Countryside Survey 1990

SUMMARY REPORT

DEPARTMENT OF THE ENVIRONMENT

Countryside Survey 1990

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Countryside Survey 1990 was carried out by the Institute of Terrestrial Ecology (ITE) and the Institute of Freshwater Ecology (IFE), with soil surveys by the Soil Survey and Land Research Centre and Macaulay Land Use Research Institute.

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A report prepared for the Department of the Environment by the Institute of Terrestrial Ecology, a component body of the Natural Environment Research Council.

A supporting technical document "Countryside Survey 1990 - Main Report" is also published by the Department of the Environment (see page 24 for further details).

DIRECTORATE OF RURAL AFFAIRS

DEPARTMENT OF THE ENVIRONMENT

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CONTENTS

Ten key points 1
Countryside policy 2
Landscape types 3
The British countryside from space 5
Using the land cover map 7
Land cover change from the ground 8
Combination of satellite mapping with field survey in detail 9
Field boundaries 10
Plant diversity in fields, woods and moors 12
Plant diversity in hedgerows 14
Plant diversity in road verges 15
Plant diversity in stream banks 16
Biodiversity in the wider countryside 17
Freshwater animals and water quality 18
Main points from Countryside Survey 1990 19
Countryside Information System 24
Further Information 25

TEN KEY POINTS

1. Countryside Survey 1990 involved a field survey of 508 1 km squares, 11,500 vegetation plots and 360 watercourses. At the same time images of the ground were obtained from space by satellite. The data collected comprise one of the most comprehensive stock-taking exercises of the British countryside ever completed.
2. Computerised databases from the survey are presented in a Countryside Information System and a satellite Land Cover Map of Great Britain. Data are provided for the whole of Britain and for particular areas such as counties and National Parks.
3. Previous surveys, of vegetation composition in 1978 and land cover and field boundaries in 1984, looked at 256 1km squares and 384 1 km squares, respectively. In 1990, the same sites were re-surveyed, plus an additional 124 new 1 km squares. The repeated squares have been used to measure change in the resources of the countryside.
4. Between 1984 and 1990 there were some significant changes in the agricultural use of the land, including a decrease in the overall extent of tilled land by 4%.
5. The area of many types of semi-natural habitat was much the same in 1990 as in 1984 but this overall balance was maintained by a pattern of losses and gains.
6. Between 1984 and 1990 there were reductions in the length of hedgerows and walls, and overall a 4% loss of field boundaries.
7. Between 1978 and 1990 there was an decline in the diversity of plant species in the general countryside (as measured by the average number of species in a standard plot). Plants characteristic of semi-natural habitats were lost.
8. Linear features - hedges, verges and streams - held a greater diversity of plant species than open fields, woods and moors. In particular they often contained meadow plants not present in the fields which they surrounded. The plant species diversity of linear features also declined between 1978 and 1990.
9. Changes in land cover and reductions in species diversity were generally greater in the lowlands than in the uplands.
10. The quality of watercourses, as determined by the freshwater animals present, was higher in the uplands than in the lowlands.

The British countryside is dynamic - crops are rotated, grasslands are improved for livestock and woods are planted and felled. The economic pressures on land continue to change, and the value placed on our landscape and wildlife has increased. Policy decisions, which may affect the rural environment, need to be informed by a knowledge of what is happening to the fields, woodlands, hedgerows, verges and streams that make up the fabric of our countryside.

Countryside Survey 1990 sets out to provide some of this information in the form of an overview of the countryside of Great Britain. Its main objectives were:

- **to record the stock of countryside features in 1990, including information on land cover, landscape features, habitats and species;**
- **to determine change by comparison with earlier surveys in 1978 and 1984;**
- **to provide a firm baseline, in the form of a database of countryside information, against which future changes could be assessed.**

It was a survey of the countryside in its widest sense, which concentrated on those common features and habitats which are most likely to influence our views and experiences. Unlike most other surveys of the countryside it was not aimed at any special interest such as agriculture, forestry or nature conservation.

Thus, Countryside Survey provides a standardised and reliable set of data as a contribution to a wider debate on the causes, consequences and directions of countryside change. This report summarises the main results of the survey.

Countryside policy

The period 1978 to 1990 saw many changes in countryside policy. Laws to protect species and habitats were strengthened and many incentives for conservation were introduced. At the same time, support for agricultural intensification was adjusted and measures to reduce over-production were implemented.

The results from Countryside Survey come at a time of major reform of the Common Agricultural Policy - a key influence on agriculture and the countryside. There is also an increasing awareness of the value of the wider countryside as a national resource for recreation and wildlife. It is now widely recognised that the conservation of many rare species and habitats in protected sites cannot be considered in isolation from the surrounding countryside.

The importance of the wider countryside was highlighted in the 1990 Environment White Paper -"This Common Inheritance" which spelled out the Government's plans for protecting the countryside. The White Paper emphasised the Government's commitment to providing a statistical report on the state of the environment and to a process of decision making in which policies are based on well established facts, not on hearsay. The publication of this report, and the full survey results on which it is based, forms part of this process.

The 1993 Science and Technology White Paper - "Realising our potential" stresses the importance of quality of life, in which the quality of our countryside has such a vital role.

Countryside Survey contributes to the Government's Biodiversity Action Plan produced as part of the UK commitment to the Biodiversity Convention agreed at the "Earth Summit" in Rio in 1991. The plan aims to turn concern about the loss of global biodiversity into practical action to conserve biodiversity in the UK.

SOME DEFINITIONS

Land use refers to the main activity taking place over an area of land. This may be farming, forestry or recreation, for example.

Land cover refers specifically to the make up of the land surface - whether it comprises arable crops, trees or buildings and so forth.

Habitats are places in which particular groups of plants and animals live, for example an oak woodland or a heather moorland.

Semi-natural vegetation refers to communities of native plants which, though modified by human activity, are similar in structure to natural communities; for example chalk grassland or lowland heath.

Landscape types are broad-scale divisions of the countryside into areas which have similar characteristics of geology, altitude and climate and generally similar patterns of land use, land cover and wildlife habitats.

* * * *

Definitions of land cover and comparison of different survey methodologies are the subject of a separate study funded by the Department of the Environment. Further details are given in the main report of Countryside Survey 1990.

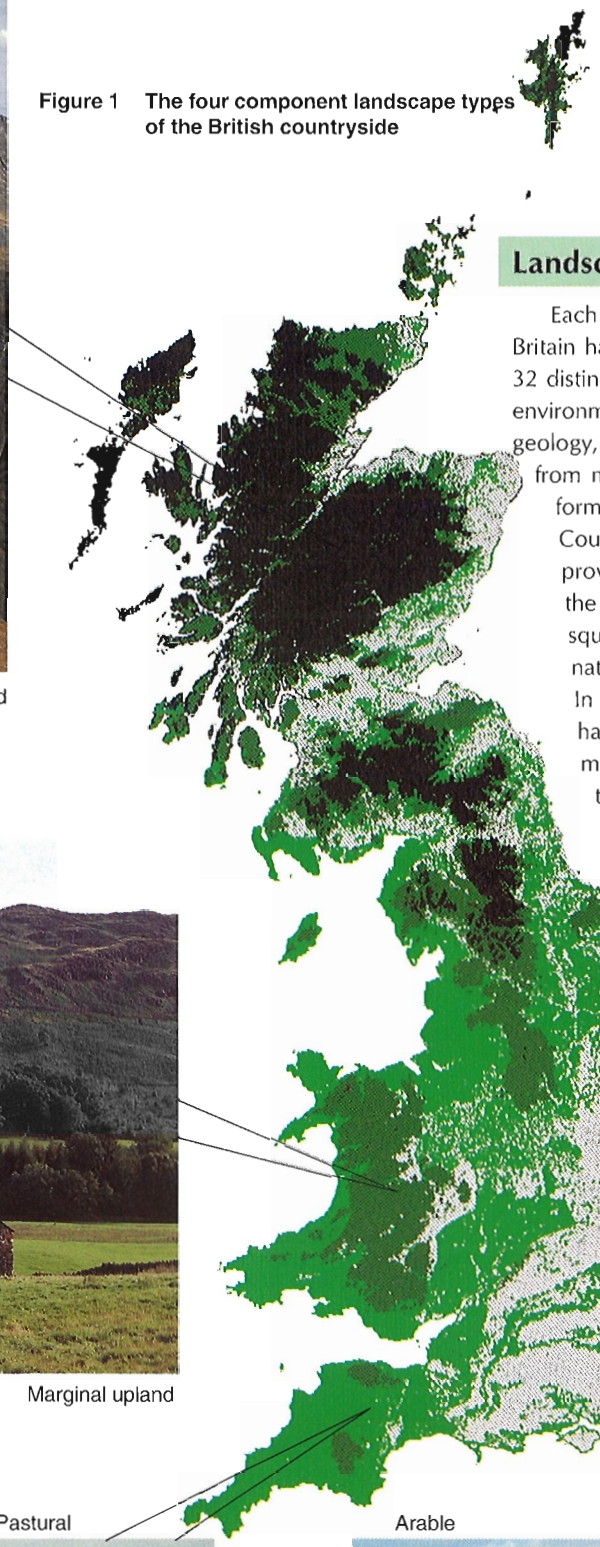
Upland

Marginal upland

Pastural

Arable

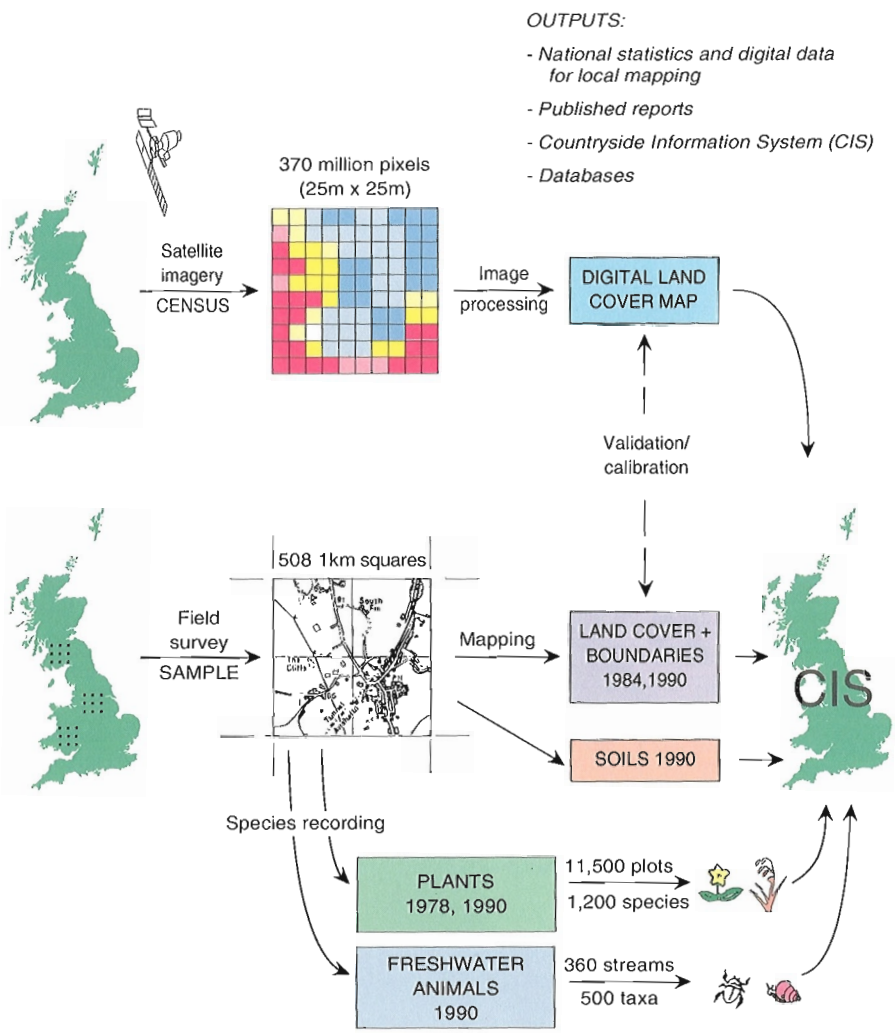
Figure 1 The four component landscape types of the British countryside



Landscape types

Each 1 km square of land in Great Britain has been allocated to one of 32 distinct land classes on the basis of environmental characteristics such as geology, altitude and climate derived from maps. The land classification formed the sampling structure for Countryside Survey 1990 and provided the framework by which the sample survey of 508 1 km squares was used to make national and regional estimates. In this report, the 32 land classes have been grouped into four major landscape types: two in the lowlands - arable and pastural landscapes; and two in the uplands - marginal upland and upland landscapes (Figure 1).

Figure 2 The integrated approach



Mapping from satellite

A unique Land Cover Map of Great Britain has been developed from high resolution satellite images. This is the first time since the 1960s that the land cover has been mapped in full. The map shows structural detail such as waterways, urban developments, embankments and belts of trees. General patterns are shown at the field-by-field scale.

The land cover map shows the dominant land cover for each 25 m x 25 m area (pixel) of Great Britain. Land cover was classified into 17 key types. It was produced using cloud-free images from the Landsat satellite, between 1988 and 1991. Summer and winter satellite data were combined to enhance the seasonal differences in the various cover types.

Field survey

A stratified random sample of 508 1 km squares was visited by survey teams. The squares were taken from all rural areas of Great Britain, excluding any square with over 75% urban land. A team of two ecologists spent between four and six days in each square:

- mapping land cover on a field-by-field basis;
- recording landscape features, such as walls, hedges and individual trees;
- recording plant species in random plots located in fields, woodlands and linear features (hedgerows, roadside verges and stream banks); and
- sampling freshwater animals (macro invertebrates) in streams and watercourses.

Soil surveyors also mapped the soil types in each square.

Similar surveys by ITE in 1978 and 1984 were used to assess change. Changes in land cover and length of field boundaries were determined by comparing maps of the same 1 km squares surveyed in 1984 and 1990. Changes in the composition of vegetation were measured using the same vegetation plots surveyed in 1978 and 1990. About 20 vegetation plots (200 m^2 in fields and 10 m^2 in linear features) were located at random in each 1 km square.

Quality control

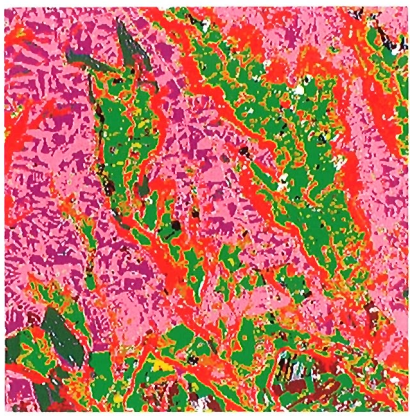
Rigorous quality control was undertaken throughout the work to ensure that the results were objective, reliable and repeatable. All surveys are subject to errors, but in this study these have been measured and are published in full in the main report. This summary report presents the main, statistically significant, results from the survey.

The British countryside from space

The land cover map shows the predominantly agricultural nature of the British countryside, half of which is tilled or managed grass (Figure 3). But large areas of the country, particularly in upland areas, which are predominant in Wales and Scotland, are covered by semi-natural land cover types.

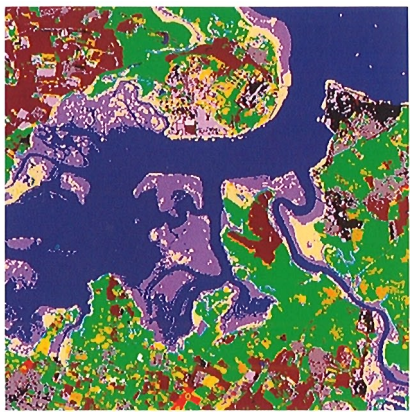
Heath, moorland and bog make up over a half of Scotland, a fifth of Wales and a tenth of England (Table 1 and Figure 4). In total 8% of Great Britain is wooded - predominately broadleaved and mixed woodland in England and Wales, but mostly coniferous woodland in Scotland.

Figure 3 The Land Cover Map of Great Britain



North York Moors

Medway Estuary



Footnote:

* The generalised picture of land cover as seen from space may not correspond with the detailed interpretation of land cover as recorded by field surveys.
* The urban land total includes all built development in urban and rural areas but does not include any areas of grassland, woodland or water greater than about 0.1 ha.
* Broadleaved woodland includes some deciduous conifer trees, such as larch.

Figure 4 Land cover of England, Scotland, Wales and Great Britain from satellite

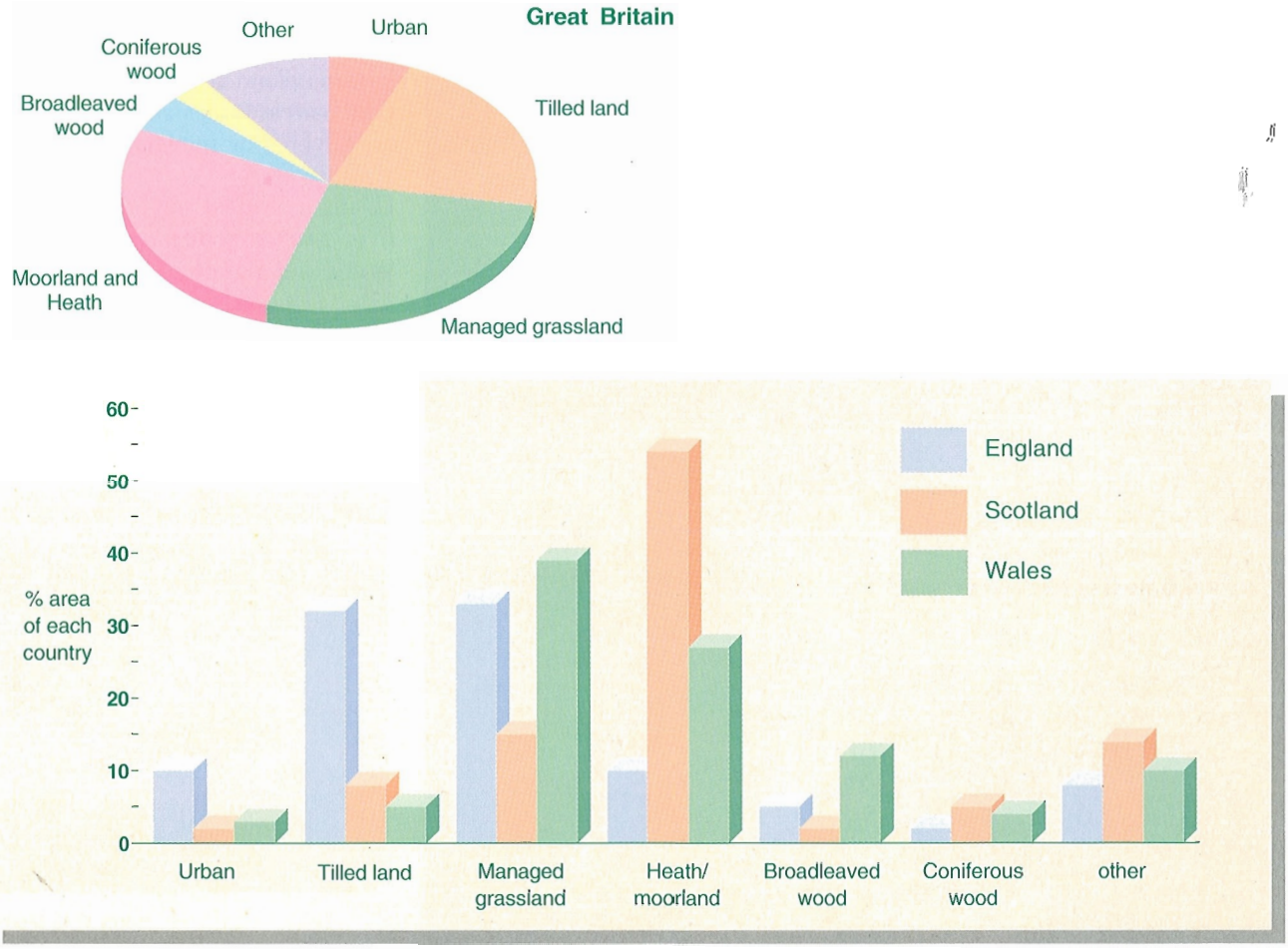


Table 1 Land cover of Great Britain from satellite: the 17 key land cover types

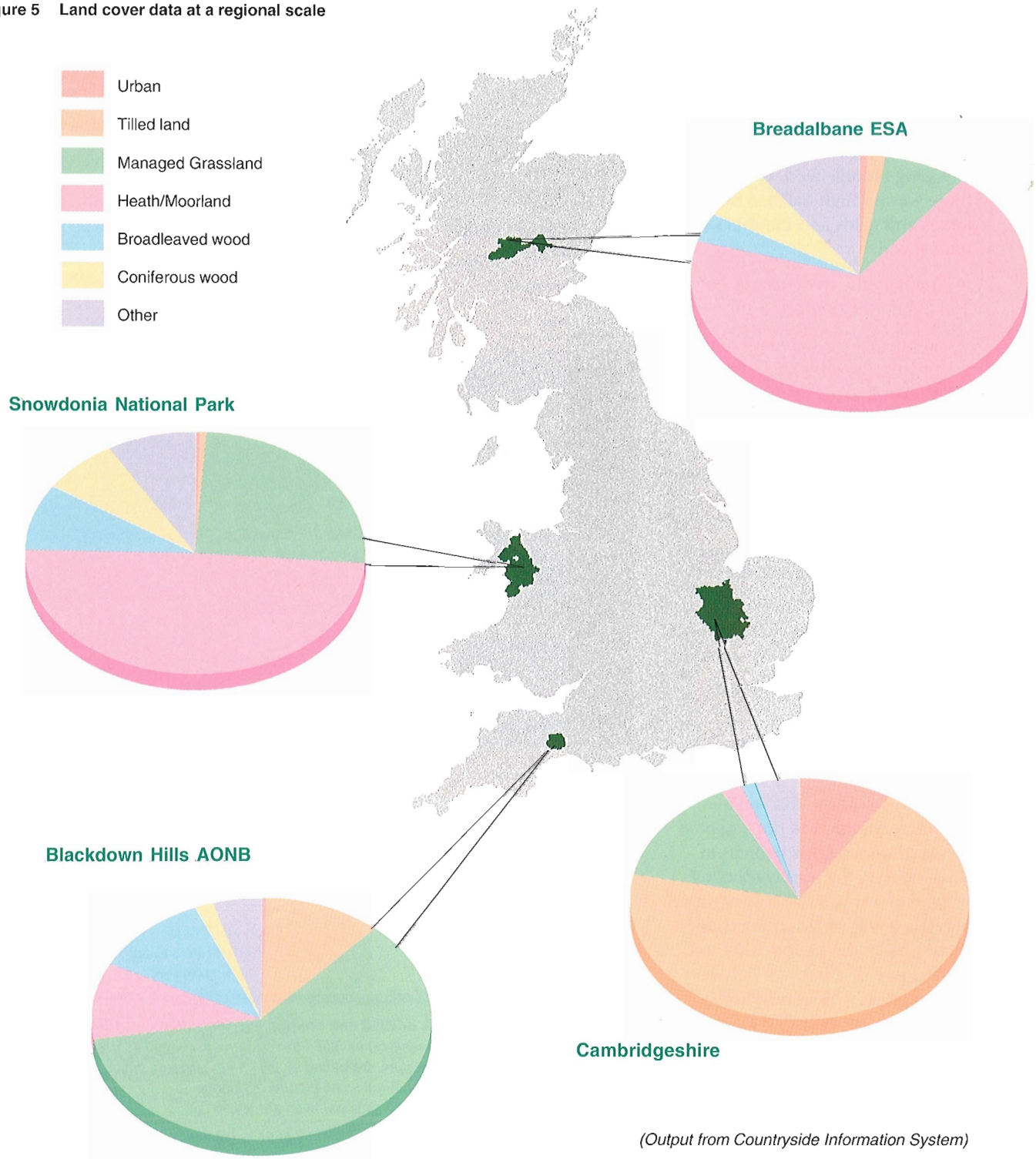
COVER TYPE	ENGLAND '000 km²	SCOTLAND '000 km²	WALES '000 km²	GREAT BRITAIN '000 km²	GREAT BRITAIN %
Urban	2.4	0.1	0.1	2.6	1.1
Suburban	11.1	1.3	0.6	13.2	5.5
Tilled land	43.1	6.9	1.1	51.3	21.4
Managed grassland	44.5	13.0	8.2	65.7	27.3
Rough grass/marsh	2.0	1.7	0.7	4.3	1.8
Bracken	1.3	1.2	1.2	3.6	1.5
Moorland grass	7.6	10.7	2.0	20.2	8.4
Open shrub heath/moor	2.3	24.0	1.5	27.9	11.6
Dense shrub heath/moor	1.2	5.4	0.6	7.2	3.0
Bog	0.3	3.8	0.2	4.3	1.8
Broadleaved/mixed wood	7.9	1.9	2.5	12.3	5.1
Coniferous wood	2.2	4.7	0.9	7.7	3.2
Bare ground	1.0	1.4	0.1	2.6	1.1
Saltmarsh	0.3	0.1	0.1	0.4	0.2
Beach/mudflats	0.7	0.6	0.1	1.4	0.6
Inland water	0.4	1.2	0.1	1.7	0.7
Sea/estuary	1.9	5.2	0.6	7.7	3.2
Unclassified	3.1	1.9	1.1	6.1	2.6
TOTAL AREA	**133.7**	**85.0**	**21.6**	**240.2**	**100.0**
LAND AREA	**131.4**	**78.6**	**20.9**	**230.8**	**96.1**

Using the land cover map

The satellite land cover map can also be used to give a description of land cover in smaller areas. Figure 5 shows the land cover make-up of four contrasting areas of Britain. Cambridgeshire is dominated by tilled land. The Blackdown Hills Area of Outstanding Natural Beauty in south west England has a high proportion of managed grassland. Snowdonia National Park in Wales and Breadalbane Environmentally Sensitive Area in Scotland are both dominated by heath and moorland.

Not only does the land cover map record the location and extent of each cover type, but it also contains information about the patterns and fragmentation of land cover which are often important for wildlife.

Figure 5 Land cover data at a regional scale



(Output from Countryside Information System)

Land cover change from the ground

The field survey gives more detailed information about land cover than the satellite land cover map and, using the squares surveyed in both 1984 and 1990, provides estimates of changes in land cover over the six-year period. The field survey results are summarised in 58 land cover types (Table 2).

The net change in each land cover type was made up of the balance between losses and gains (Figure 6). Overall 87% of the country stayed in the same broad land cover type and most of the large changes were typical of agricultural rotations between crops and grassland. In many semi-natural vegetation types, including broadleaved woodlands, there was a rough balance between losses and gains and the totals are unchanged.

In summary the net changes between 1984 and 1990 were;

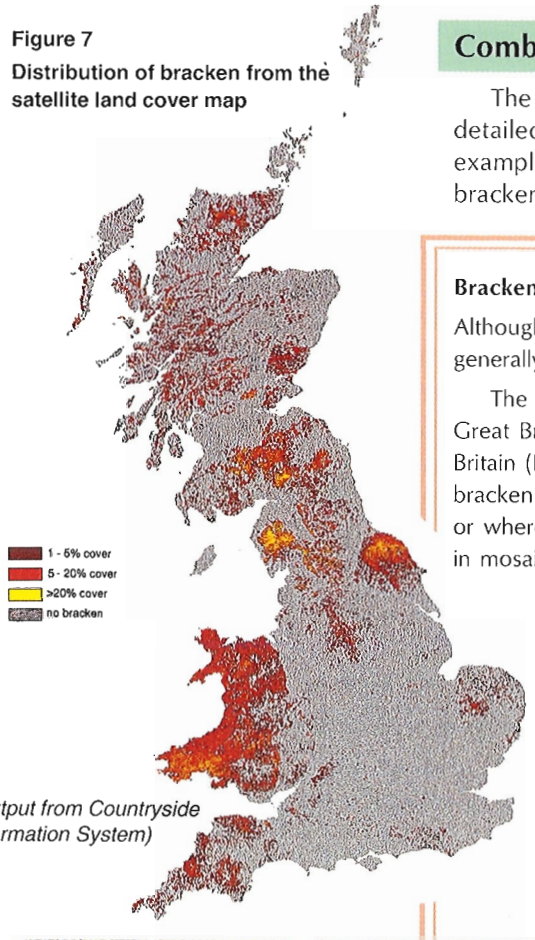
- an overall 4% decrease in tilled land, mostly of barley crops which decreased by 33%, but including an increase in minor crops such as maize and linseed;
- a decrease of intensively managed types of grassland and an increase in weedier, unmanaged grasslands;
- doubling in non-cropped arable land (typically land set-aside from cereal production);
- a 4% net increase of built up land in the countryside;
- a 5% net increase in conifer woodland;
- little net change in the area of many semi-natural vegetation types.

The results from this survey contrast with the well documented losses of semi-natural habitats in Britain during the post-war period. Instead of a wholesale loss of these habitats in the wider countryside there was, in the period 1984 to 1990, more of a balance between loss and gain. This equilibrium, however, is not reflected in hedges and other field boundary types nor has it prevented the loss of plant species diversity.

COVER TYPE	AREA 1990 '000km²	CHANGE 1984-1990 -100% 0 +100%
TILLED LAND		
Wheat	22.3	
Barley	11.5	*
Oats	0.9	
Other cereals	0.3	
Maize	0.4	(350%)
Turnips/swedes	0.7	
Kale	0.5	
Oil-seed rape	4.1	
Other crucifer crops	0.3	(1,000%)
Peas	1.1	
Field beans	1	
Other legumes	0	
Sugarbeet	2.2	
Other root crops	0.1	
Potatoes	1.4	
Other field crops	1	(600%)*
Horticulture	0.4	
SUB-TOTAL	**48.1**	
MANAGED GRASS		
Recreational grass	2.5	
Recently sown grass	7.1	*
Pure rye-grass	20.3	
Well managed grass	19.3	*
Weedy swards	9.9	(150%)*
Unimproved grassland	2	
Calcareous grass	0.7	
Upland grass	6.1	
Maritime vegetation	0.3	
SUB-TOTAL	**68.2**	
ROUGH GRASS/MARSH		
Ploughed/fallow	3.5	(250%)*
Tall herb	2.7	*
Felled woodland	0.4	(150%)*
Wetland	3.7	*
Waste land	0.4	
Dense bracken	3.7	
Purple moor grass	3.7	
Other moorland grass	8.1	
Dune	0.2	
SUB-TOTAL	**26.4**	
HEATH/BOG		
Wet heath and bog	16.6	
Open-canopy heath	8.2	
Berry-bush heath	1.2	
Drier northern bogs	5.2	
Dense heath	4.5	
SUB-TOTAL	**35.7**	
BROADLEAVED WOOD		
Perennial crops	0.7	
Mixed woodland	2.2	
Broadleaved woodland	9.2	
Shrub	0.9	
SUB-TOTAL	**13**	
CONIFER WOODLAND		
SUB-TOTAL	**13.7**	
BUILT UP		
Railway	0.4	
Roads	4.4	
Agricultural Buildings	1.4	
Residential Buildings	6.8	*
Other Buildings	3	*
Unsurveyed urban land	4.8	
SUB-TOTAL	**20.8**	
OTHER		
Inland water	2.9	
Coastal unvegetated	1.8	
Saltmarsh	0.4	
Rocks/quarries	0.6	
SUB-TOTAL	**5.7**	
TOTAL	**231.8**	

Table 2. Land cover stock in 1990 and change between 1984 and 1990
The 1990 stock figures are based on all 508 1 km squares surveyed in 1990.
The 1984 to 1990 change statistics are based on 381 1 km squares which were surveyed in both years. This gives the most accurate picture of change.
Changes which are significant at a national level are shown by *.

Figure 7
Distribution of bracken from the satellite land cover map



(Output from Countryside Information System)

Combination of satellite mapping with field survey in detail

The Countryside Survey 1990 databases allow great flexibility for more detailed analyses on particular habitats, landscape features and species, for example: ponds, heather or bracken. An example of further analysis of bracken is given below.

Bracken

Although bracken can provide a habitat for rare butterflies and other insects, it is generally regarded as an invasive weed.

The total area of bracken as measured by satellite was 3603 km² or 1.5% of Great Britain (Table 1) and bracken was most common in western and northern Britain (Figure 7). Although the satellite can be used to map areas of dense bracken it cannot distinguish bracken growing in mosaics with other vegetation or where it occurs beneath a tree canopy. More detailed information on bracken in mosaics was obtained from the field survey:

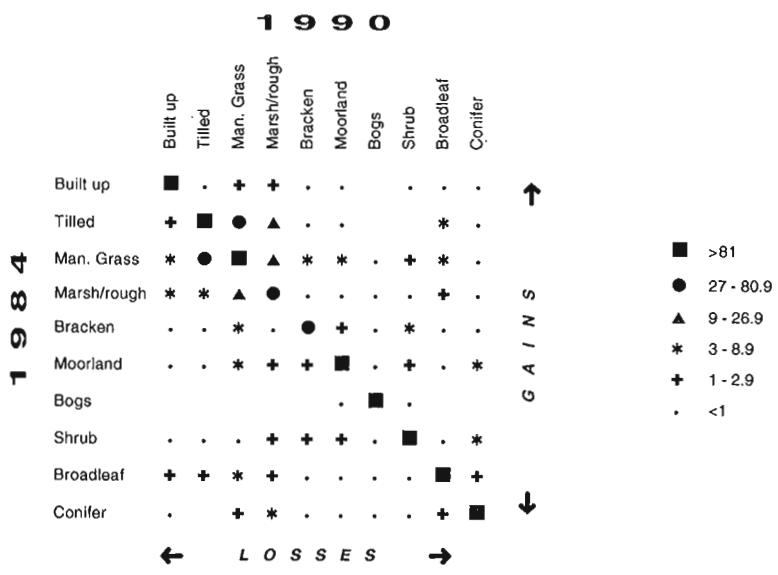
	km²	% of GB
Open areas with dense bracken[1]	4760	2.0
Open areas with scattered bracken	4280	1.8
Woodland with dense bracken	2260	1.0
Woodland with scattered bracken	5770	2.5
Total bracken	17070	7.3

In addition to affecting 7% of the land area, bracken was also found to be a common component of linear features particularly in the lowlands. Comparison with squares previously surveyed in 1984 showed a decrease in the extent of dense bracken (Table 2) and an indication that some areas of bracken were restored to moorland or heath (Figure 6)

[1]*(The definition of 'open areas with dense bracken' used here refers to parcels of land which contain 'dense bracken' mosaics. These parcels are more extensive than dense bracken alone, as given in Table 2).*

Figure 6. Changes between land cover types 1984-1990

This diagram uses symbols to show how much of one type of land cover changed to another type between 1984 and 1990. The strong diagonal line indicates that most land remained in the same broad land cover type. For example, reading across the bottom row shows that a small amount (*) of conifer woodland in 1984 changed to rough grass/ marsh in 1990 (ie. it was felled). Reading down the righthand column shows that small amounts of moorland and shrub (*) in 1984 had conifers growing in 1990.



Field boundaries

The hedges, walls, fences and other field boundaries which criss-cross the countryside are an important part of the British landscape.

In 1990 the total estimated length of field boundaries was nearly 1.5 million km - enough to go around the earth about 40 times. On average there were about 6.3 km of field boundaries in each 1 km square. Many of these boundaries (30%) contained more than one component, such as a wall beside a fence. Over two thirds of boundaries (72%) contained a fence and almost a third (31%) contained a hedge.

Between 1984 and 1990 there were substantial losses of hedges and walls, but gains in fences and relict hedges. Altogether the total length of boundaries fell slightly (Table 3).

BOUNDARY TYPE	LENGTH 1990 '000km	CHANGE 1984-1990 -100% 0 +100%
Fence only	676	*
Hedge	225	*
Hedge + fence	240	*
Relict hedge	35	*
Relict hedge + fence	49	*
Wall	116	
Wall + fence	75	
Bank	21	
Bank + fence	30	
Other/unclassified	19	*
TOTAL FIELD BOUNDARY	**1,416**	*

(Note: Hedges include hedges besides walls and/or banks)

Table 3 Length of field boundaries in 1990 and change from 1984-90 for Great Britain
Changes which are significant at a national level are shown by *

On average there were about 6.3km of field boundaries in each 1 km square

Walls - 13% of boundaries contain walls, 47% of these were in Scotland and 39% in England. Walls were present in almost a third of all boundaries in the marginal upland and upland landscapes where they were often a prominent feature of the landscape.

The total length of walls decreased by 10% between 1984 and 1990. These losses were concentrated in the marginal upland and arable landscapes. Walls next to fences were twice as likely to be lost than walls on their own.

The total length of walls decreased by 10%

Fences are the most widespread and common boundary component occurring in 72% of all boundaries. Nearly half of all boundaries were formed by fences alone and they were the single most common boundary in all landscape types.

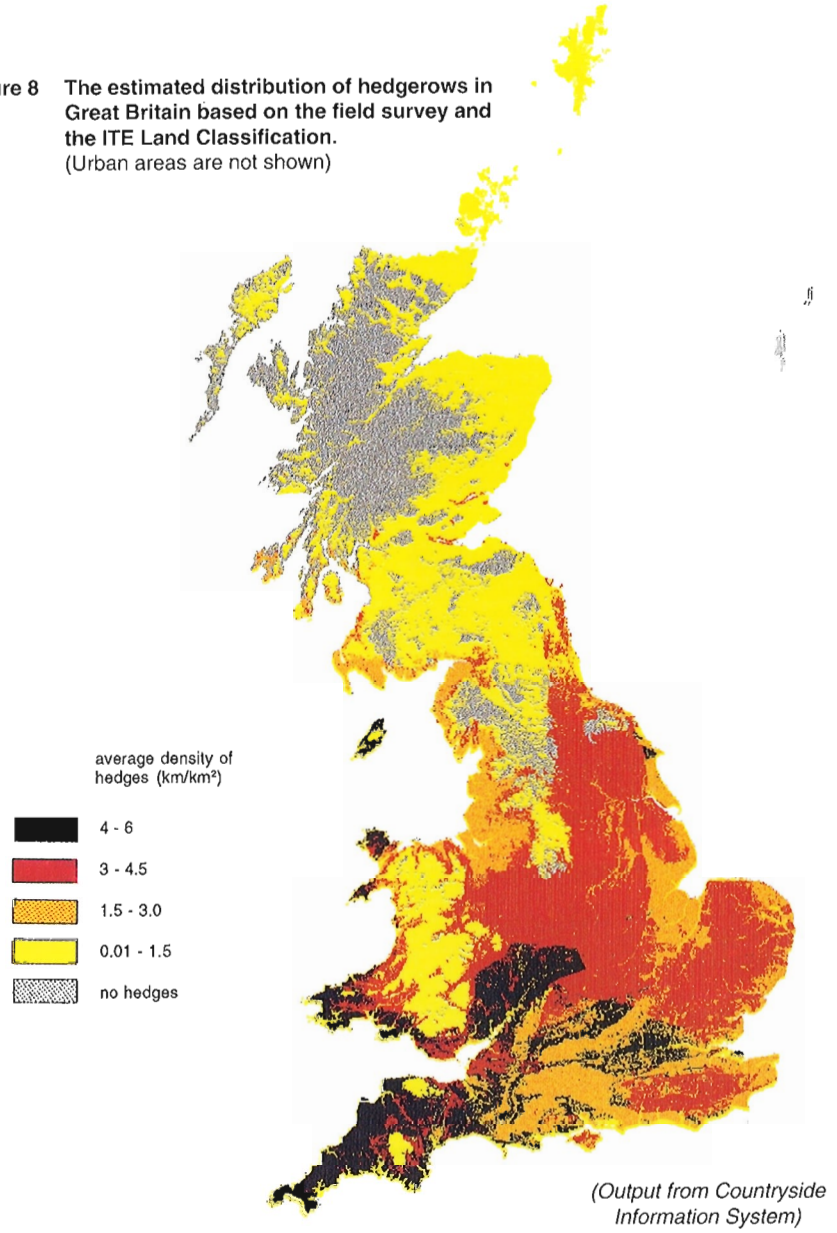
The length of fences increased by 11% between 1984 and 1990. Almost half of these new fences were erected in pastural landscapes with relatively few in the arable and upland landscapes

Hedges - A third of all field boundaries in Great Britain contained hedges and most of these were in England (Figure 8). About half the hedges were found in pastural landscapes. Hedges were often found in combination with other boundary types, particularly fences and banks. Hedges were less common in marginal upland landscapes and almost absent from the uplands.

In net terms, there were 23% fewer hedges recorded in 1990 than 1984. Most of this loss was caused by hedges moving to another boundary type (eg a hedge becoming a line of trees), probably because of declining hedge management. The 23% net loss of hedges represents the balance between gains from new hedge planting and natural hedge regeneration and losses from boundary removal, together with changes to and from other types of boundary (Figure 9).

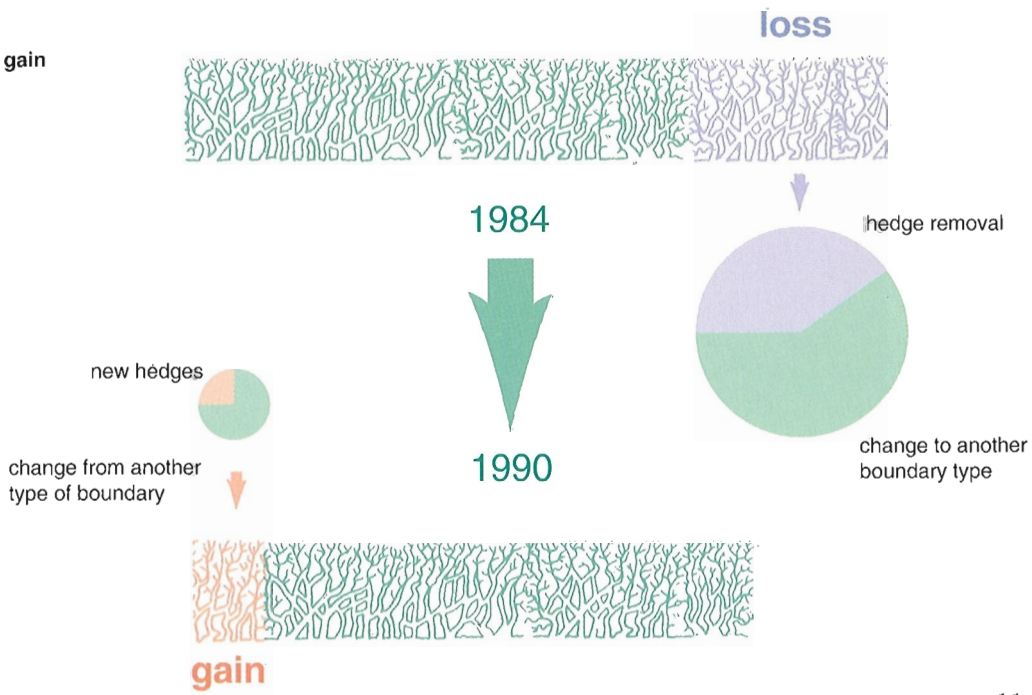
Relict hedges are boundaries that are recognisable as having once been hedges, but have become, for example, rows of trees or shrubs and are no longer stock-proof boundaries. They were present in only 6% of boundaries (mostly in England). The length of relict hedges increased by 55% between 1984 and 1990 mainly as a result of hedges becoming lines of trees.

Figure 8 **The estimated distribution of hedgerows in Great Britain based on the field survey and the ITE Land Classification.**
(Urban areas are not shown)



(Output from Countryside Information System)

Figure 9
Balance of hedgerow loss and gain between 1984 and 1990



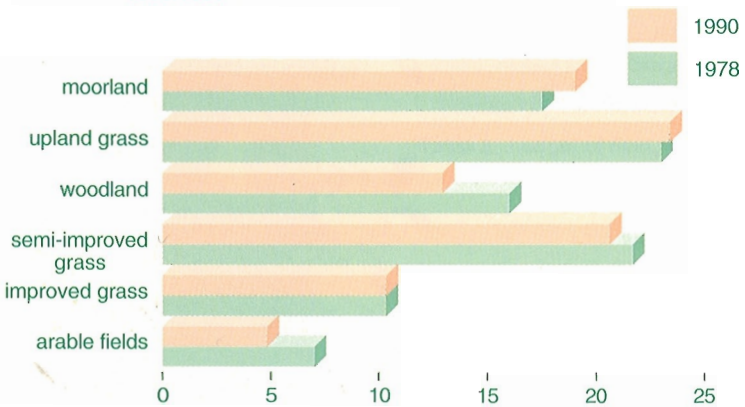
Changes in plant diversity

In addition to the wholesale conversion of one type of land cover, habitat or boundary to another, change in the countryside can also take the form of more gradual, subtle changes in the balance of species within habitats. The loss or gain of flowering plants in meadows is a typical example.

Using the detailed records of plants from the same plots in 1978 and 1990 it was possible to distinguish between those losses and gains in plant diversity due to major changes **between** vegetation types and those due to smaller changes in the species composition **within** vegetation types. Vegetation plots were not recorded in the 1984 survey.

A mathematical procedure (TWINSPAN) has been used to classify each of the vegetation plots into distinct vegetation types characteristic of open fields, woods or moors, hedges, road verges and stream banks.

Figure 10 Change in plant diversity within vegetation types 1978-1990



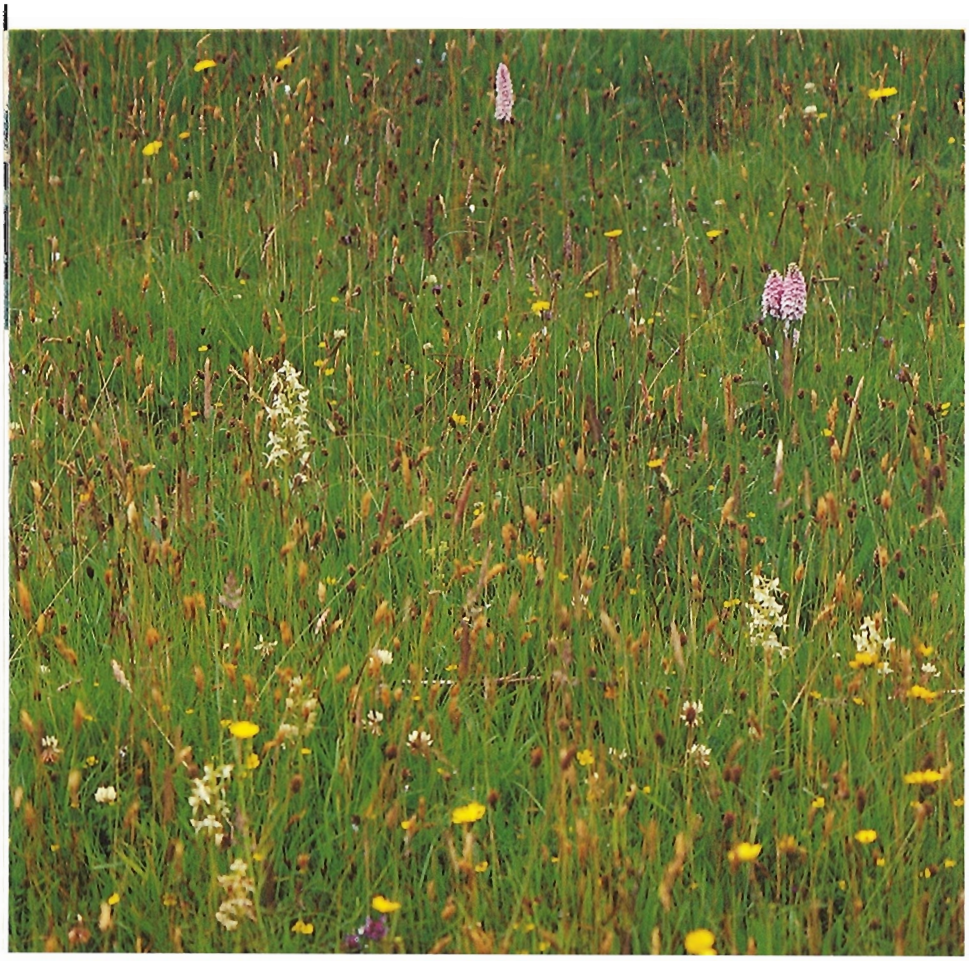
Plant diversity in fields, woods and moors

The vegetation plots from open fields, woods and moors were grouped into six major types of vegetation - arable fields, improved grassland, semi-improved grassland, woodland, upland grass and moorland.

In Britain as a whole, three of these six major vegetation types (arable fields, semi-improved grassland and woodland) showed significant losses of species between 1978 and 1990. Only the moorland vegetation type showed a significant increase in species diversity (Figure 10).

Plots in each of the four major landscapes showed a change in species composition, with an increase in plants typical of intensively managed vegetation. Thus, in arable landscapes there was a net shift towards more intensively managed types of vegetation in almost a third of all plots. Similar, but smaller, shifts were recorded in the other landscape types.

The main changes in the species composition of the six main types of vegetation are summarised on the opposite page.



Gradual intensification of management in a grassland may lead to sensitive species being replaced by invasive weed species.

Changes of species composition within open fields, woods and moors.

Arable fields The loss of species in arable fields was associated with a shift towards plants typical of more intensive use. Thus, broadleaved weeds decreased and grass weeds increased, within cereal crops. Most of the weed species which have declined are common elsewhere, on waste ground for example, but their loss from some fields may have implications for birds and invertebrates which depend on them for food or shelter. Plots from fields in arable landscapes had 30% fewer species in 1990 than in 1978.

Improved grassland No significant changes were recorded.

Semi-improved grassland In arable and pastural landscapes, plots from semi-improved grasslands lost diversity and shifted towards more intensively managed vegetation types. Plots in pastural landscapes had 14% fewer species in 1990 than in 1978. The most pronounced decline was in plants associated with unimproved meadows which include many of the rarer grassland species. Plots from fields in each landscape type had very similar numbers of species in 1978 but by 1990 those in the marginal uplands were clearly more diverse.

Woodlands Woodlands in all landscapes except arable showed a significant loss of species. However, plants more characteristic of disturbed and grassy habitats within woodlands increased, suggesting that woods became more open and grassy.

Upland grassland No significant changes were recorded.

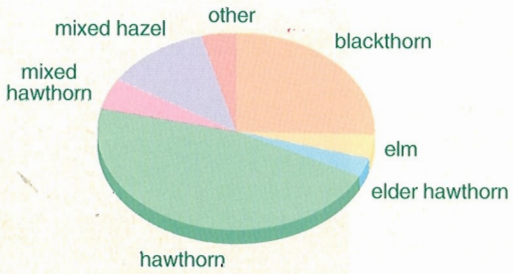
Moorland In moorland plots from marginal and upland landscapes there was an increase in species number. Moorland habitats are inherently species-poor and the species which have increased include both typical moorland plants and those associated with disturbance and enrichment.

Plant diversity of hedgerows

Countryside Survey recorded over 40 species of woody shrub and about 270 herbaceous plants in almost 1000 hedge plots. These plots have been grouped into 7 hedgerow types and 4 ground flora types (Figures 11 - 13). The results confirm that hedgerows are dominated by hawthorn - a consequence of the planting of hedges to enclose fields around 200 years ago. However, the hedgerows also contained many other plant species. The two most diverse types, in terms of tree and shrub species, were the mixed hazel hedges found mainly in pastural landscapes and mixed hawthorn hedges, found mainly in arable landscapes.

Hedgerows provide a habitat for over 300 plant and shrub species

Figure 11 Types of hedgerow in Britain



Shrub species diversity of hedgerows

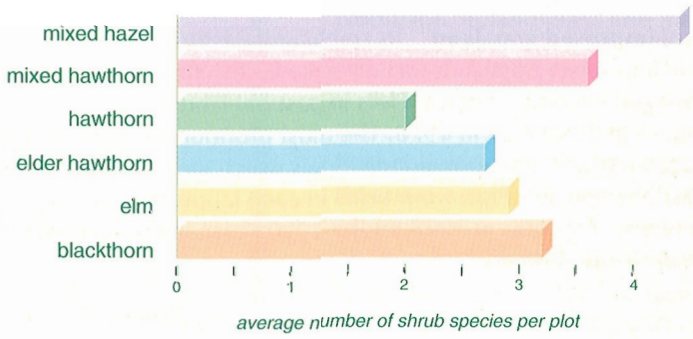


Figure 12 Number of species in hedge plots 1978 - 1990

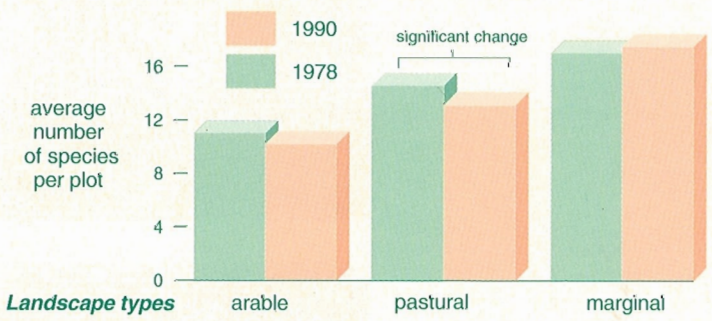


Figure 13 Changes in hedgerow ground flora 1978 - 1990

Comparison of the 1978 and 1990 surveys show:

- no change in the woody species composition of hedge plots despite the reduction in the total length of hedges;

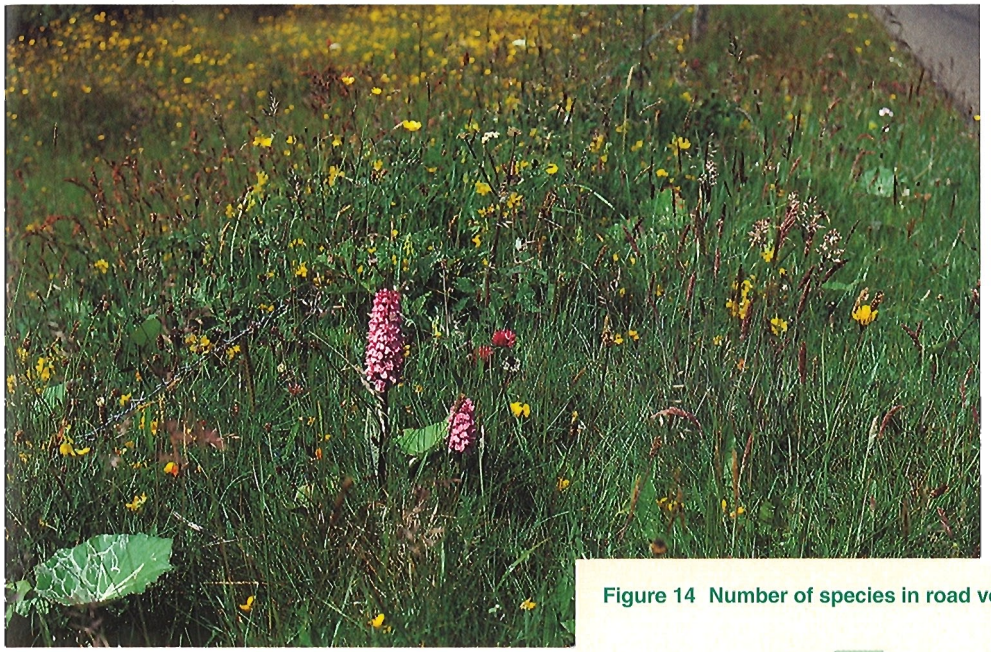
- no significant change in the species richness of hedge plots in arable landscapes, although there was a shift towards plants more characteristic of arable fields;

- a decrease in species richness of hedge plots in pastural landscape types, particularly a decrease in plants associated with meadow and chalk grasslands;

- no significant change in the species richness of hedge plots in marginal uplands.

Plant diversity in road verges

The species composition of road verges is directly affected by changes in management, for example: mowing regimes, road-salting and use of herbicides. Verges are also vulnerable to disturbance from road works, machinery and vehicles which may create bare patches and allow the spread of colonising species.



Road verges rich in meadow species became less common

Almost 2000 verge plots were surveyed in 1990 and grouped into 8 types of verge flora. Species diversity in road verges decreased significantly in arable landscapes, but not elsewhere (Figure 14). Verges rich in meadow species became less common and overgrown verges increased slighty (Figure 15).

In all areas there was some loss of characteristic meadow species. Plants typical of overgrown verges - tussocky grasses, tall herbs, and sometimes scrub - increased in all landscapes except the uplands, where verges were often grazed.

Figure 14 Number of species in road verge plots 1978 - 1990

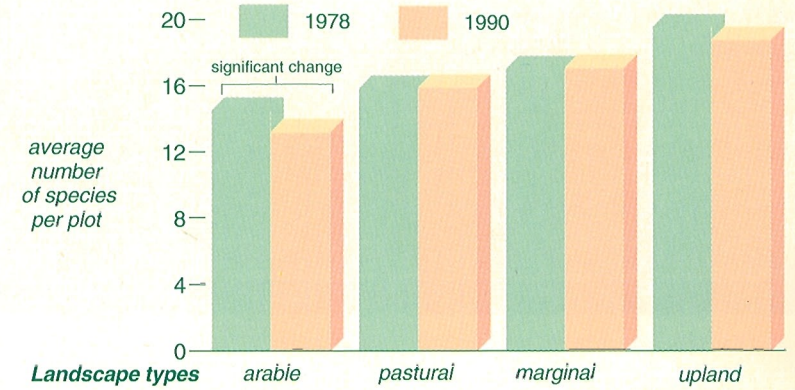
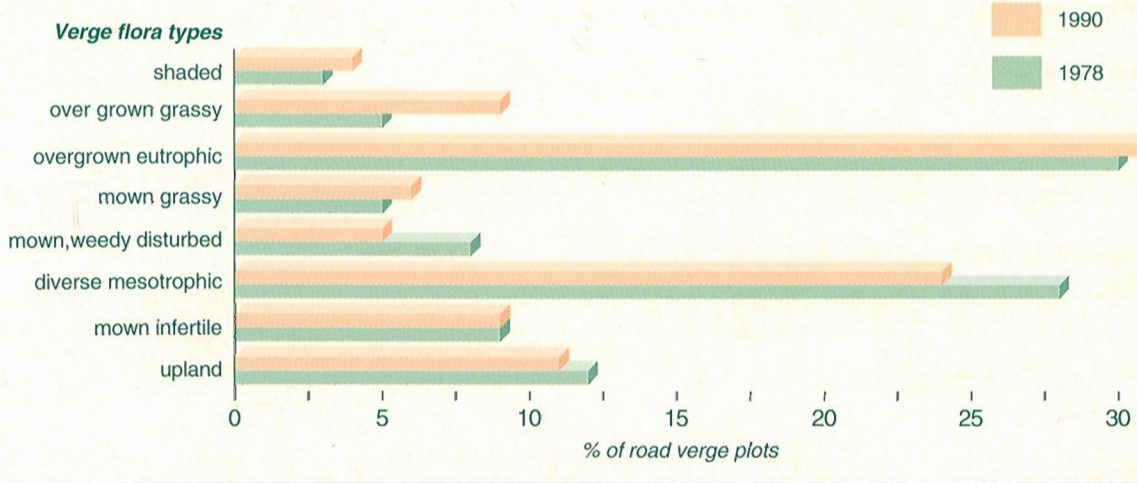


Figure 15 Changes in road verge flora 1978 - 1990



Plant diversity in stream banks

Over 2000 plots were surveyed beside ditches, streams and rivers. These were grouped into 7 types of stream bank flora. The species number decreased in stream bank plots in throughout Britain between 1978 and 1990. These losses were significant in pastural and upland landscapes (Figure 16). Stream banks comprising moorland grass and grazed pasture became less common and there was an increase in overgrown grassland (Figure 17).

In stream bank plots throughout the lowlands, species typical of wet meadows and moist woodlands became less common.

Some of the wetland plants which became less common imply that the habitat dried out. These changes may have been a response to drought conditions prevalent in southern parts of Britain in 1990. However, similar changes were also recorded in the uplands which were not affected by the drought. Furthermore, most of the species which decreased were long-lived perennials which were unlikely to be lost because of seasonal drying. Drought is unlikely to be the whole reason for the changes observed.

Species number decreased in stream banks in all four landscapes.

Figure 16 Number of species in stream bank plots 1978 - 1990

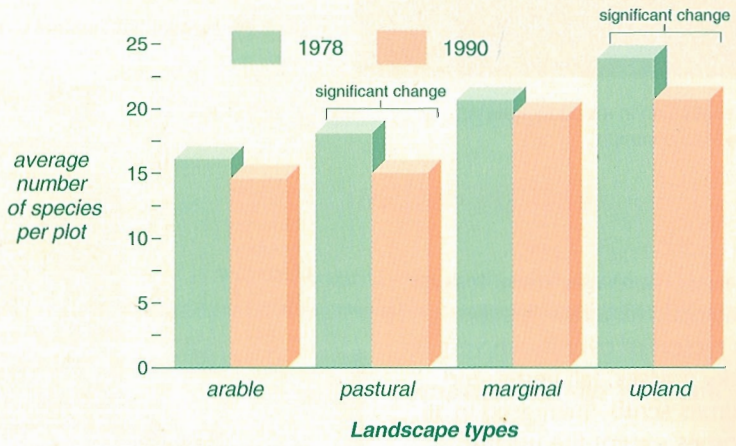
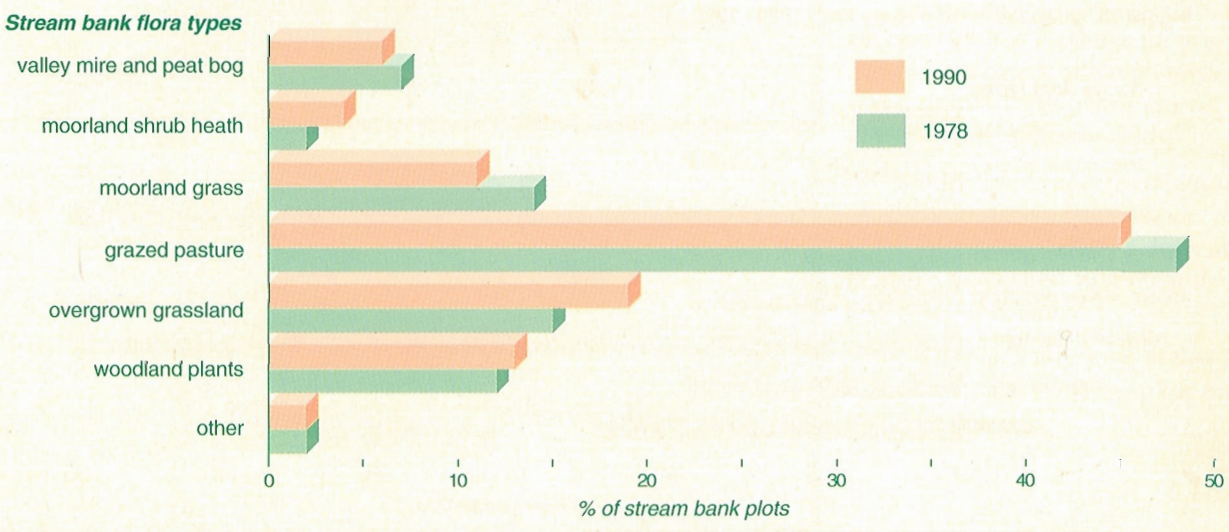


Figure 17 Changes in stream bank flora 1978 - 1990



Biodiversity in the wider countryside

Linear features such as road verges, hedges and streams contain much of the plant diversity of the countryside, particularly in arable landscapes.

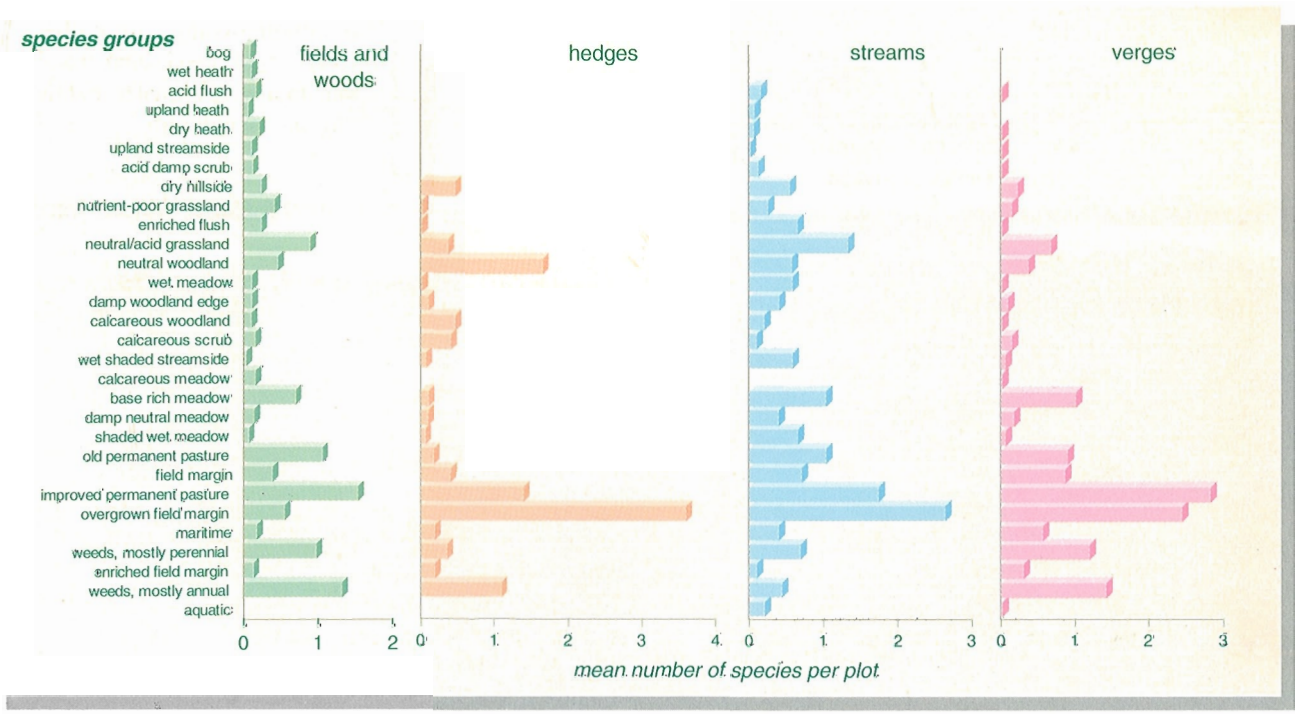
Hedges, verges and stream banks contained many plant species which were absent or rare in the surrounding landscape and therefore they formed an important reservoir of plant biodiversity. This was particularly true in arable landscapes where most types of plants were more often found in the linear features than in the fields or woodlands (Figure 18).

Although meadow species became less common in hedgerows, verges and stream banks, these linear features still contained more of the total resource of meadow species than was found in the open countryside.

Linear features are important not only because of their contribution to overall plant biodiversity in 1990 but also because they can act as a source of locally native seed. In years to come, given the right conditions, it may be possible for species-rich habitats to regenerate from these seed banks. Any further loss of linear features, or the meadow species they often contain, may limit the scope to conserve biodiversity in the lowlands.

Some groups of plants are less common in linear features. Where such plants are lost from open fields or moors it may be more difficult for them to regenerate if seed banks are not available.

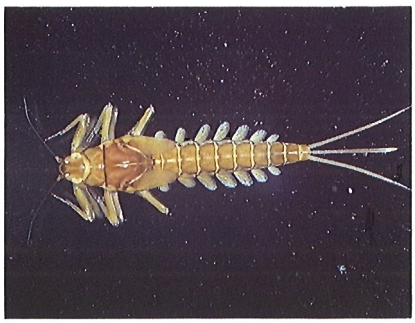
Figure 18
Species groups in arable landscapes
In arable landscapes, many types of plants are more commonly found in linear features than in the adjacent fields and woodlands. In this diagram species have been grouped according to their habitat requirements and the frequency in the different components of the landscape is shown.



Freshwater animals and water quality

The survey of freshwater animals was carried out for the first time in 1990 and forms a baseline to compare with future surveys. About 500 freshwater animal species or groups of species were recorded from around 360 watercourses. These records were used to provide an indication of water quality of streams and small rivers in the British countryside. The field survey in the south and east of Britain was affected by the drought conditions of 1990.

Animal species diversity was greater in lowland watercourses than in the uplands (Figure 19) but water quality was highest in the uplands (Figure 20). In arable landscapes, only 60 % of watercourses were found to be of 'good' quality compared to 88% in the uplands.



Water quality was determined by the diversity of freshwater animals

Figure 19 Diversity of freshwater animals in small watercourses in 1990

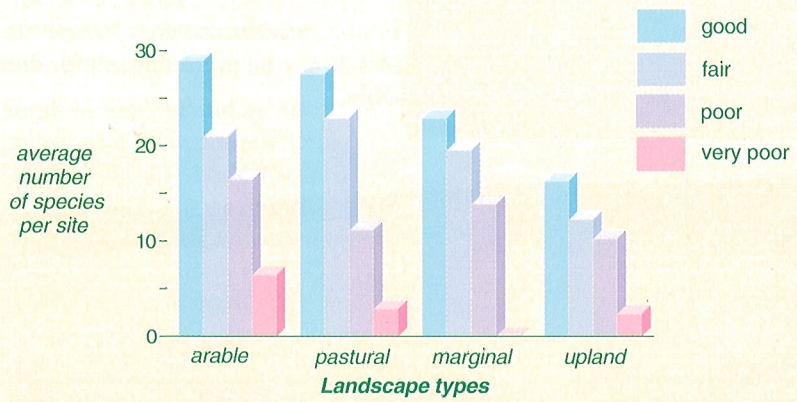
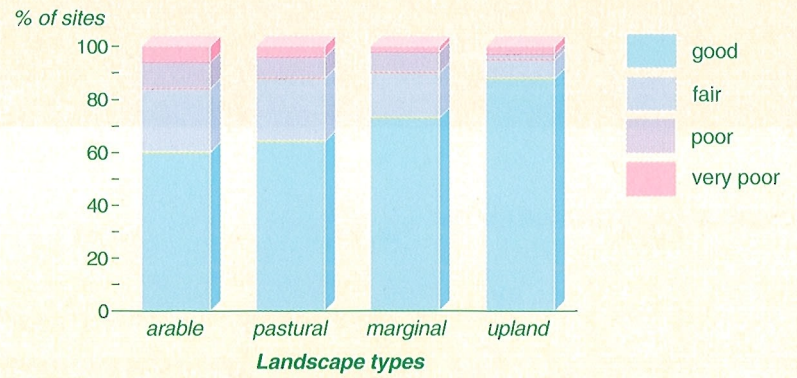


Figure 20 Water quality of small watercourses in 1990



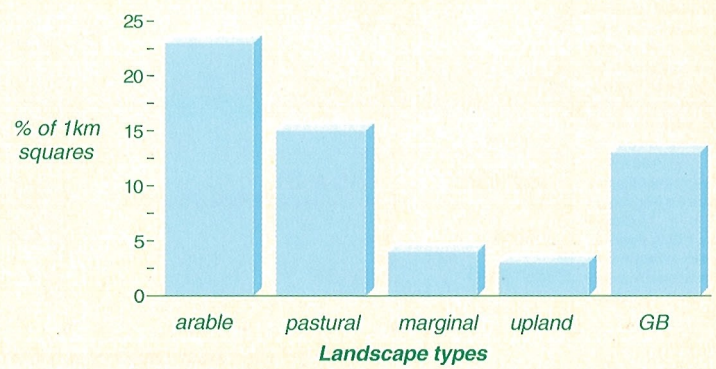
WATER QUALITY ASSESSMENT

Samples of freshwater animals (macro-invertebrates) taken during the field survey of Countryside Survey 1990 were used to make inferences about water quality. Research has shown that there is a relationship between the species composition of freshwater habitats and the water quality. Using a procedure known as RIVPACS, sites with entirely different environmental characteristics in different parts of the country, can be compared on a common basis. In this procedure, species or species groups recorded at a site are compared with those expected to be present in the absence of pollution. Results from this analysis have been summarised into four water quality bands (Figures 19 and 20).

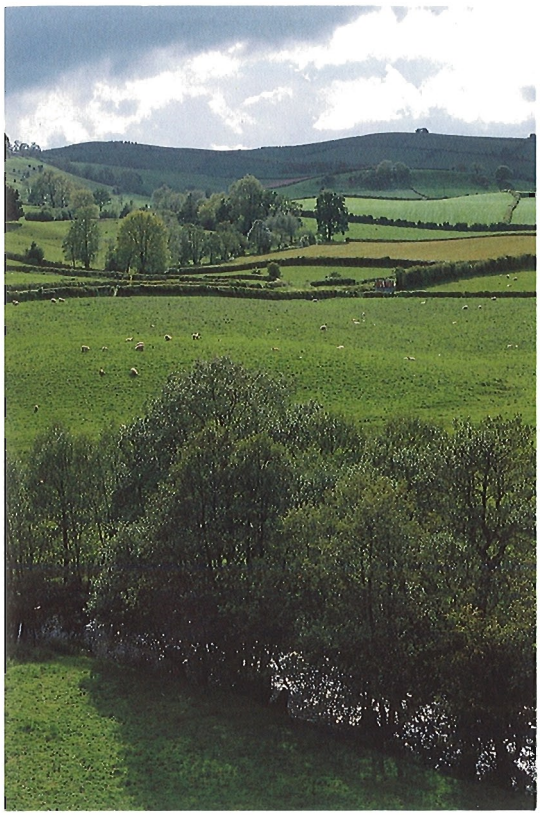
The 1990 drought

Weather conditions in 1990 were very dry in the south and east of Great Britain. Of the 508 squares sampled, 13% had watercourses marked on the 1:10,000 Ordnance Survey maps where none was found in the field (Figure 21). These squares were mainly in the arable and pastural landscapes, often associated with chalk soils.

Figure 21 Proportion of 1 km squares with dry streams in 1990



The main points from Countryside Survey 1990



Meadow species declined in pastural landscapes

Countryside Survey 1990 was complex and wide-ranging, and in summarising the results there is a danger of over-simplification. More detailed results and analysis are presented in the main report of the survey. The following general conclusions can be made about change in the British countryside in the 1980s:

- there were major changes in the areas of different crops grown and overall, a small reduction in the area of tilled land
- the overall extent of the main semi-natural vegetation types in the British countryside remained more-or-less the same throughout the late 1980s.
- from 1978 to 1990 there was an overall loss of species diversity and an associated decrease in species characteristic of less intensively managed vegetation;
- habitats were lost and species diversity decreased in linear features (hedges, verges and stream banks) but these features were still important reservoirs of plant species, particularly in the lowlands;
- the loss of species and movement towards more intensively managed vegetation types was greater in the lowlands than the uplands.
- the quality of freshwater habitats, as determined by the invertebrate species they contained in 1990, was also lower in the lowlands.

Figures 22-25 on the following pages present the key results for each of the four major landscape types.

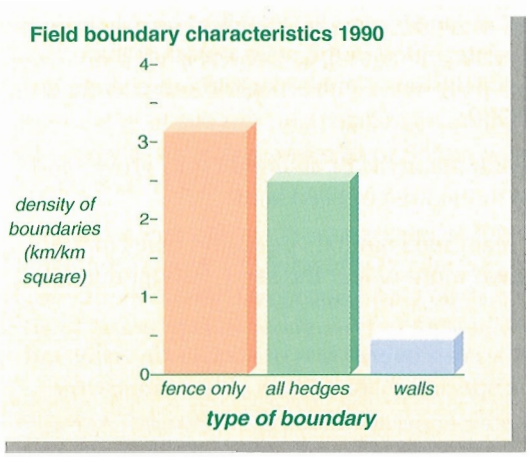
Countryside Survey 2000?

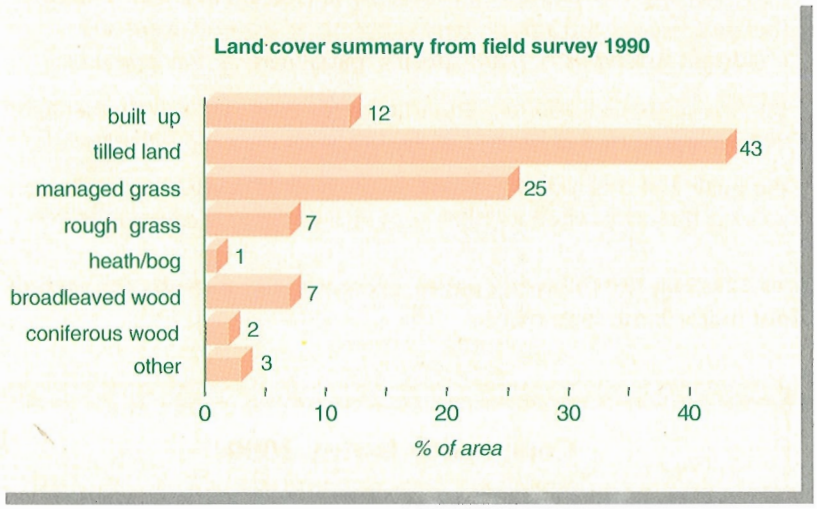
The Countryside Survey databases and summary are now available for further research about the processes, causes and consequences of countryside change. Several additional surveys and analyses are already in progress - improving our understanding of the countryside and providing up-to-date information about particular issues.

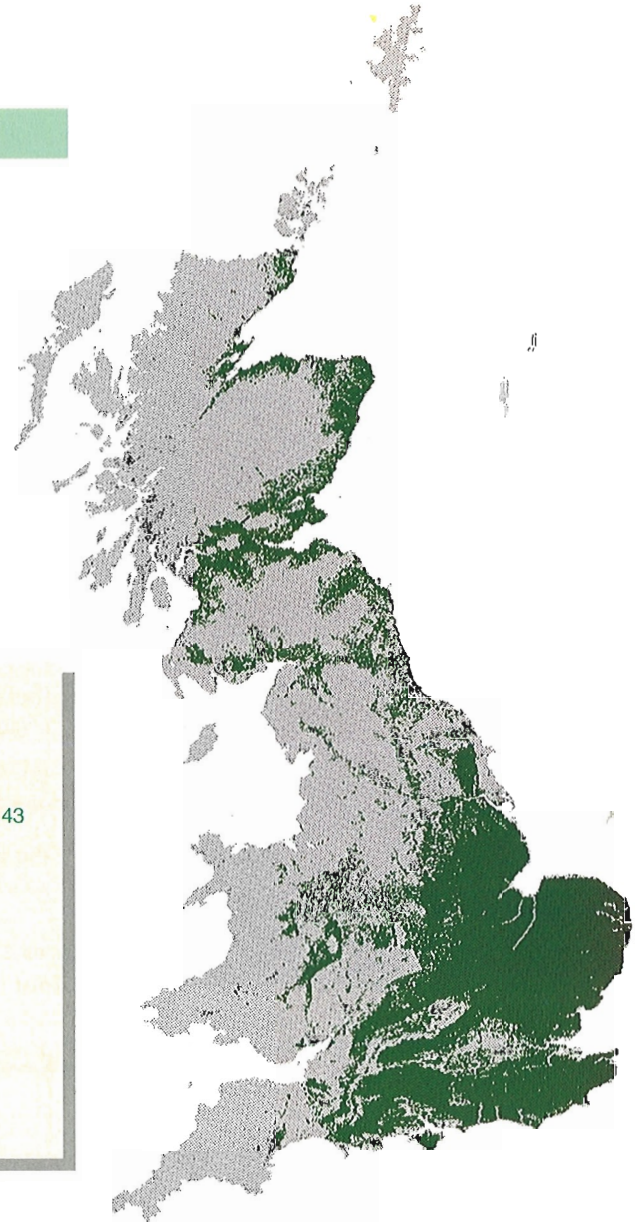
Countryside Survey 1990 forms a baseline for evaluating future changes in the countryside. Current plans are to repeat Countryside Survey in the year 2000.

Little change was evident in the uplands

Figure 22 Arable landscapes: key results







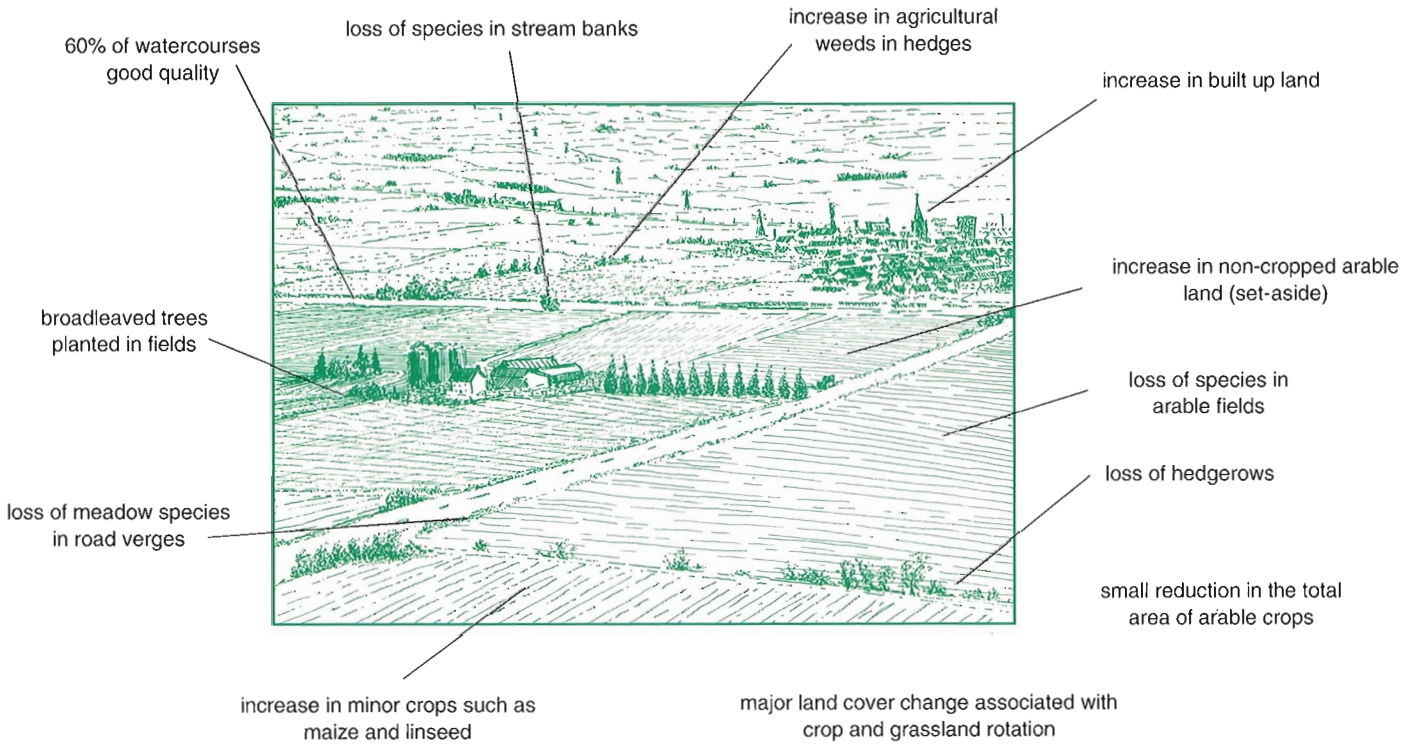
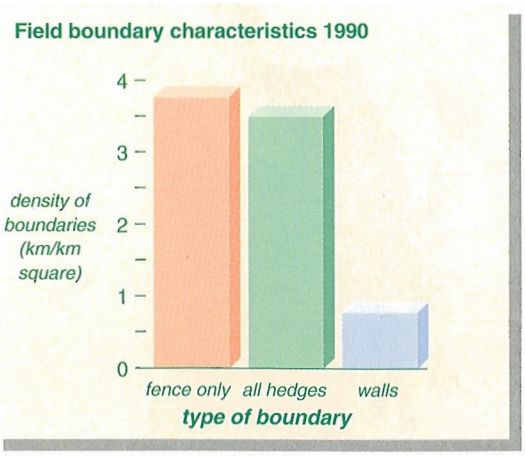
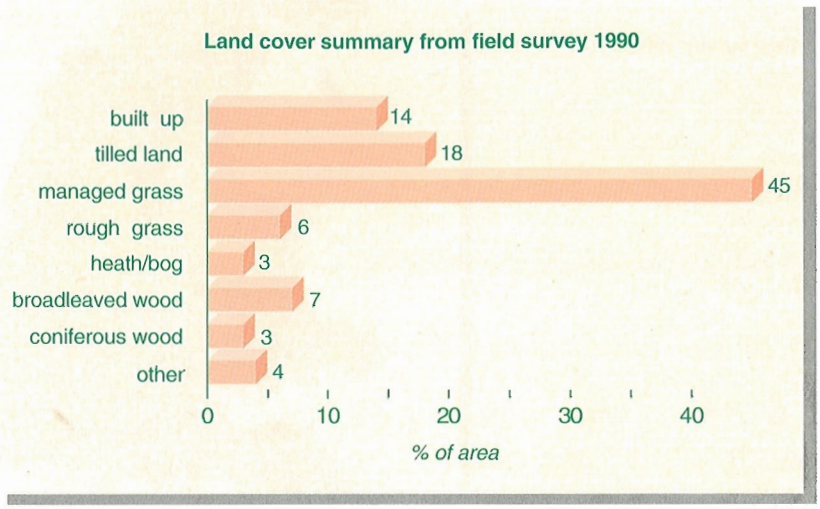


Figure 23 **Pastural landscapes:** key results





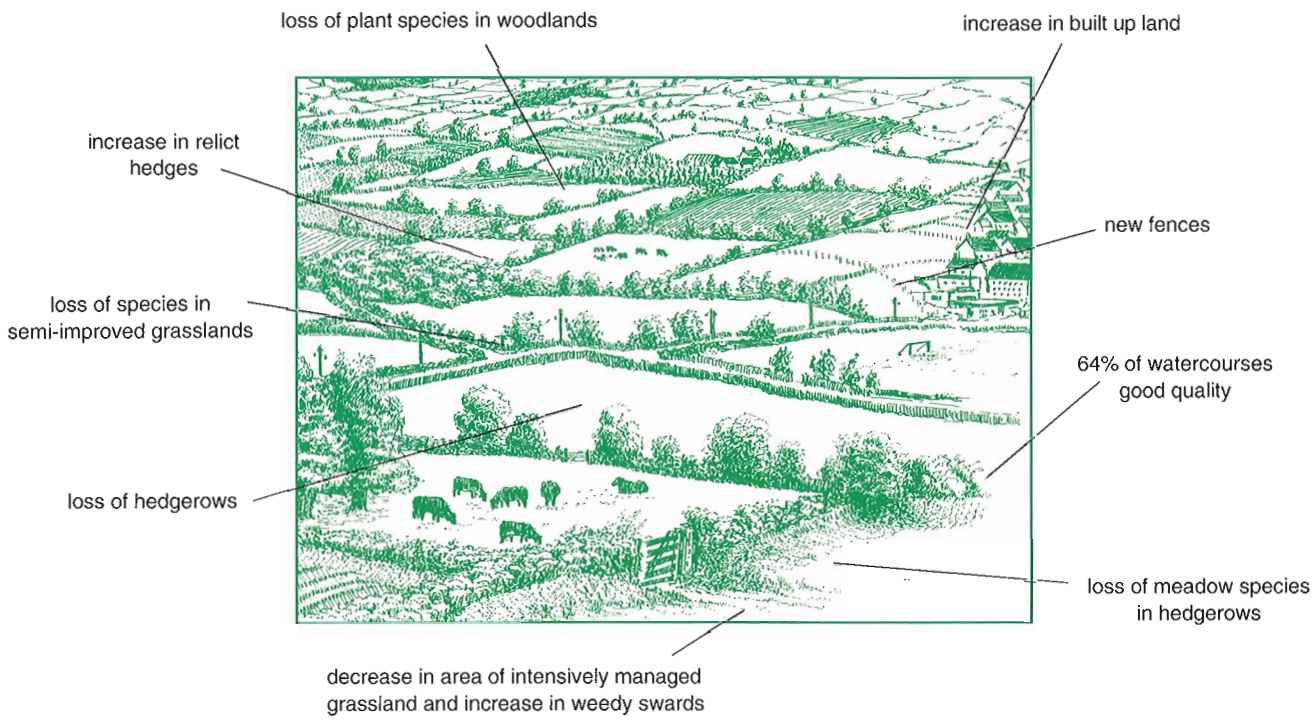
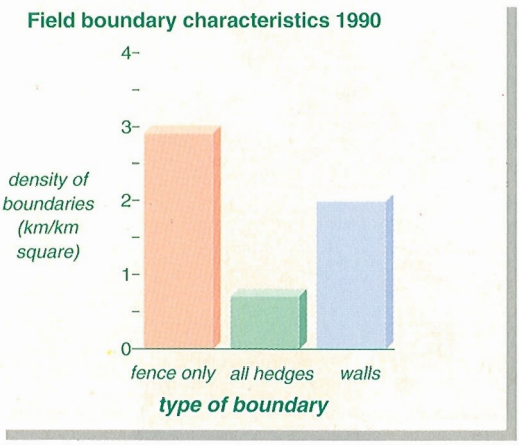
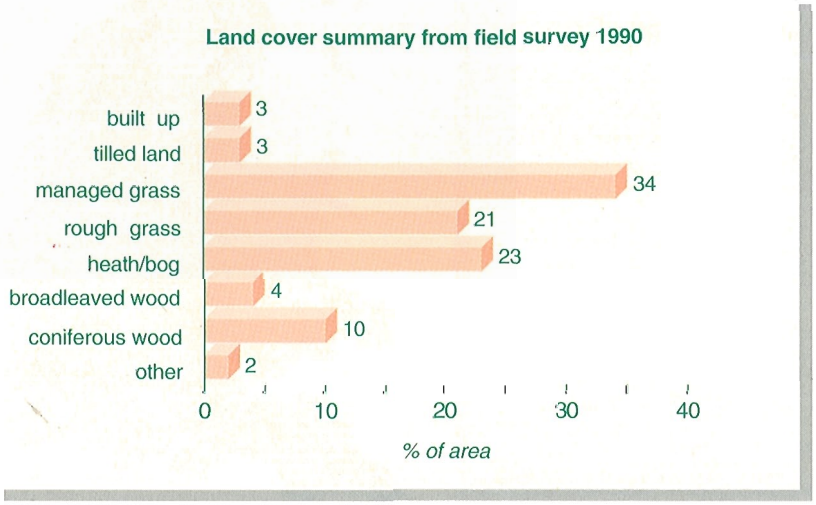


Figure 24 Marginal upland landscapes: key results





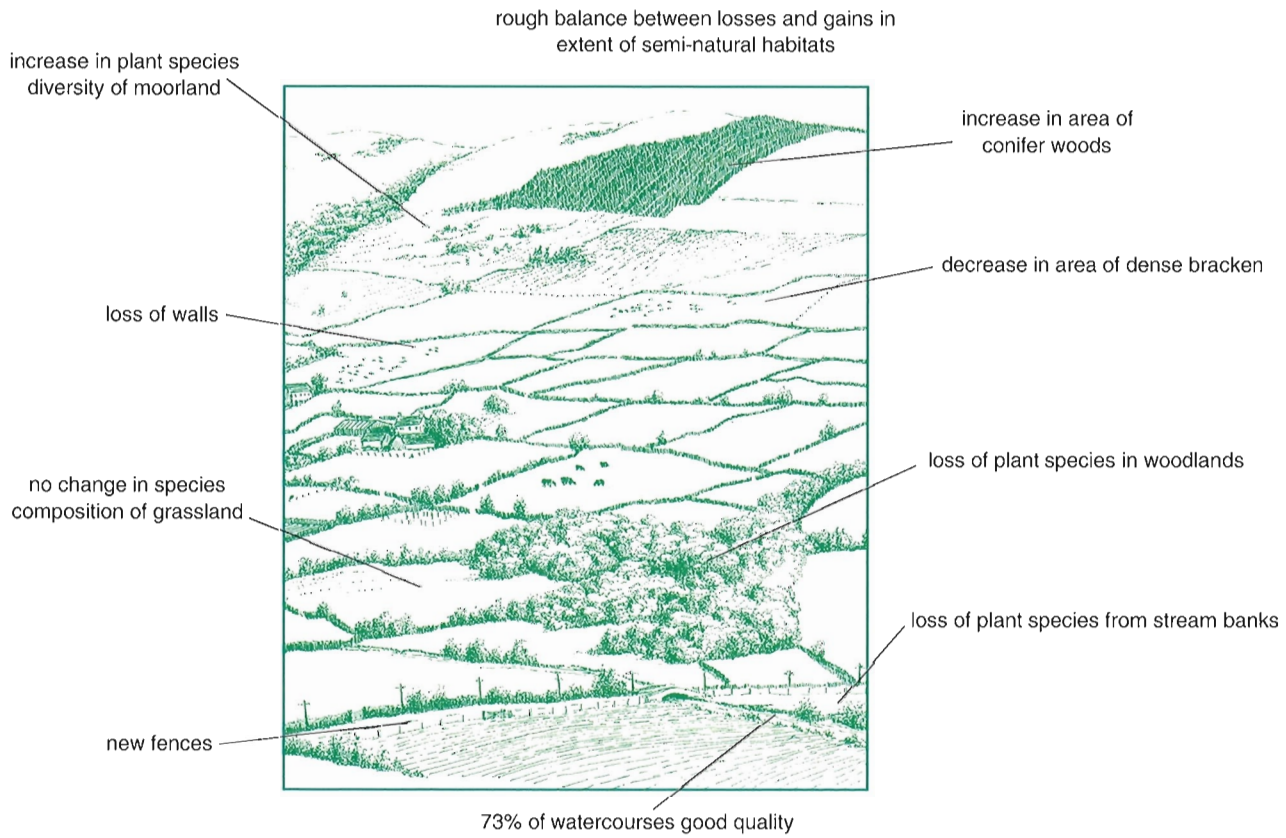
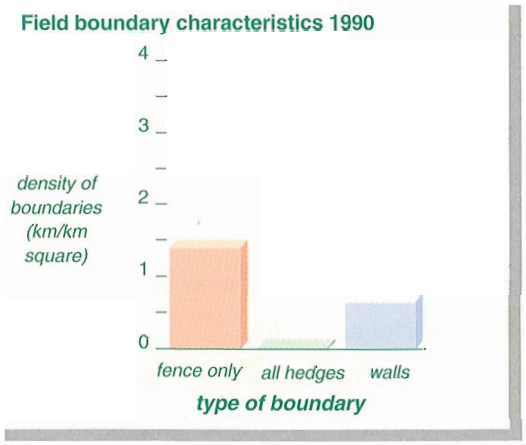
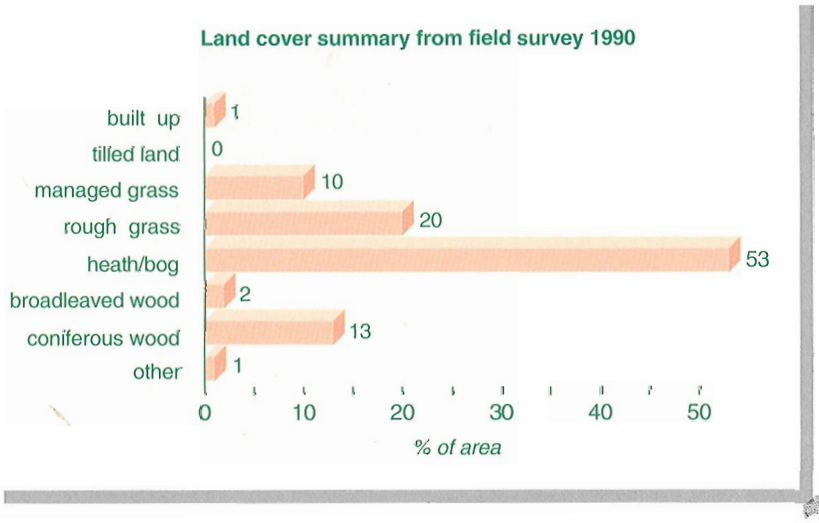
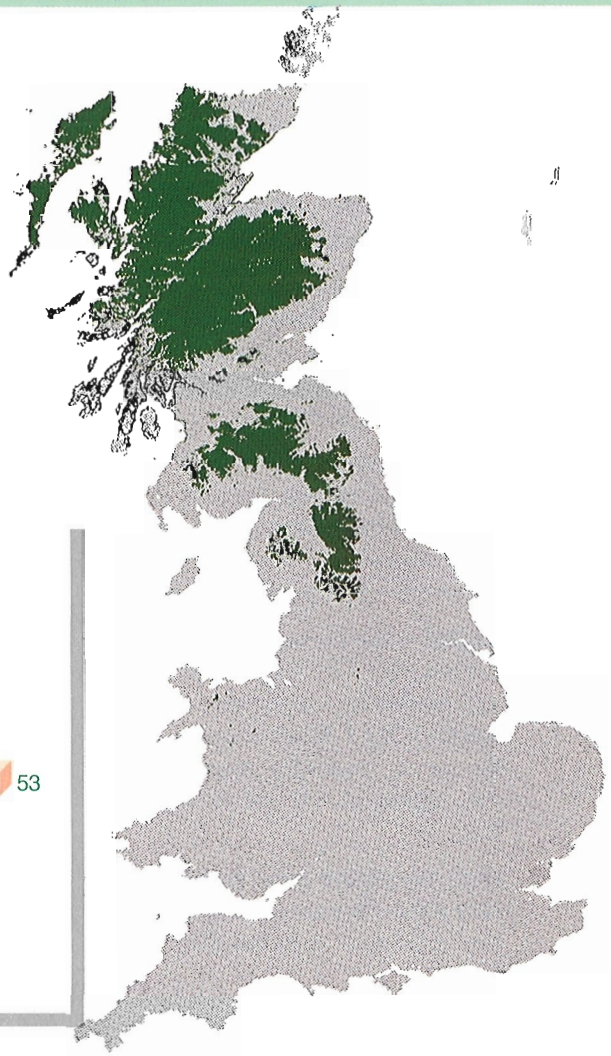


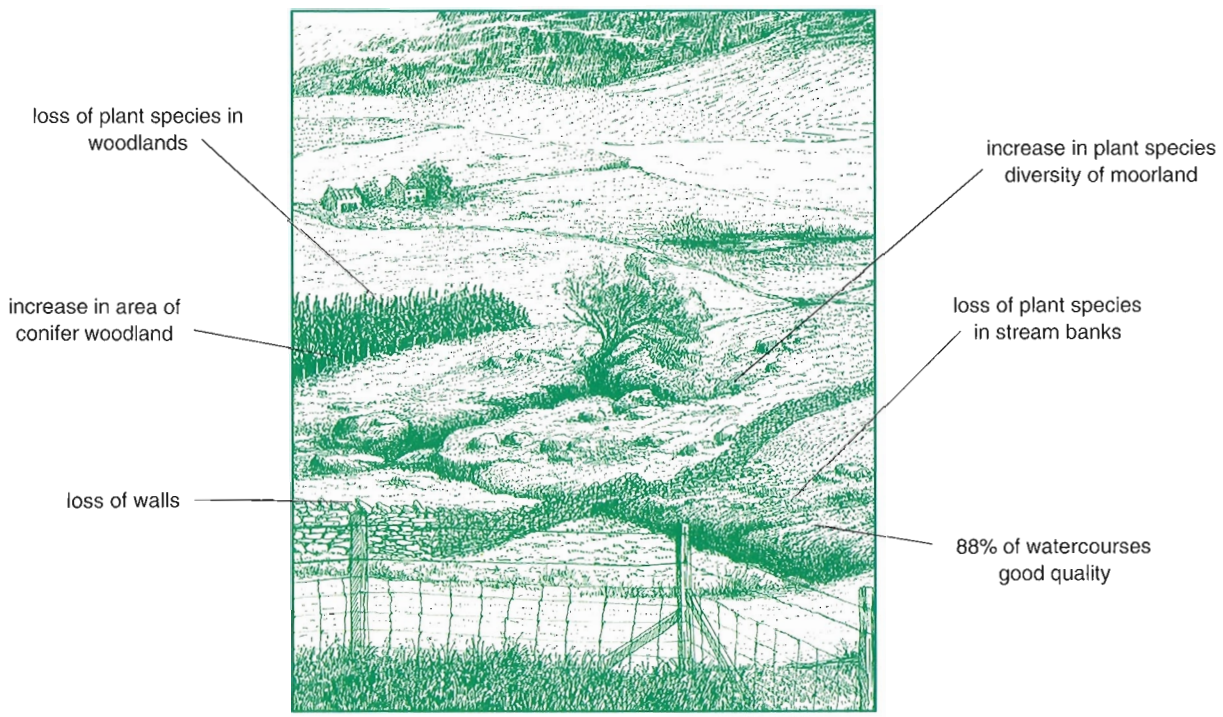
Figure 25 **Upland landscapes:** key results







rough balance between losses and gains in extent of semi-natural habitats



Outputs from Countryside Survey 1990

The primary output of the survey is a database. Information from the database will be made widely available as:

Summary information - published by the Department of the Environment in a series of reports under the heading 'Countryside 1990'.

Government statistical reports - for example, as part of the Department of the Environment's 'Digest of Environmental Statistics'.

Digital data (1 km square summaries) - for use in the 'Countryside Information System (CIS)'. CIS can present the survey results for almost any region of interest (see box).

High resolution land cover map data - for applications in Geographical Information Systems.

Detailed field survey data - for further analysis and research about processes of countryside change.

Countryside Information System (CIS)

The DOE Countryside Information System (CIS) is designed to provide users with easy and flexible access to information from Countryside Survey 1990. Any other data set which can be expressed on 1 km square framework can be added to CIS. These may include data on designated areas, agricultural data, population census data, wildlife distribution data and data on features such as roads and rivers.

What Does CIS Do?

The CIS has applications at a regional and national level:

- to generate maps and statistics for any region;
- to locate areas with given environmental characteristics;
- to compare areas, for example inside and outside designated areas;
- to conduct simple overlay analysis and modelling exercises.

CIS also contains an inventory of data sets and provides a framework for the exchange or publication of information about the rural environment. Many of the maps used in this report have been produced using CIS.

Data Quality and Help Systems

CIS provides help and information about the sources and quality of data and on the accuracy of statistics. Definitions of all the land cover categories used are provided, with an explanation of how they are related to land cover categories in other surveys.

Operating Environment

CIS runs on a standard 386 or 486 computer operating Microsoft Windows.

Further Reading

Countryside 1990 Series:
Volume 1 - Ecological Consequences of Land Use Change (1993). DOE London.
Volume 2 - Countryside Survey 1990: Main Report (1993). DOE London.

Other Government Reports:
This Common Inheritance: Britain's Environmental Strategy (1990). HMSO London.
The UK Environment (1992). HMSO London.
Action for the Countryside (1992). DOE London.

Copies of Countryside Survey 1990: Main Report can be obtained from:-
Publication Sales Unit
Government Buildings
Lime Grove
Eastcote
HA4 8SE
Price £12.00

Additional copies of this Summary Report can be obtained from the above address. Price £6.00

For further information about Countryside Survey 1990 please write to:-

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BS2 9DJ

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Environmental Information Centre
Institute of Terrestrial Ecology
Monks Wood
Abbots Ripton
Huntingdon
PE17 2LS

The countryside is changing -
but how quickly and in what ways?

Countryside Survey 1990 sets out to answer these questions using the lastest techniques of ecological field survey and satellite imagery. It provides the most up-to-date and comprehensive overview of land cover, landscape features and habitats in Great Britain. The results will be central to the evaluation and development of Government policies for the countryside.