect to applications in countryside Survey and to make recommendations for the long-term adoptions of such monitoring as a standard requirement for ECN sites.

SUMMARY OF PROGRESS
- A delayed progress report was submitted to DETR in Feb 1999. The following is drawn from that report.
- The field survey was carried out between mid June and the end of August. Mr Doug MacCutcheon, working as a temporary surveyor for ITE covered the upland sites and Dr Phil Wilson and Ms Marion Read (Wessex Environmental Consultants) the lowland sites. The full number of planned plots were recorded to the agreed schedule. Staff at each ECN site were responsible for marking plots and facilitating the surveyors visits. All data has now been checked and entered onto the computer for storage in the ECN database. Species have been recorded using BRC codes and this will enable the data to be linked to the main CS2000 databases. Data entry and checking was carried out by Ms Michelle Taylor and Ms Helen Demopoulos based at the ECN Wytham site. The field data sheets are currently archived at ECN Wytham.
- The main data analysis will not be carried out until after the 1999 survey but a preliminary assessment has shown that there were substantial variations in number of species recorded in each plot. Some changes are due to local factors while others seem to be due climatic variations, particularly year to year variations in rainfall.

PROGRESS IN RELATION TO MILESTONES

Date of Milestone	Description of Milestone	Progress
Dec 1998	Results from the 1998 survey and illustration of use.	Submitted to DETR Feb 1999.
Jan 2000	Technical evaluation of the methodology; results from 1998-1999 surveys, interpretation in relation to CS2000: proposals for continued monitoring.	-
Mar 2000	Draft final report by end Jan 2000; report ready for publication by end March 2000	-

Module title: Module 11 - Northern Ireland Countryside Survey Link		
Funded by: DETR and ITE (NERC)		
Module leader (s): R. G. H. Bunce		
Start date: Jan 1998	End date: Nov 2000	Period covered by progress report: up to Feb 1999

OBJECTIVES
- To ensure co-ordination of CS2000 with the Northern Ireland Countryside Survey (NICS).
- To develop compatible methodologies within the two surveys.
- To produce UK statistics on widespread habitats, linear landscape features, land cover and vegetation compatible with those developed in Module 1 of CS2000 and as a basis for the production of UK reports to common standards.

SUMMARY OF PROGRESS
- The module is on schedule and all planned reports have been delivered.
- The first UK figures for a land cover type, broadleaved woodland, have been calculated, with an error term, by combining GB and NI data. The procedure can now be applied to all other cover types for which GB and NI data is available.
- Under a separate but related contract, with the Environment Heritage, Northern Ireland Dr Bunce has supervised a quality assurance exercise for the Northern Ireland Countryside Survey 20000 (NICS). This showed that correspondence between the QA and NICS at the UK Broad Habitat level was 90.7%. The main reason for disagreement between the two surveys was the different interpretations in the field of land cover criteria (4.9%). Categorical error only accounted for 0.9% of the disagreements. At the NICS level, correspondence of land cover types between QA and NICS was 70.4%. Of the disagreements, interpretation of land cover criteria accounted for 14.4%; splitting of one land cover type into two others accounted for 4.4%; seasonal changes for 3.6%; difficulty in identification of Lolium perenne varieties for 1.3% and categorical error for 4.0%.
- Within woodland cover types, the correspondence between QA and NICS was 88.9%; within agricultural land cover types 69.8% and within landscape land cover types 81.3%. The main reason for the differences was interpretation of land cover criteria between closely related types.
- Correspondence between NICS and QA of boundary types was 77.0%. Of then disagreements, interpretation of boundary criteria accounted for 13.0%, seasonally related differences for 2.0%, other reasons for 3.0% and categorical error for 5.0%.
- Although the sample was small, it was adequate to draw valid conclusions about the reliability of the data, which is comparable to other surveys. The QA confirmed the reliability of the mapping procedure and showed that the results will be robust. Finally, the high correspondence at the Broad habitat level shows the validity of using the categories for UK reporting.

PROGRESS IN RELATION TO MILESTONES

Date of Milestone	Description of Milestone	Progress
Mar 1998	Interim report 1 – Comparability of survey protocols.	Report submitted on schedule.
Apr 1999	Interim report 2 – Comparability of analytical procedures and recommendations for joint reporting.	The work programme for period to April 1999 is almost completed.
Oct 1999	Draft final report.	-
Dec 1999	Final report.	-
Apr 2000	Final report published.	-

Module title: Module 13 - Scientific Support and Information Management		
Funded by: DETR and ITE (NERC)		
Module leader (s): T. J. Moffat		
Start date: Jan 1998	**End date:** Dec 2001	**Period covered by progress report:** up to Feb 1999

OBJECTIVES

- To facilitate access to data derived from CS2000 and earlier surveys for the Department and the Department's contractors or collaborators; to advise about data characteristics and quality; and, to service ad hoc requests for data and analyses (see CS2000 Data Access Policy).
- To design, implement and manage a database that is capable of integrating and linking the information collected in each of the CS2000 modules and earlier surveys.
- To support the synthesis and dissemination of outputs from all CS2000 modules; to produce data and other materials required for electronic transmission of information via the Internet or the Countryside Information System (CIS), including the National Biodiversity Network; to provide information for the production of the CS2000 Summary Report.
- To provide assistance and advice to users of CS2000 data and to provide CS2000 data to third parties, subject to agreed policies for access to data.
- To develop and implement a dissemination strategy.

SUMMARY OF PROGRESS

- The development of the data model under Module 13 took longer than anticipated but the structure is now in place. However, as noted in the Module 13 report, data capture started ahead of the schedule initially defined for the Module with data being entered into temporary databases prior to validation. The scheduling of activities has now been modified so that the timetable is now split with implementation and data capture from previous surveys to running in parallel with data capture from CS2000, which will now run from November 98 to April / May 99.
- Several items of scientific support have been supplied to DETR over the reporting period.

REPORTS

Moffat TJ, Watkins JW and Symes K, Oct 1998. Countryside Survey 2000 Integrated Data System (CIDS)

PROGRESS IN RELATION TO MILESTONES

Date of Milestone	Description of Milestone	Progress
Feb 1998	Ad hoc report – Evaluation of hedgerow criteria	Discussion document submitted to DETR.
Jun 1998	Interim report 1 – Data model and database structure	Submitted in Oct 1998.
Dec 1998	Ad hoc report – Hedgerow criteria	Covered by discussions with DETR.
Apr 1999	Interim report 2 – Data dissemination strategy	A dissemination strategy is in preparation.
Feb 2000	Preliminary data	-
Nov 2000	Interim report 3 – Catalogue of data and data products	-
Nov 2000 to Dec 2001	Production, dissemination and support of data products	-
Jun 2001	Draft final report	-
Sep 2001	Final report	-
Dec 2001	Final report published	-

Module title: Module 16 - Programme Management, Co-ordination and Policy Liasion		
Funded by: DETR and ITE (NERC)		
Module leader (s): M. Hornung		
Start date: Jan 1998	End date: Feb 2002	Period covered by progress report: To end Feb 1999

OBJECTIVES
- To liase with policy customers and to draw out from the results the main points of significance for countryside and wildlife policies.
- To be aware of the developing policy agenda and other related research and monitoring activities and ensure that the presentation of results is responsive to changing demands.
- To liase between NERC, DETR, the members of the CS2000 Joint Management Team (JMT) and the sponsors of CS2000 modules, to ensure the overall co-ordination of the work programme.
- To provide secretarial functions for the CS2000 Joint Management Team and Advisory group.
- To develop awareness amongst the user community of progress in CS2000 through the production of a regular newsletter and maintenance of a Web site.
- To develop and promote common reporting approaches and standards for all CS2000 modules and to maintain an overview of all CS2000 outputs and products.
- To identify and promote opportunities for using CS2000 data in consultation with policy customers and other users, including initiatives undertaken as part of the national Biodiversity Network.
- To co-ordinate, edit and produce a summary report on the results of CS2000.

SUMMARY OF PROGRESS
- Discussions have been held with all module leaders at regular intervals
- Tenders covering the work within Modules 3 and 4 were submitted to MAFF in and contracts signed in June. A draft specification and contract has been agreed with the EA to cover their contribution to the Soil Quality work under Module 6. A contract covering the DETR land and Water Directorate's 1998/99 contribution to the Soil Quality work was agreed in August; a contract for the 99/00 and 00/01 is currently under discussion. The contract with Air Quality to cover the DETR Air Quality contribution to the *Calluna* work was signed in September. Contracts with DETR and SNH have been signed with respect to Module 2 and discussions are in progress with EA on the contract covering their input to this module.
- The eighth meeting of the JMT was held at Eland House, London on the 18th November. Documentation for the meeting was prepared and circulated from ITE Merlewood.
- The second issue of the newsletter was released in December 1998 and c. 1000 copies have been distributed.
- The web site has expanded and updated.

REPORTS
Stark GJ. Apr 1998. Countryside Survey 2000 News Issue 1
Hornung, M. June 1999. Countryside Survey 2000 First Integrated Progress Report.
Stark GJ. Dec 1998. Countryside Survey 2000 News Issue 2
Hornung, M. Jan 1999. Countryside Survey 2000 Second Integrated Progress Report.

PROGRESS IN RELATION TO MILESTONES

Date of Milestone	Description of Milestone	Progress
Mar 1998	Launch of Newsletter and Web Site	The 1st newsletter was produced in April 1998, Web site launched in July 1998
Jun 1998	Integrated progress report	Submitted on schedule
Nov 1998	Integrated progress report, second newsletter	Submitted in January, but second newsletter Dec 1998.
Mar 1999	Module review/Interim report – Evaluation of progress and requirements for remainder of contract, third newsletter	Review in progress.
Nov 1999	Progress report – Content, style and data requirements for Summary Report, common reporting requirements, fourth newsletter	-
May 2000	Draft Summary Report, fifth newsletter	-
Sep 2000	Completed Summary Report	-
Nov 2000	Summary Report Published, sixth newsletter	-
Mar 2001	Integrated progress report, seventh newsletter	-
Jun 2001	Away Day – Discussion of results and policy implications	-
Oct 2001	Draft final report – policy responses and feedback	-
Nov 2001	Integrated progress report, eighth newsletter	-
Dec 2001	Final report	-
Feb 2002	Final report published	-

ANNEX 2

ANALYSIS OF CS2000 FIELD SURVEY DATA

ANALYSIS OF CS2000 FIELD SURVEY DATA

1. INTRODUCTION

1.1 Work on the analysis phase of the CS2000 field survey programme is due to commence in May 1999. It is important that a specification for this analysis is developed at an early stage and that the necessary protocols are finalised and agreed well before analysis begins.

1.2 This paper (i) summarises progress made to date in establishing the specification for analysis and (ii) highlights issues that have still to be addressed before a protocol can be finalised. The Advisory Group is invited to comment on the draft specification and to provide input to discussion of the remaining issues.

1.3 A draft glossary of terms is provided at the end of the paper.

2. PROGRESS TO DATE

2.1 Guidelines on the outputs from CS2000 Module 1 were given in the project specification (DETR, December 1997), within a reporting framework:

- An interim report (1) on the finalised sampling strategy, field survey protocols, recording codes and typologies.

- An interim report (2) on the outcome of the field survey in terms of number of squares visited and samples collected etc.

- Interim report (3) on final proposals for analytical procedures and reporting frameworks for landscape pattern, land cover accounts, ecological zones and botanical analysis.

- Interim report (4) presenting preliminary results and data for incorporation in the Millennium Report on Biodiversity and CS2000 Summary Report. Tabulated data outputs are as follows:

    (a) Summaries of the stock and change in area of each widespread habitat, by country, by ecological zone and GB;

    (b) Summaries of the change in land cover and vegetation character of selected widespread habitats by country, by ecological zone and GB;

    (c) Summaries of the stock, change and condition of linear landscape features by country, by ecological zone and GB;

    (d) Summaries of the change in species diversity by vegetation class, by plot type, by country, by ecological zone and GB;

    (e) Summaries of the types of botanical changes occurring within each vegetation class, by plot type, by country, by ecological zone and GB;

    (f) Summaries of the stock and change of each Main Land Cover type by country, by ecological zone and GB; and

    (g) Summary flow accounts showing the breakdown of the types of change occurring within each Main Land Cover type and the amount of initial stock carried over between survey years.

- The Final Report will present the above results with a commentary explaining the sampling approach, analytical methods, significance and inter-relationships.

Key points will be highlighted as indicators of change in the countryside. The final report will discuss the significance of the results and suggest the possible contributory factors (cf. ECOFACT).

2.2   Given the need for the analysis of CS2000 data to address the specified reporting framework, the list of outputs to be provided in Interim Report 4 (a-g, above) provides a useful structure for the analysis specification.

2.3   Some additional detail has been given to the list of outputs at a meeting between DETR, ITE and Nottingham University (on 23 November 1998).

2.4   ITE has set up two data analysis teams to work on (a) the spatial data and (b) the vegetation plot data, with suitable liaison and integration between the work of the two groups. The groups have presented their draft specifications (and initial draft protocols) to a workshop which was attended by representatives of DETR, EN, JNCC and Nottingham University.

3   GENERIC ISSUES OF DATA ANALYSIS

3.1   While the list of outputs listed as part of Interim Report 4 is useful in providing a structure for the specification, there are a number of generic issues which cut across several of the outputs and have been addressed separately.

3.2   The generic issues which affect the way CS2000 results will be analysed are mostly concerned with the reporting framework and the classifications and *stratifications* used in analysing and reporting the results of the survey.

3.3   The way in which data are stratified (divided up) during the analysis will determine the way in which CS2000 is reported. It is helpful to distinguish between strata which will remain more or less constant between surveys (and are usually derived from data outwith the survey, eg country), and those strata between which data types may move between surveys (eg Broad Habitats). For the purpose of data analysis the former have been termed *static* strata and the latter *dynamic* strata.

STATIC STRATA

Country estimates

3.4   Two *country units* will be defined: (a) England and Wales and (b) Scotland (see Figure 1). Where a sample square straddles the Scotland-England border the entire square will be allocated to the country with the greater proportion of the squares area.

Figure 1. Hierarchical arrangement of static strata

1 UK	United Kingdom								Urban core
2 GB	Great Britain							Northern	excluded
3 Country	England and Wales				Scotland			Ireland	
4 Ecological zone	Z1	Z...	Z...	Z...	Z...	Z...	Zn		
5 ITE Land Class									

Note - For CS2000 purposes the Isle of Man, Channel Islands and Isles of Scilly are excluded.

3.5   Due to its relatively small area and environmental similarity to parts of England, **Wales** will not be treated as a separate country. However, for reporting purposes, separate England and Wales figures will be shown. These estimates will be calculated from relative proportions at the sampling strata level (5 in Figure 1). Note that in revising the sampling strata for CS2000, Land Class 17, which comprises 41 % of Wales and also occurs in England, has been sub-divided into four strata, three of which are entirely within Wales (and the other is all in England).

Urban core

3.6   CS2000 is a survey of rural land; 'predominantly urban squares' have been excluded from the sample. For Countryside Survey purposes, predominantly urban is defined as 1 km squares with greater than 75% built-up land; such squares sum to about 2.5% of the GB land area. It is proposed to place such squares in a *separate stratum*, for which no field survey estimates will be made. There is a sense in which such a stratum is dynamic because, while it is unlikely that many built-up squares will become more rural, it is possible that some squares which are currently rural in nature may become built-up and move into this stratum

Ecological zones

3.7   The production of ecological zones needs to reflect the needs of end-users of the information. The users will also define the number of regions required; in CS1990, ITE land Classes were aggregated into four landscape types. It has been suggested that there is a need to re-examine these aggregations and to define *new zones*, within the country units.

3.8   Once the objectives of the zonation have been defined, the methodology can be determined. There are several statistical methods that can be employed at different resolutions to either split or cluster the ITE Land Classes. A variety of datasets is available for analysis, some with data for every square in GB, others with data only for the surveyed squares. Census data available for every square can be divided into the data that contributed to the original land classification (geology, climate, morphology, etc.) and additional data (soils, land cover from satellite mapping, etc.). Different goals may be set for different datasets, such as minimising of sample variance.

3.9   Other approaches include the use of rule-based algorithms and expert decisions. One approach may be to perform a series of standard statistical procedures and then select a compromise, either through further statistics or judgmental decisions.

Issue: How should the ecological zones be defined?

DYNAMIC STRATA

Broad Habitats

3.10   Broad Habitats are to be the *major stratification for reporting* the results of CS2000. It will be at this level that the spatial analysis will be integrated with the vegetation analysis and other CS2000 modules, such as the Land Cover Map. The Broad Habitat classes were originally named and described in the Biodiversity Action Plan. The classification has undergone some revision since then, and detailed definitions of Broad Habitats for CS2000 analysis purposes will be finalised in consultation with JNCC.

3.11   Data analysis will be carried out for all Broad Habitat types. If, for a particular analysis, the available sample is found to be of insufficient size, Broad Habitats may

be **aggregated** at the reporting stage. The vegetation character of Broad Habitats will be determined by separate analysis of plots.

3.12 In some situations (too early to quantify) data have been recorded as a **mosaic** of Broad Habitat types. During the analysis an assessment will be made of mosaic combinations in the data set. Depending on the frequency of mosaic combinations, these units will be treated as either unique combinations of Broad Habitats or allocated to one of the constituent Broad Habitats by standard rules. It will not be possible to make a spatial separation between the constituents of these mosaic types.

Enclosed/ unenclosed

3.13 The primary division within the land cover data set is between Broad Habitats that *typically* occur in enclosed and unenclosed situations. The distinction is based on land cover, rather than the presence of field boundaries. Thus, the Broad Habitat *acid grassland* is treated as unenclosed even though it sometimes occurs in enclosed situations. The separation of Broad Habitats between enclosed and unenclosed types is shown in Table 1. The distinction between enclosed and unenclosed reflects a change in methodology from that used in CS1990. For CS2000 there has been a change in emphasis from assessing change in unenclosed situations by detailed land cover mapping to collecting additional vegetation plots.

Table 1. Terrestrial Broad Habitats

Area/ Length[1]	Enc/ Unenc[2]	JNCC code	Broad Habitat Name
A	E	1	Broad-leaved, mixed and yew woodland
A	E	2	Coniferous woodland
A	E	4	Arable and horticulture
A	E	5	Improved grassland
A	E	6	Neutral grassland
A	E	7	Calcareous grassland
A	E	13	Standing open water and canals
A	E	17	Built up areas and gardens
A	U	8	Acid grassland
A	U	9	Bracken
A	U	10	Dwarf shrub heath
A	U	11	Fen, marsh, and swamp
A	U	12	Bog
A	U	15	Montane habitats
A	U	16	Inland rock
A	U	18	Supra-littoral rock
A	U	19	Supra-littoral sediment (incl. sand dunes)
A	U	21	Littoral sediment (incl. saltmarsh)
L	E	3	Boundary and linear features
L	E	14	Rivers and streams

Notes
[1] Whether Broad Habitats would be reported as an area or a length is discussed in the text.
[2] Enc – enclosed; Unenc – unenclosed. See text for an explanation of these terms.

3.14 Marine Broad Habitats would **not** be reported within CS2000:

Main Land Cover Types

3.15 The main land cover types will be approximately equivalent to the *CS1990 reporting categories* for land cover. Standard rules will be applied to define the main land cover types from the codes recorded in the field. Some changes to the definition used

in CS1990 will be necessary to ensure that the main land cover types nest within Broad Habitats. The definitions for main land cover types will be mutually exclusive. Because of the change in mapping methodology introduced into CS2000, no main land cover types will be defined for unenclosed situations. Proposed main land cover types in enclosed landscapes are shown in Table 2. The final list of main land cover types for reporting will be determined following assessment of sample size during initial analyses.

Table 2. Proposed Main Land Cover Types.

Broad Habitat	Main Land Cover Types
ENCLOSED BROAD HABITATS	
Broad-leaved, mixed and yew woodland	Mixed wood, Broad-leaved deciduous, Shrub, Felled
Coniferous woodland	Conifers, Felled
Arable and horticulture	Wheat, Barley, Oats, Other cereal, Maize, Oilseed rape, Turnips / Swedes, Kale, Other crucifers, Peas, Field beans, Other legumes, Sugar beet, Potatoes, Other roots, Other field crops, Horticulture, Perennial crops, Non-cropped arable
Improved grassland	Recreational grass, Sown grass, Rye grass, Managed grass, Weedy grass, Non agriculturally improved grass
Neutral grassland	Herb-rich grassland, Unmanaged grass and tall herb
Calcareous grassland	Calcareous grass
Standing open water and canals	Still water
Built up areas and gardens.	Agricultural buildings, Residential buildings, Continuous built, Waste and derelict, Hard areas
Boundary and linear features	Railway, Road, (includes lengths, eg hedgerows)
Rivers and streams	Running water, (includes lengths, eg streams)

4   SPECIFIC DATA ANALYSIS ISSUES RELATING TO REPORTING ITEMS

4.1   Having addressed the generic issues that affect two or more of the specified outputs, the list of outputs listed as part of Interim Report 4 is useful in providing a structure to the second part of the specification. The following section takes each reporting item in turn and considers the issues that relate to it.

a. Summaries of the stock and change in area of each widespread habitat, by country, by ecological zone and GB;

4.2   **Widespread habitats** are those Broad Habitats which have sufficient extent to be recorded reliably by a sample survey such as CS2000. Which habitats are to be reported will depend on the statistical robustness of the estimates made for each stratum.

4.3   With each consecutive Countryside Survey the size of the sample has been increased. Whenever possible squares surveyed on a previous occasion have been revisited in order to collect information on changes that have taken place; though in a few cases access to sites previously surveyed has not been possible in subsequent surveys. For

stock calculation the best estimate for any one year is that calculated from all data collected in that year.

4.4   For calculation of *change* the situation is more complicated. Change might be estimated from paired samples of revisited sites, or comparison of total population estimates. Statistically, the error terms associated with these alternative estimates will vary, depending on the order of magnitude of change.

4.5   For small changes the paired estimates approach is usually the most efficient but the results will not match the subtraction of the two best estimates of stock. Conversely, where the change is large, the best estimate of change is from the subtraction of independent population estimates, however the two samples are not totally independent and may therefore invalidate the test. A pragmatic decision was made for CS1990 to use paired change in all cases so as to avoid confusion of different comparisons in the same data table.

4.6   Of the options available for calculation of stock and change figures four are presented below:

- Option 1   best estimate of stock and change although they will not be internally consistent (as was done in CS1990),
- Option 2   best estimate of stock with consistent, but sub-optimal, estimate of change,
- Option 3   best estimate of 1998 stock and all change, but stock estimates for 1984 and 1990 calculated by subtraction of change from 1998 stock,
- Option 4   reports all figures only on those squares that were surveyed in each year.

4.7   These options are illustrated in Table 3.

Table 3. Options for stock and change calculations

	Option 1	Option 2	Option 3	Option 4
1998 Stock	Best	Best	Best	Reduced
1990-1998 Change	Paired	Gross	Paired	Paired
1990 Stock	Best	Best	Inferred	Reduced
1984-1998 Change	Paired	Gross	Paired	Paired
1984 Stock	Best	Best	Inferred	Best

Issue: which approach(es) should be used for the calculation of stock and change?

4.8   There are three time periods over which change in land cover can be reported: 1990-1998, 1984-1990 and 1984-1998. It is proposed that we only calculate changes using 1998 data.

4.9   Although not comprising a specific Broad Habitat type, *ponds* require special consideration. There is a requirement to analyse CS2000 data on ponds and to compare the numbers of ponds with estimates obtained in 1990 and in the Lowland Pond Survey 1996.

4.10   A *characterisation* of widespread habitats is required in terms of species and *vegetation* classes. This will be based upon 1998 data only and will consist of tables conveying percentage frequency of plant species and CVS classes for each subset of CS2000 plot data within each Broad Habitat. Additional information will convey

sample size and summary statistics for selected Indicators of Botanical Diversity (IBDs) (see below and Glossary).

4.11 This level of characterisation will be based upon *all* available plots in each spatial Broad Habitat unit. However it is important to highlight differences in the contribution of linear features and small fragments of vegetation not typical of most of the vegetation in each sample square. Thus, separate characterisations will be produced based on data subsets comprising areal plots (X, U), linear plots (B, H, R/V, S/W) and targeted plots (Y). Because of the special features of the D plots (hedgerow woody species only) and A plots (1x100m, located along arable field margins), separate characterisations based upon these will be carried out.

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b. Summaries of the change in land cover and vegetation character of selected widespread habitats by country, by ecological zone and GB;

4.12 The **selection** of widespread habitats will depend largely on the statistical robustness of the estimates, after analysis.

4.13 Change in **land cover** of enclosed Broad Habitats is covered under output (f), below.

4.14 *Integration* of the land cover and vegetation data will be at the level of Broad Habitats. A link between plot location and land cover parcel will be made in the GIS spatial database.

4.15 Because the specified stratification includes what have been termed 'dynamic' strata (see Glossary), there will be analyses of three types of data subset:

a) The 'stay-same analysis' focusing on plots that did not change Broad Habitat or Aggregate Class membership between 1990 and 1998.

b) The '90-based analysis' where plots are grouped by their 1990 Broad Habitat or Aggregate Class and 1998 replicates are analysed irrespective of their change in stratum membership.

c) A 'turn-over analysis' of unmatched replicates that can examine the extent to which plots recruited into a Broad Habitat or Aggregate Class in 1998 compensate for those lost in 1990.

4.16 Although outputs will not be stratified by Aggregate Vegetation Class, such stratification *within* Broad Habitat is required.

4.17 Summary variables for which change will be quantified and tested are listed below (Table 4). These define 'vegetation character' and are a subset of the Indicators of Botanical Diversity developed and analysed during the ECOFACT project.

Table 4 List of Indicators of Botanical Diversity

Indicator of Botanical Diversity (IBD)	Data type
IBD1 – Aggregate Class change	Count of plots
IBD 2 – CVS class change	Count of plots
IBD 3 – CSR scores	Weighted proportion per plot
IBD 5 – Species richness	Count of category 1 taxa per plot
IBD 6 – Ellenberg scores	Weighted proportion per plot
IBD 10 – Food-plant Index	Weighted proportion per plot

4.18 Matrices of change will be constructed to demonstrate net flows and turnover *within* each Broad Habitat between Aggregate vegetation classes. Change matrices can be summarised as net flow diagrams and can be used to summarise the dynamics of change within selected Broad Habitats (Figure 2).

Figure 2. Net flow diagram for change in Aggregate Class membership of CS plots between 1978 and 1990.
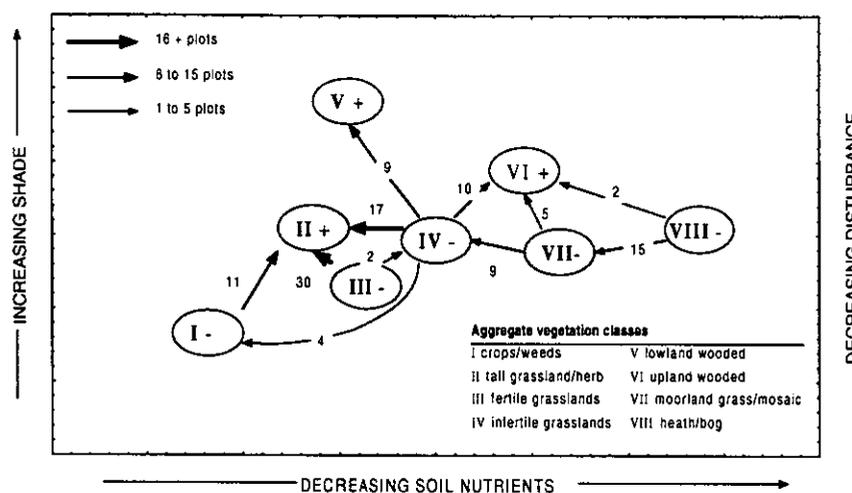
4.19 Analyses of change in CVS class will focus only on particular, meaningful, change scenarios within particular Broad Habitats. For example, shifts in class membership away from unimproved grassland classes versus shifts towards more eutrophic, managed or unmanaged vegetation.

4.20 The *Food-plant Index* will only be computed for specific subsets of CS2000 data which coincide with areas in which changes in the abundance of each animal group are known to have occurred. Index scores are only likely to be appropriate when describing vegetation within the known range of the animal species. In previous work the link between food plants and animal species was drawn out at the species level. However for CS2000, analyses will use a single index only. This will convey the proportion of cover in a plot taken up by those plant species that are known to be important as hosts to a selected range of butterfly species or food-plants to a selected number of lowland farmland birds.

4.21 Among the original (ECOFACT) IBDs was a list of species characteristic of unimproved acid, calcareous and neutral grasslands. Although useful, the list is incomplete in terms of a GB-wide analysis of stock and change. This IBD will not form part of the CS2000 analysis, but it may still be important to examine the fate of named individual plant species between 1990 and 1998. This will require an analysis of change in plant species particularly characteristic of each Broad Habitat. Such an approach may be necessary to help assess *significance for nature conservation*.

Issue: should the analysis of change in individual plants be classified by their association with a Broad Habitat ? When, how and by whom should such a list be created ?

c. Summaries of the stock, change and condition of linear landscape features by country, by ecological zone and GB;.

4.22 In CS1990, the only linear features for which estimates were reported were different types of field boundaries (hedges, walls, banks and fences). It is assumed that CS2000 will need to estimate the extent (see below for discussion on units of measurement) of all linear features which are to be included in the **BAP** Boundary and Linear Features Broad Habitat type.

4.23 This type includes a diverse range of linearly arranged landscape structures and areas such as hedgerows, walls, stone and/or earth banks, grass strips (but not fences) and dry ditches, whether separate or in combination (multi-element boundaries). Included here are lines of trees, whether constituting part of a hedgerow or not, and hedgerow trees. The type also includes some of the built components of the rural landscape including roads and tracks [*and dedicated footpaths?*], and railways (outside urban areas) and their associated narrow verges of semi-natural habitat.

4.24 The definition does not currently include canals, river corridors, or ditches which are water-filled for the majority of the year (all of which are classified within the Standing open water and canals, or Rivers and streams Broad Habitat types). Nor does this type include linear features within woodland such as rides and firebreaks (which are classified with the woodland Broad habitats), or the linear elements of arable field such as field margins and headlands which should be included in the arable and horticultural Broad habitat type.

Issue: should CS2000 reporting of linear features adhere closely to the BAP definition and how do other features (eg fences, rivers and canals) become reported?

4.25 Additional information describing the **condition** of hedges and walls was recorded in 1998. Some assessment of boundary condition (eg whether a boundary was stock-proof or not) was made in CS1990 and these data will be used to estimate changes for the 1990-1998 period.

4.26 Field boundaries frequently contain more than one element, eg hedge with fence. If each element were to be treated separately in the analysis this would lead to double counting. Boundary types will be defined for analysis purposes so that all boundaries can be allocated to one type (Table 5). This analysis will be complemented by a separate analysis showing each unique combination of boundary elements for which data have been collected as a separate row (ie the second column of Table 5).

Table 5. Illustrative example of the procedure for the allocation of field boundaries to types (for hedge, wall and fence elements, only).

Boundary type	Boundary elements
Hedge	Hedge
	Hedge and wall
	Hedge and fence
	Hedge and wall and fence
Wall	Wall
	Wall and fence
Fence	Fence

4.27   The Broad Habitat type, *Boundary and linear features*, includes some elements which, in Countryside Survey, are measured by length and others which are measured by area (Table 6). There is an issue as to whether this Broad Habitat should be reported as a mixture of length and area measurements. The alternative is to measure all linear features in the same way, ie as lengths, or as areas, but not a mixture of both. Thus, converting area measurements for roads, rivers etc to lengths would be possible; but would ignore the significance of changes in width, such as road widening. A more technically challenging approach would be to give all linear features an area; this would require the assumption of an average width for each feature type, with consequent shrinking of other land covers. This approach would complicate interpretation of comparative change since different linear features would have different average widths.

Table 6. Measurement of linear feature elements in Countryside Survey

Element	Measurement
Hedge	Length
Wall	Length
Fence	Length
Bank	Length
Grass strip	Length
Other boundary	Length
Verge	Area
Road	Area
Railway	Area
Constructed track	Length
Unconstructed track	Length
Footpath	Length
Dry ditch	Length
Stream	Length
River	Area
Canal	Area
Line of trees	Length

Issue: Is it appropriate that the Broad Habitat boundary and linear features is reported as a mixture of lengths and areas?

d. Summaries of the change in species diversity by vegetation class, by plot type, by country, by ecological zone and GB;

4.28   Outputs under this section will require repetition of the data stratification carried out under analyses for ECOFACT Module 1 (for change between 1978 and 1990). The classification of GB by four landscape types (arable, pastural, marginal uplands and uplands) was used in reporting for CS1990. A similar analysis of 1990 to 1998 data would provide continuity with earlier work; the current emphasis on Broad Habitats means that there is now a need to re-work 1978 data by providing an analysis of trend

in mean category 1 species richness from 1978 to 1990 to 1998, using the smaller 1978 replicate data set.

4.29 Since reliable land cover information does not exist for 1978 it is not possible to group 1978 plots by Broad Habitat. However, even without Broad Habitat stratification, such an analysis would provide a link with previously reported changes in species richness. Replicate data will therefore, be stratified by the original four zones, by the new country and zone classification, by aggregate class and by plot type.

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e. Summaries of the types of botanical changes occurring within each vegetation class, by plot type, by country, by ecological zone and GB;

4.30 Outputs specified under this heading require 'stay-same' type analyses within each Aggregate Class. This output is therefore already covered under (b) above.

4.31 Since Land Cover types are subsumed within the wider Broad Habitat classification, , it is not proposed to stratify plot data by Land Cover type.

4.32 Analyses carried out under this heading and under (b) above, will examine the extent to which recruitment of vegetation into Broad Habitats in 1998 compensates for losses in 1990. Differences in IBD variables between plots gained and plots lost will convey aspects of botanical quality as well as suggesting the underlying processes of change. There is a parallel with the work that was carried out on the vegetation aspects of the Land Cover Flow accounts between 1978 and 1990 and it is proposed to make links between that classification of change, and the processes inferred from 1990 to 1998 change results.

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f. Summaries of the stock and change of each Main Land Cover type by country, by ecological zone and GB;

4.33 'Main Land Cover types' will need to be defined but will be based on the CS1990 reporting categories but modified, where necessary, to allow nesting within Broad Habitats.

4.34 MLCs may need to be aggregated for reporting - this may be depending on error terms and may therefore vary between countries/zones.

4.35 Main land cover types will be defined for enclosed Broad Habitats only (see 3.15 above). For unenclosed situations main land cover type and Broad Habitat will be synonymous. Thus, matrices of change will show flows between main land cover types in enclosed situations and the equivalent of Broad Habitats in unenclosed situations.

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g. Summary flow accounts showing the breakdown of the types of change occurring within each Main Land Cover type and the amount of initial stock carried over between survey years;

4.36 The flow accounts will be based on those developed by Haines-Young et al. in their report to DETR (Environmental Accounts for Land Cover). The accounts will be based on detailed matrices of change, at the Main Land Cover level, and will also include information on the type of changes taking place, where possible. The

typology developed by Haines-Young will be re-examined to ensure current policy issues are taken into account.

4.37   The typology currently includes: crop rotation; grassland rotation; land use intensification; land use extensification; afforestation; deforestation; built development; land reclamation (from built land).

4.38   Table 7 shows a summary of flows between years and highlights the importance of loss of initial stock of each land cover type.

Table 7. Summary flow accounts between years

	Initial Stock	Types of change	1998 Stock	Net change	Loss of initial stock
Main Land Cover	Area and Error	Change & Error	Area and Error	Change and Error	Change and Error

h. *Other outputs*

4.39   As part of the ECOFACT project, CS1990 data has been analysed with respect to landscape pattern. Those pattern measures which are identified as best expressing the overall character of pattern (and changes) in the landscape will be obtained for 1998, 1990 and 1984 so that an assessment can be made of the trends in landscape pattern.

4.40   CS2000 data will be made available in a format suitable for use in the Countryside Information System.

5.   SUMMARY OF OUTPUTS AND ANALYSES

5.1   Table 8 shows a summary of the analyses that are to be carried out, by output item.

Table 8. A summary of CS2000 Module 1 outputs and associated analyses

Output required	Stock/ Change	Stratification	Analyses to be undertaken
a. Summaries of the stock and change in area of each widespread habitat, by country, by ecological zone and GB;	**Spatial data** Stock: 1984, 1990 and 1998 Change: ? **Vegetation data** Stock: 1998	**Spatial data** In each country unit In each ecological zone within country units For Broad Habitats **Vegetation data** For each Broad Habitat 1…n; Within each Country Within each Ecological Zone within each Country	**Spatial data** Stock in area of Broad Habitat Change in area of Broad Habitat Matrix of change between Broad Habitats (+ Stock and changes in the number of ponds) **Vegetation data** Characterise Broad Habitats in 1998 only. For each Broad Habitat; Frequency tables of species and selected CVS classes Median IBD values +-inter-quartile range AC and CSR % composition
b. Summaries of the change in land cover and vegetation character of selected widespread habitats by country, by ecological zone and GB; (for spatial data, see (f) below)	**Vegetation data** Change: 1990 – '98	**Vegetation data** For each Broad Habitat 1…n; Within each Country Within each Zone within each Country	**Vegetation data** For each Broad Habitat; Change in median IBD values including matrices of shift in AC and selected CVS classes Broad Habitat is an dynamic stratum so '90- based', 'stay-same' and 'turnover' analyses are possible
c. Summaries of the stock, change and condition of linear landscape features by country, by ecological zone and GB;	**Spatial data** Stock: 1984, 1990 and 1998 Change: ??	**Spatial data** In each country unit In each ecological zone within country units For linear feature elements	**Spatial data** Stock length of linear feature types Stock length of unique linear feature element combinations Change in length of linear feature types Change in length of unique linear feature element combinations Stock condition of boundaries (1984, 1990 and 1998) Stock condition of hedgerows and dry stone walls (1998) Change in the condition of boundaries (1990 to 1998)

d) "summaries of the change in species diversity by vegetation class, by plot type, by country, by ecological zone and GB."....and by the original 4-zone classification of GB.	Vegetation data Change: 1978 – '90 – '98	Vegetation data For each Aggregate Class; Within each Country Within each Zone within each Country Within each Plot Type within each Country	Vegetation da^{ta} For each AC; Change in me... AC is a dynamic and 'turn(
e) "Summaries of the types of botanical changes occurring within each vegetation class, by plot type, by country, by ecological zone and GB." Broad Habitats also mentioned in minuted additions by CJB on 26/11/98.	Vegetation data Change: 1990 – '98	Vegetation data Prescribes a stratification the same as D) but Broad Habitats are included.	Vegetation da For each Broad Change in me: of change in A relevant 'Stay-same' and although alrea
f. Summaries of the stock and change of each Main Land Cover type by country, by ecological zone and GB; and	Spatial data Stock: 1984, 1990, 1998 Change: ??	Spatial data In each country unit In each ecological zone within country units For main land cover types	Spatial data Stock in area of Change in are: Matrix of char
g. Summary flow accounts showing the breakdown of the types of change occurring within each Main Land Cover type and the amount of initial stock carried over between survey years.	Spatial data Stock: 1984, 1990, 1998 Change: ??	Spatial data In each country unit In each ecological zone within country units For main land cover types	Spatial data In addition to : Loss of initial ... Types of change
h. Summaries of stock and change in pattern by country, by ecological zone and GB.	Spatial data Stock:1984, 1990, 1998 Change: ??	Spatial data In each country unit In each ecological zone within country units	Spatial data Stock of area an Change in patter Matrix of chan

Analysis of CS2000 Field Survey Data

GLOSSARY (EARLY DRAFT)

(This glossary is being developed for inclusion in the reporting phase of the project and is in an early stage of development)

Aggregate class: In order to maximise analytical power, like vegetation needed to be grouped with like, based upon CS plots throughout all squares. To do this a fully integrated vegetation classification was developed. All 1978 and 1990 plots were classified using TWINSPAN to create 100 smaller groups of plots. The mean DCA scores for these were then clustered giving eight broad habitat groups or Aggregate Classes. These eight classes provide a means of stratifying CS plots based on similarity of species composition. Because the eight classes consist of relatively large numbers of plots, sample size is also maximised.

Boundary type – Field boundaries frequently contain more than one element, eg hedge with fence. If each element were to be treated separately in the analysis this would lead to double counting. Boundary types will be defined for analysis purposes so that all boundaries can be allocated to one type.

Category 1 taxa: Covers native plant species that can be most confidently identified in the field. Excludes generic records, amalgams and bryophytes. Changes in species richness reported in CS1990 were based only on this subset of species records.

Country unit: For the purposes of CS2000 analysis, there are two country units for which estimates will be derived from sample data: (a) England and Wales treated together, and (b) Scotland.

CSR score: Based on the classification of Grime and co-workers at Sheffield, this IBD variable is calculated as a score for each CS plot weighted by the Competitor, Stress-tolerator or Ruderal value of the plant species occurring in each. Changes in these scores can imply processes of change such as disturbance and shifts in trophic status.

CVS class: The initial TWINSPAN classification of CS1978 and 1990 plots resulted in 102 groups defined by floristic similarity. Two outliers were rejected leaving a core of 100 so-called CVS(Countryside Vegetation System) classes. Using Ellenberg scores to convey the environmental affinities of the species in each plot, the gradients along which the CVS classes arranged themselves, were interpreted in terms of ecological conditions. Thus shifts in both CVS class and Aggregate Class resulting from changes in species composition can be interpreted in terms of changes in those conditions. The two key gradients were firstly fertility and secondly shade or disturbance.

Dynamic Strata - Strata between which data types may move between surveys (eg Broad Habitats). – see notes at end of glossary.

Ecological zone: For reporting results from CS2000, results from individual strata (ITE Land Classes) will be aggregated into a number of regional zones for each country unit. These are broadly analogous to the Landscape Types used in the reporting of CS1990 results.

Enclosed (Broad Habitats): Enclosed habitats are those that are found in generally enclosed situations ie bounded by hedges, walls or fences, or in well defined blocks (see Table 1). There may be circumstances where an enclosed Broad Habitat (eg Broad-leaved woodland) is found in an unenclosed situation (eg where moorland is being invaded by scrub).

Indicators of Botanical Diversity (IBD): Comprises a total of total of 12 descriptors calculated from CS vegetation data. All 12 were developed and used to analyse stock and change between 1978 and 1990 as part of the ECOFACT modules 1 (Measuring Botanical Diversity in the Wider Countryside) and 6 (Understanding the Causes of Change in Biodiversity).

Linear feature element – subdivisions of the Broad Habitat referring to types of linear feature eg hedge, railway

Plot type: During the Countryside Surveys of 1978, 1990 and 1998 plant species records were collected from within a series of plot types designed to sample different parts of the landscape within each 1km square. In each survey different types of plot were sampled (Table 9).

Table 9. Types of plot in CS2000

Plot type	1978	1990	1998
X, field and unenclosed land	✓	✓	✓
B, field boundaries		✓	✓
H, hedgerows	✓	✓	✓
R, road verges	✓	✓	✓
V, additional road verges		✓	✓
S, stream/river sides	✓	✓	✓
W, additional stream/river sides		✓	✓
Y, targeted on atypical vegetation		✓	✓
U, 'unenclosed' Broad Habitats			✓
A, arable field margins			✓
D, hedgerow woody species			✓

SAG: The Spatial Analysis Group is the name given to the ITE team which is analysing mapped data from CS2000.

Static Strata - Strata which will remain more or less constant between surveys (and are usually derived from data outwith the survey, eg country) – see notes at end of glossary.

Unenclosed: Unenclosed habitats are those that are found in generally unenclosed situations ie not defined by hedges, walls or fences, and generally irregular, or ill-defined, in shape (see Table 1). There may be circumstances where an unenclosed Broad Habitat (eg Bracken) is found in an enclosed situation (eg invading an improved grassland field).

VAG: The Vegetation Analysis Group is the name given to the ITE team which is analysing vegetation data from CS2000 plots.

Vegetation Character: Consists of six Indicators of Botanical Diversity (IBD) which are calculated from the plant species data recorded in each CS plot. Some IBDs convey aspects of botanical quality eg. species richness and the Food-plant Index. Others can be used to infer the processes responsible for vegetation change eg. Ellenberg scores for fertility, wetness and light.

Notes on Dynamic and Static Strata in relation to analysis of vegetation data: An important distinction can be made between strata where plots can change membership in time and those where they cannot. The distinction has important technical consequences since it logically leads to a number of options for partitioning change. Static strata include Country, Ecological Zone and Plot Type where any plot cannot change its membership of a stratum level over time. For example, an X plot is always an X plot and a plot located in the pastural landscape of England and Wales will always be so classified. Dynamic strata are Broad Habitat and Aggregate Class. Membership of dynamic strata can and does change over time with vegetation and land cover change (Table 10).


Thus for dynamic strata three analytical options are available (Figure 3). Each type of change analysis focuses on a different aspect of ecological change. These options were explored to some extent in the ECOFACT 1 project but their potential was not fully exploited.

Table 10.

CS strata	Membership change possible	Dynamic or static
Country	No	Static
Ecological zone	No	Static
Plot type	No	Static
BAP habitat	Yes	Dynamic
Aggregate class	Yes	Dynamic

Figure 3.
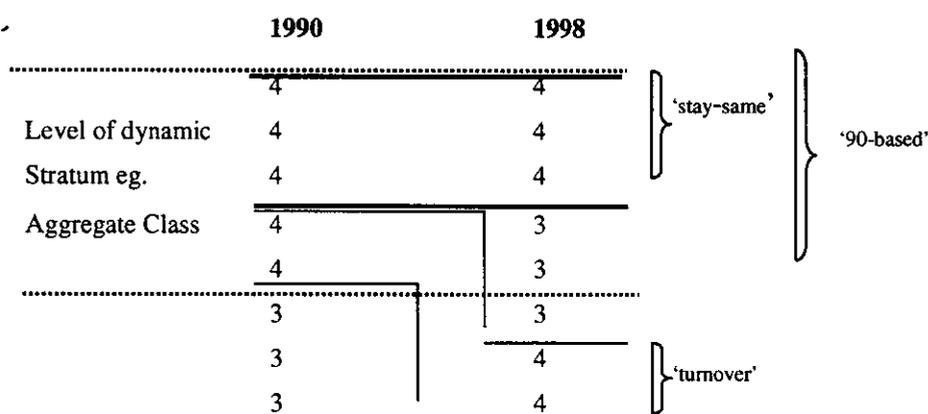
The 'stay-same' approach is based upon plots whose vegetation or land cover did not change sufficiently to cause a shift in Broad Habitat or Aggregate Class. It therefore focuses on changes within the dynamic stratum that were not large enough to result in a shift in stratum membership. This type of analysis is required under 4.1.4e of the outputs.

The '90-based' analysis looks at plots stratified by their stratum membership in 1990 and analyses their '98 replicates irrespective of the magnitude of change and their stratum membership in '98. This approach is easiest to understand as it simply divides up the data in a baseline year and examines the fate of plots through time but always with reference to the baseline membership of the data. It is also likely to be the most powerful statistically since it will incorporate the largest number of paired samples of all three approaches. However it will be affected by divergent trajectories among plots. For example it could not discriminate between effects on upland grassland plots that became afforested and those where grazing had relaxed. Such interactions will increase within year variance and could lead to lack of significance as happened with the CS1990 amalgamated woodland analysis.

The 'turnover' approach compares plots with the same stratum membership in either year but where each plot either moved into the stratum level in '98 or was lost from the stratum level in '90. Change will therefore be based upon unpaired replicates and is also likely to be unbalanced (Figure 3). This approach is useful in that it allows evaluation of the extent to which gains to a stratum level compensate for losses from that level.

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