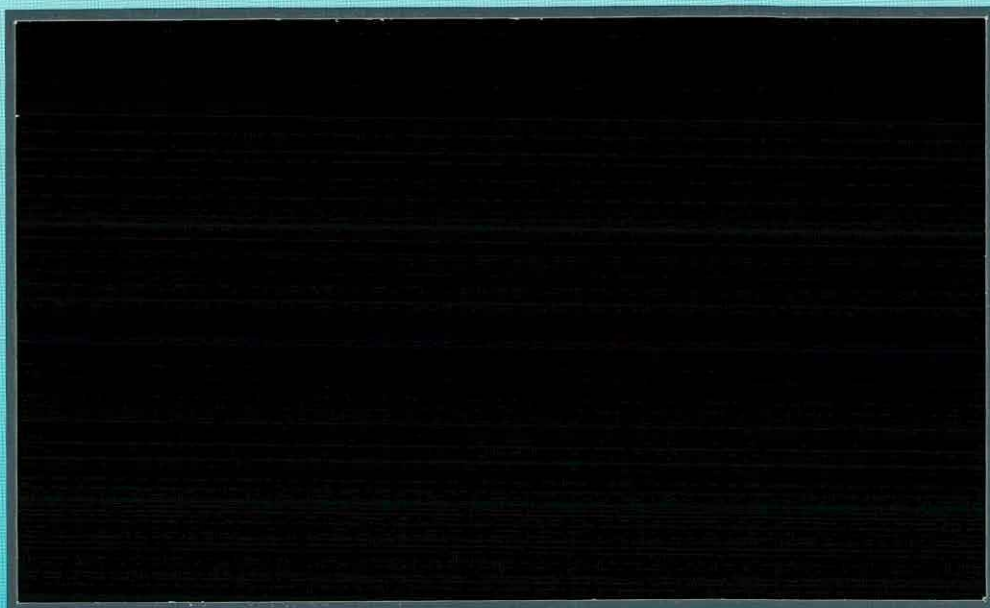


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21 AUG 1992

INSTITUTE OF  
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MERLEWOOD



Institute of  
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Ecology





**ITE** has administrative headquarters north and south, and the geographical distribution of its 250 staff in six Research Stations throughout Britain allows efficient use of resources for regional studies and provides an understanding of local ecological and land use characteristics.

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INSTITUTE OF TERRESTRIAL ECOLOGY

(NATURAL ENVIRONMENT RESEARCH COUNCIL)

Project T02052m5

**COUNTRYSIDE SURVEY 1990**

**MAPPING THE LAND COVER OF GREAT BRITAIN  
USING LANDSAT IMAGERY: A DEMONSTRATOR  
PROJECT IN REMOTE SENSING**

**QUARTERLY REPORT TO THE BRITISH NATIONAL  
SPACE CENTRE**

**AUGUST 1992**

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## INTRODUCTION

This is the eighth progress report, in the series covering this project. The reports have comprised Interim reports in December 1990 and January 1992, and brief quarterly reports in September 1990, May 1991, July 1991, October 1991 and May 1992.

## AIMS OF THE PROJECT

To compile a digital map of land cover in Great Britain: to make quantitative assessments of accuracy; to integrate the map with other data in a GIS environment, including demonstrator output.

## METHODS

The methods were described in the First Interim Report.

## SCHEDULE OF WORK

The schedule of work and progress to date are summarised in Figures 1 and 2. The following paragraphs give brief descriptions of the elements shown in Figure 1.

1. The sample-based field survey (to be used for validation) was successfully completed in late summer 1990.
2. The digitising of field survey maps at ITE Merlewood has been completed for all but about 20 of the 500-plus squares, with completion expected very shortly.
3. The image search and scheduling is now complete, and full coverage of Britain has been identified (Figure 2). It has been necessary to use two summer dates for all of Wales to get reasonably cloud-free summer-cover. Even then, sections of Cornwall and Wales will not be covered by a winter date, and will be classified as summer only data. The winter scene of SW Scotland has much snow and will also include a large proportion of single-date classification. The Shetlands may be classified using only summer data. It seems that such problems are facts of life which we will have to accept when constraining acceptable date of cover to 1990 +/- 2 years.
4. Image orders are complete for all of Britain unless summer only classification of SW Scotland and/or Shetland proves unsatisfactory.
5. Class selection was completed and explained in detail in the second Interim Report (January 1992).

6. Most scenes in stock have now been **geometrically corrected** and the summer and winter images have been made into composites (see Figure 2).
7. **Field reconnaissance** has been completed for all of Britain except southern Scotland.
8. **Training and classification** has been completed for scenes covering some 80% of Great Britain (see Figure 2).
9. **Accuracy assessment** will compare data from the Countryside 1990, 1 km field-survey squares, in their digital form, with the corresponding section of cover map. Data are being delivered to Monks Wood, in ArcInfo vector format which is then converted to Laserscan Horizon format. We have agreed the target correspondence between the many field cover types and the 25 Landsat classes. Progress to date has compared 46 squares out of 120 delivered and further 54 have been processed from ArcInfo vector to Laserscan raster and only await raster-to-raster comparison. Initial rates of analysis have not matched early expectations. However, a streamlined methodology has been developed and it is still intended to complete comparison of 256 squares within the final phase of the project.

Initial assessments of the results show approximately 70% correspondence between field and Landsat maps. In addition to the normal pixel-by-pixel scores for all pixels, there is a need to distinguish between within-field misclassification and boundary misclassification. Vector GIS boundaries are converted to raster outlines and all such boundary cells are then omitted in a second field-map to Landsat-map comparison. This raises the level of correspondence to about 75%. Differences are explained by many factors, including error in either survey, differences in target classes, differences of interpretation, spatial generalisation of field maps, geometric misregistrations, and the artificial 25 m quantisation imposed by raster data. A full assessment of errors will be made for the final report.

10. **Building a mosaic of full GB land cover** has continued, with the data stored as 100 km tiles (Figure 3). These are made as 'jigsaws' from the appropriate sections of each scene. As a scene-classification is completed, the sections are 'cut out' and stored in their 100 km tile. Building the mosaic will simply involve butt-joining the tiles.
11. **Hard copy production** was discussed in the last Interim report. Future outputs require a rationalisation of colours to reflect the similarities and differences between habitats and to maximise distinctions between key classes. New versions of the colour maps will be made once cover is complete.
12. **GIS demonstration** work continues using the 75 km x 50 km test area of cover-map centred on the Thames estuary. Various experiments will use overlaid thematic and topographic data which are currently being registered with the cover map.

The cover data will also be summarised, as 1 km grid data, recording broad distributions of landscape components. This summary will be

built into the Countryside Information System, a user-accessible, microcomputer-based, database for applications purposes. The data, combined with the ITE field survey summaries, will also improve cover-estimates derived from the latter, and allow sophisticated interrogation of the integrated datasets.

13. **Pattern analysis** will examine patch size, size frequency, perimeter length, fragmentation and isolation, boundary length, density and diversity. These concepts can be readily defined in vector and the appropriate measures will be applied to sample areas representing a variety of landscapes in Britain.

In order to analyse pattern at the national scale, summaries at 1 km square level are favoured. Measures which can be calculated readily from full resolution raster data and which, it is proposed, will be summarised at 1 km level in the Countryside Information System are:

1. **diversity** - number of cover types per 1 km square or a diversity index (eg Shannon) which takes cover into account
2. **boundary length per class per square**
3. **pairwise boundary combinations** (but with class list aggregated to 11 major types and with only ecologically meaningful pairs selected)
4. **cover within fixed distances** - of 4 aggregate cover types, selected as being of key ecological importance (water, moor/heath/bog, deciduous woodland and bracken)

It is also proposed to undertake a small number of demonstrator projects in ecology to show how far landscape cover patterns can be related to population dynamics, distribution, dispersal and other important ecological variables. In addition, a number of other collaborative studies are underway (see Second Interim Report) which will form relevant examples of landscape pattern analysis in other areas of applied environmental research.

## CONCLUSIONS

The rate of production continues to match original intentions. We still expect the successful and timely completion of the project, with excellent levels of detail and accuracy.

## FORWARD LOOK TO FIFTH QUARTER

The aims for the quarter, mid-August 1992 to late October 1992 will be to:

1. complete classifications of 3 scenes covering Cornwall, N and S Wales
2. extract 100 km squares of above data

3. geometrically correct and co-register scenes for S Scotland
4. complete field reconnaissance of S Scotland
5. develop preliminary classification of SW Scotland and Shetland
6. develop raster-based measures of landscape pattern
7. compare a further 80 pairs of field and Landsat 1 km squares
8. refine analyses of 1 km comparisons



## LIST OF FIGURES

- Figure 1. Planned schedule of activities and progress to date (black bars), 17 August 1992.
- Figure 2. Status of image acquisition and processing, 17 August 1992.
- Figure 3. Status of 100 km squares of land cover information, 17 August 1992.

Figure 1. Planned schedule of activities and progress to date (black bars), 17 August 1992.

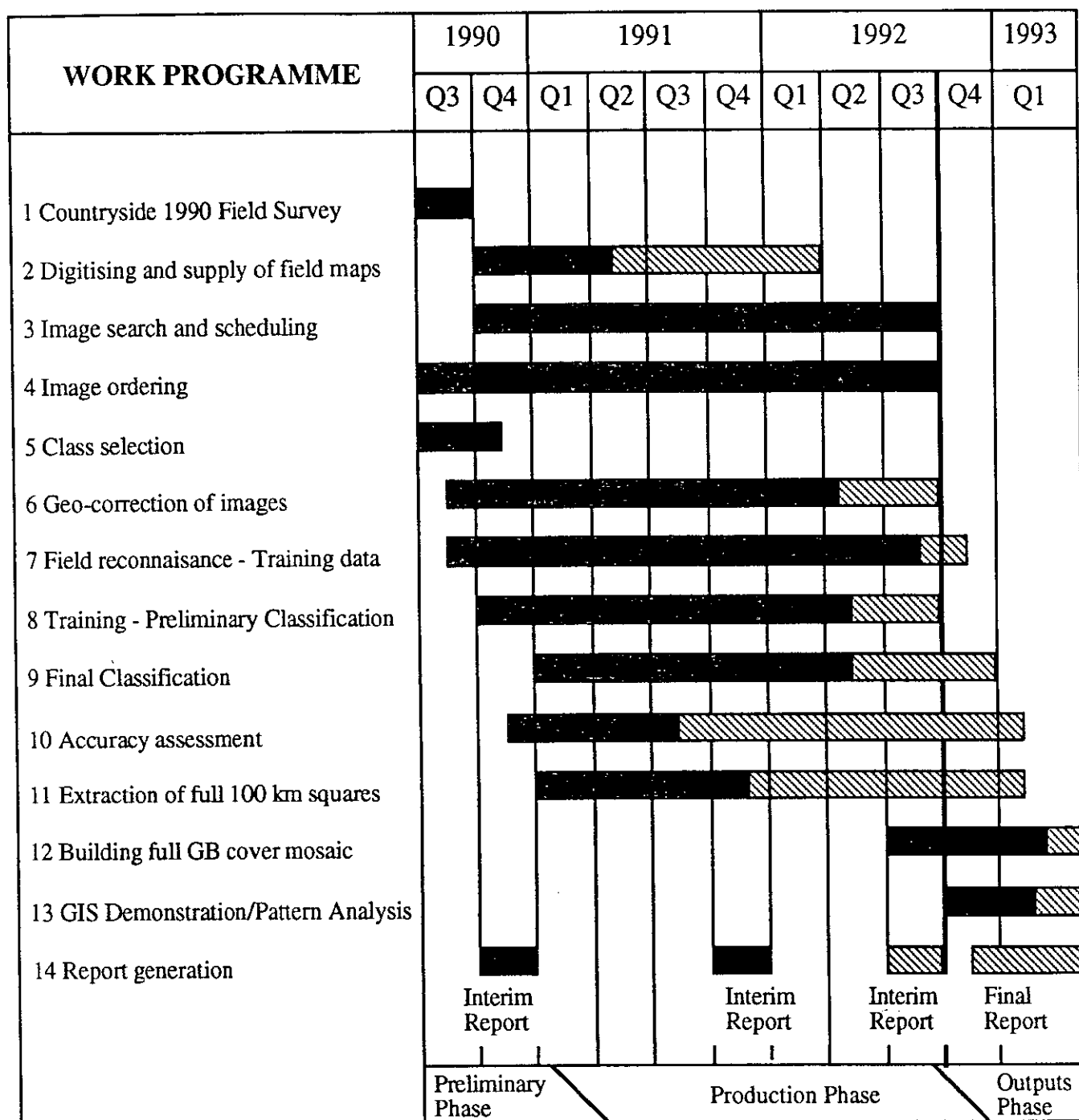


Figure 2 Status of image acquisition and processing, 17 August 1992.

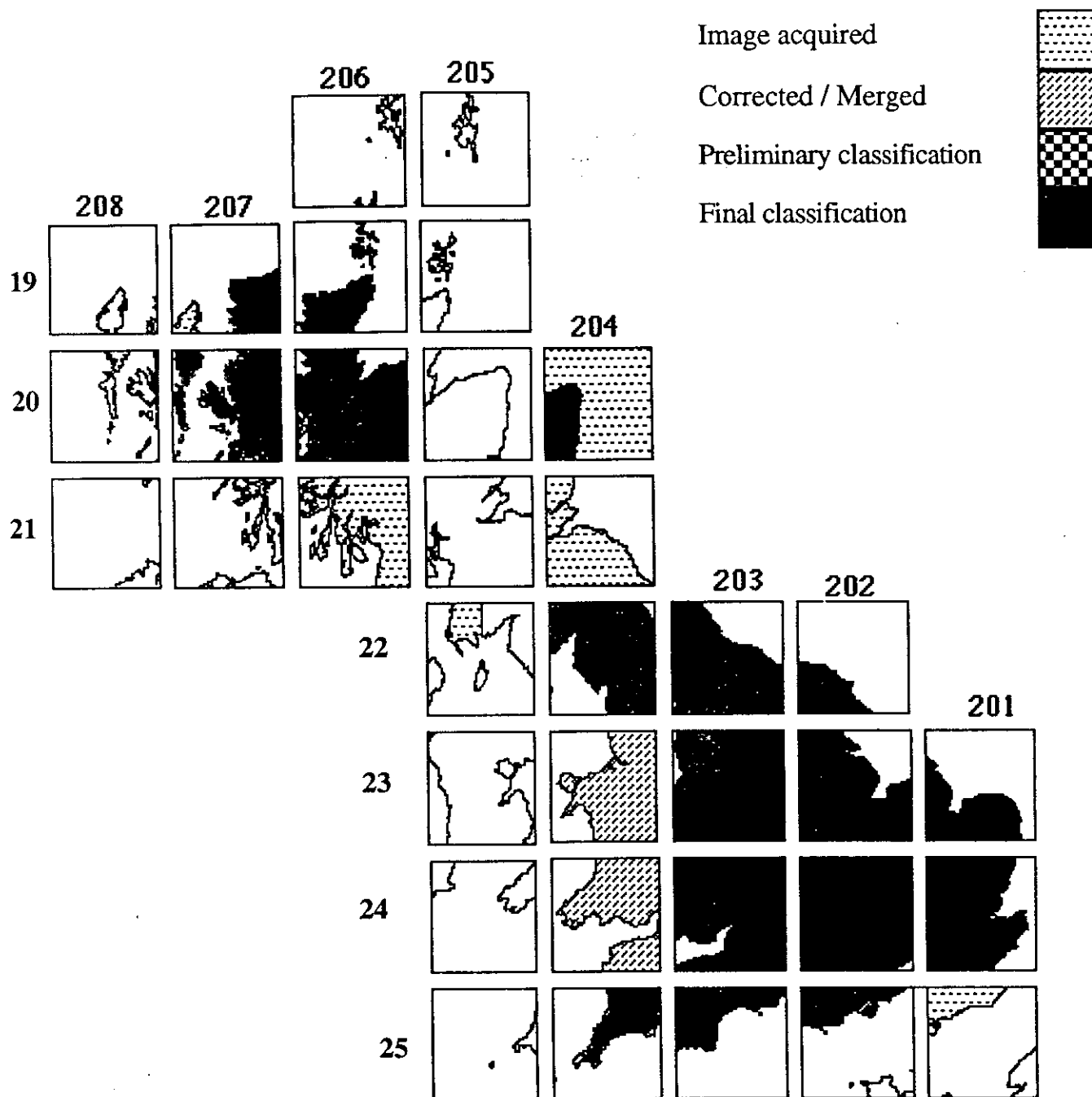


Figure 3. Status of 100 km squares of land cover information, 17 August 1992.

