

Countryside Survey 1990

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Background

Change has always been a feature of the British countryside. As the economic pressures on land continue to change and the value placed on our landscape and wildlife increases, policy decisions which may affect the rural environment need to be informed by knowledge of what is happening to the fields, woodlands, hedgerows, verges and streams that make up the fabric of the British countryside.

Countryside Survey 1990 set 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 reference to 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 the common features and habitats which are most likely to influence the public's perception of rural Britain. Unlike most other surveys of the countryside, it was not aimed at any particular sectoral interest, such as agriculture, forestry or nature conservation.

A general aim of Countryside Survey 1990 was to provide a common and reliable set of data as a contribution to a wider debate on the causes, consequences and directions of countryside change. In line with that aim, this report is factual. It summarises, but does not interpret or evaluate, the main results from the survey.

Countryside policy

Countryside Survey 1990's focus on the wider countryside came at a time when reform of the European Community's Common Agricultural Policy was presaging rapid changes in British agriculture, and when there was an

increasing awareness of the value of the countryside as a national resource for recreation and wildlife. Although it was a survey aimed at common features, it was also understood that the conservation of rare species and habitats in protected reserves should not be set 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 also 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. The publication of the report on Countryside Survey 1990 and the full survey results on which it is based form part of this process. The results will also contribute to the Biodiversity Action Plan to be produced by the Department of the Environment as part of the UK commitment to the International Biodiversity Convention agreed at the United Nations Conference on Environment and Development (the 'Earth Summit') in Rio de Janeiro in 1992. The Plan aims to turn international concern about the loss of biodiversity into practical action in the UK.

Surveying the countryside

There have been many other surveys which have looked at the British countryside, either in part or as a whole. Apart from being the most recent of these surveys, two things set Countryside Survey 1990 apart from the rest. First, its breadth of coverage and, second, its generality.

Countryside Survey 1990 is the first study to integrate satellite mapping with detailed field surveys of vegetation, soils and freshwater at a national scale. Satellite mapping was used to give an overview of land cover of the whole country, and field survey was used to describe a sample of the countryside, including freshwaters, in much more detail. In combination, these two approaches provided the best available data about the total resource of the 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. This 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 pastoral landscapes; and two in the uplands – marginal upland and upland landscapes.

Satellite mapping

The satellite mapping was based upon cloud-free images from the Landsat Thematic Mapper satellite between 1988 and 1991, but using 1990 images whenever possible. Summer and winter satellite data were combined to enhance the seasonal differences in the various cover types.

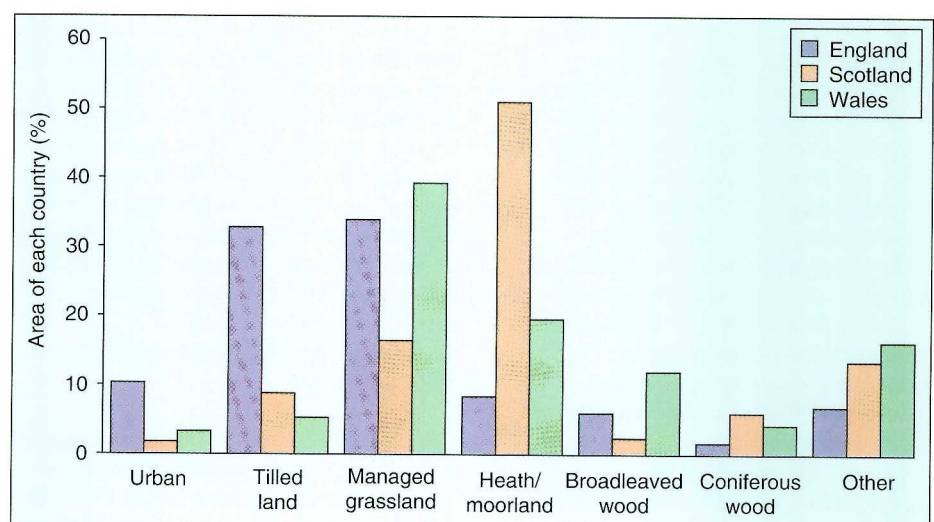


Figure 13. Land cover of England, Scotland, Wales and Great Britain from satellite

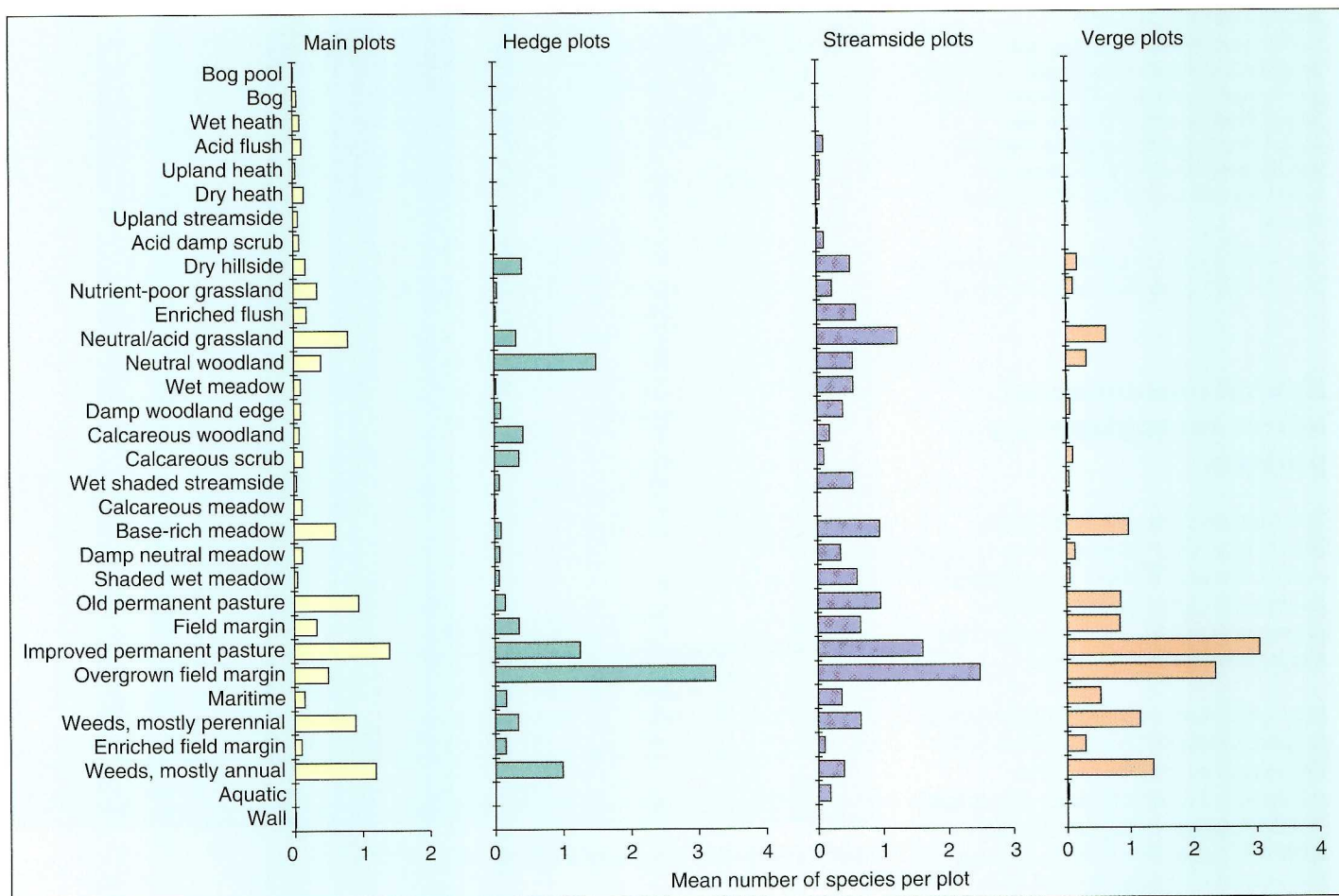


Figure 18. Comparison between the mean number of species in the species groups, recorded in the main plots and linear plots in 1990, in arable landscapes

Main points from Countryside Survey 1990

It is not easy to summarise the results from a project as complex as Countryside Survey 1990 without a risk of oversimplification. However, the following general conclusions are supported by the results.

- The proportion of the main semi-natural vegetation types in the British countryside has remained constant throughout the late 1980s, but the quality of the vegetation in areas of semi-natural and agricultural land cover has declined.
- Loss of habitats and species diversity has also occurred in linear features (hedges, verges and watersides) but these features were still important reservoirs of plant species, particularly in the lowlands.
- Loss of species and decreases in the quality of vegetation were greater in the lowlands than the uplands. The

quality of freshwater habitats, as reflected by the invertebrate species they contained in 1990, was also lower in the lowlands.

Data availability

This report has, inevitably, provided only a glimpse of the wealth of data collected during Countryside Survey 1990. A more detailed presentation of the methodology, the stock and change data on land cover, landscape features and vegetation at the national and landscape scale, and of the information on freshwater biology, is provided by Barr *et al.* (1993). Information on the land classes used to provide the sampling framework, the data contained in the main report, plus further data at the land class level, will soon be available in a Countryside Information System for use on personal computers. Due to be launched in autumn 1994, the System will allow the user to integrate, combine or overlay the constituent data sets and output derived results in tabular or graphical form.

The future

Change in the countryside is a continuous process and the three countryside surveys provide snapshots at given times. At the launch of the Countryside Survey 1990 reports in October 1992, John Gummer, the Secretary of State for the Environment, stressed that the 1990 Survey provided an essential baseline against which future change could be assessed and against which the success of countryside policies could be judged, and he gave a commitment to Government support for a further survey in the year 2000.

C J Barr, R G H Bunce and T W Parr

References

- Barr, C.J., Bunce, R.G.H., Clarke, R.T., Fuller, R.M., Furse, M.T., Gillespie, M.K., Groom, G.B., Hallam, C.J., Hornung, M., Howard, D.C. & Ness, M. 1993. *Countryside Survey 1990: main report*. London: Department of the Environment.

herbaceous species in 1000 hedge plots. These plots have been grouped into seven hedgerow types and four ground flora types. The results confirm that British hedges are dominated by hawthorn (*Crataegus monogyna*) – a consequence of the planting of hedges to enclose fields around 200 years ago. However, they also contain many other plant species. The two most diverse types, in terms of tree and shrub species, were the mixed hazel (*Coryllus avellana*) hedges found mainly in the west of Britain and mixed hawthorn hedges, found mainly in the east. Hedgerow ground flora was most diverse in the west of the country where hedges are more frequently adjacent to woodland and grassland, rather than arable fields.

Between 1978 and 1990 there was:

- no change in the woody species composition of hedge plots in any landscape type, despite the reduction in the total length of hedges;
- no significant change in the species richness of hedge plots in arable landscape types, although there was a shift towards species more characteristic of arable fields;
- a decrease in the number of species in hedges in pastoral landscape types, particularly in the ground flora of hedges bordering grassland where meadow and chalk grassland species decreased;
- no significant change in the number of species of hedge plots in marginal upland landscapes.

Plant diversity in road verges

Verges are susceptible to a number of factors which influence their species composition. They are directly affected by changes in management, eg mowing regimes, road salting, use of herbicides and growth retardants. Verges are also vulnerable to disturbance from road works, ditch clearance and vehicles, all of which may create bare patches which allow the invasion of colonising species.

Almost 2000 verge plots were surveyed in 1990 and grouped into eight types of verge flora. Species diversity decreased significantly in road verges in arable landscapes, but not elsewhere. However, in all areas, there was some loss of characteristic meadow species and, with the exception of the uplands, where verges were often grazed, there was a

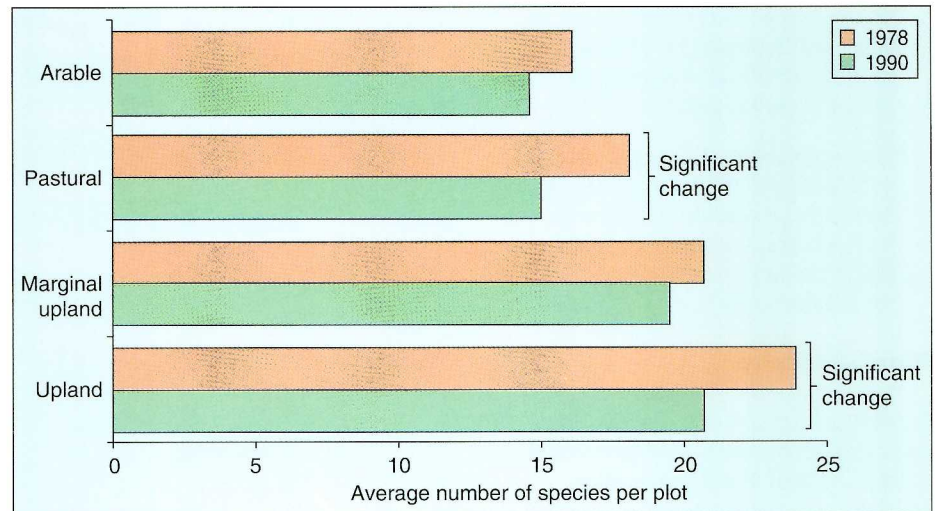


Figure 17. Number of species in stream bank plots, 1978–90

trend towards an increase in overgrown verge types, often dominated by tussocky grasses and tall herbs, and sometimes scrub.

Plant diversity in watersides

Over 2000 plots were surveyed beside ditches, streams and rivers. They were grouped into seven types of stream bank flora. The plots showed a loss of species in all four landscapes between 1978 and 1990, the losses being significant in pastoral and upland landscapes (Figure 17).

Throughout the lowlands there was a loss of species typical of wet meadows and moist woodlands, all of which require damp conditions. In the pastoral and upland landscapes, there was a loss of species in most species groups, but particularly traditional meadow species.

In the arable landscape there is some indication that removal of grazing and/or the cutting of watercourse banks has led to the development of coarse grassland or tall herb vegetation, and possibly scrub invasion. Some losses imply that the habitat has dried out. For example, species typical of wet meadows and aquatic margins decreased in all four landscapes, though more so in the lowlands. These changes may reflect the fact that 1990 was a drought year in southern parts of Great Britain. However, changes were also recorded in the unaffected upland regions, and most of the species that decreased were long-lived perennials which are unlikely to be lost because of short-term changes in water levels.

Biodiversity in the wider countryside

Hedges, verges and watersides contained many species which were absent or rare in the surrounding landscape and represented an important reservoir of botanical diversity. This was particularly true in arable landscapes in which most types of species were more frequently found in the linear features than in the fields or woodlands (Figure 18).

Although meadow species were declining in hedgerows, verges and watersides, these linear features still contained more of the total resource of meadow species than was found in the open countryside. Linear features are important for biodiversity not only because of their contribution to overall plant diversity in the countryside, 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.

Freshwater animals and water quality

The Institute of Freshwater Ecology identified a total of 479 freshwater species or groups of species in the samples collected from 361 sites. Although species diversity was greater in lowland watercourses than in the uplands, the reverse was true for water quality. In arable landscapes, 60% of watercourses were 'good' quality compared to 88% in the uplands.

fences alone. Fences were also the most stable boundary type, with almost two-thirds remaining as fences over the survey period.

The length of fences increased by 11% between 1984 and 1990. Almost half of these new fences were built in pastoral landscapes, with relatively few in the arable and upland landscape types.

Plant diversity

In addition to major and obvious step-wise shifts from one type of land cover, habitat or linear feature to another, change in the countryside can 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 species composition from the same plots in 1978 and 1990, it was possible to distinguish between those losses and gains in plant diversity due to shifts *between* vegetation types and those due to changes in the quality, ie the species composition, *within* vegetation types.

The vegetation plots have been classified using TWINSPLAN into vegetation types, characteristic of open fields, woods or moors, hedges, roadside verges and stream banks.

Changes within vegetation types

The vegetation plots from open fields, woods and moors were grouped into six 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 grass and woodland) showed significant losses of species between 1978 and 1990. Only one vegetation type, moorland, showed a significant increase in species diversity but this vegetation type is inherently species poor (Figure 16).

All the four landscapes showed a change in species composition with an increase of species more characteristic of intensively managed vegetation, and this change was most pronounced in the lowlands. In the arable landscape, there was a net shift towards more intensive types of vegetation in 29% of all plots. In pastoral, marginal upland and upland landscapes, the shifts in the same direction were 27%, 11% and 9% respectively.

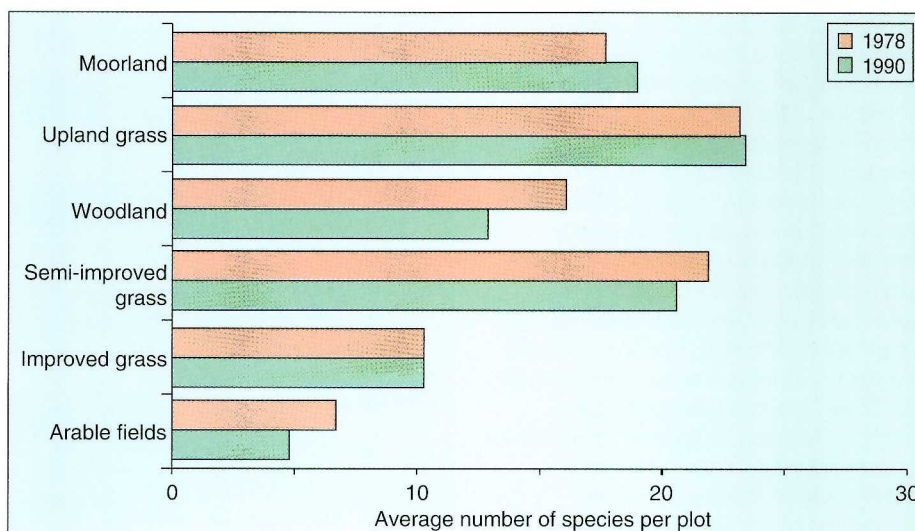


Figure 16. Change in plant diversity within vegetation types, 1978–90

The main changes in six main types of vegetation in Great Britain are summarised below.

- **Arable fields**

The loss of species in arable fields, particularly in arable landscape types, was associated with a shift towards groups of species typical of more intensive use. This reflected a decrease in broadleaved weeds and an increase in grass weeds within cereal crops, particularly in arable landscape types where arable fields now have 25% fewer species than those in pastoral landscapes.

The decline in annual and perennial weed species, especially the broadleaved species, may have some implications for invertebrate and bird species, but, from a botanical point of view, the species in decline are found elsewhere in the landscape, on disturbed ground. Rare species associated with arable fields, such as the corncockle (*Agrostemma githago*), had already disappeared from the vast majority of fields by 1978.

- **Improved lowland grassland**

No significant changes were recorded in plots of this vegetation type.

- **Semi-improved grassland**

In arable and pastoral landscapes, plots from semi-improved grasslands lost diversity and shifted towards more intensively managed vegetation types. Plots in pastoral landscapes had 14% fewer species in 1990 than in 1978. The most pronounced decline has been in species associated with 'unimproved meadows', which

include many of the rarer grassland species. Plots from fields in all three landscapes had very similar numbers of species in 1978, but by 1990 those in marginal upland landscapes were more diverse than those in other areas. These data indicate that at least some of the grassland types in the marginal upland landscapes were being less intensively managed in 1990 than in 1978.

- **Woodlands**

Woodlands in all landscape types except arable have shown a significant loss of species. Most species groups have decreased but species more characteristic of disturbed and grassy habitats within woodlands are increasing, indicating that at least some woodlands are becoming more open and grassy.

- **Upland grassland**

No significant changes were recorded.

- **Moorland**

In moorland plots from marginal upland and upland landscapes, there was an increase in species number, in contrast to the pastoral landscapes where the species number had declined (because of a loss of bog/moorland species). Moorland habitats are inherently species poor, so increases in species diversity might indicate invasion by non-moorland species.

Plant diversity of hedgerows

Countryside Survey 1990 recorded 40 species of woody shrub and 270

Land cover change from field survey

The field survey gave a more detailed picture of land cover on the ground and provided the opportunity, using the 381 km squares surveyed in both 1984 and 1990, to examine changes in land cover over that six-year period. The field survey results are summarised in 58 land cover types (Figure 14). The use of identical squares allowed measurement of changes between different cover and vegetation types, giving matrices of from/to information. The net changes in each land cover type were made up of the balance between losses and gains. Overall, 87% of GB 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 remain unchanged.

In summary, the net changes between 1984 and 1990 were:

- an increase in urban land of 10 500 ha yr⁻¹;
- a 4% decrease in tilled land, mostly in barley which decreased by 33%, but there was also 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;
- a doubling of non-cropped arable land (which would be the type of land typically resulting from land set-aside from cereal production);
- little change in the area of many semi-natural vegetation types;
- a 4% net increase of built-up land, mostly in the countryside;
- a 5% net increase in coniferous woodland.

The results 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 1984–90, more of a balance between loss and gain.

The grouping of the field data into 58 land cover categories provided a general overview of the GB countryside, but the Countryside Survey database allows greater flexibility for more detailed analyses of particular habitats, landscape

features and species, eg ponds, heather (*Calluna vulgaris*), and non-native species.

Field boundaries

The linear features that criss-cross the countryside form an important part of the British landscape. Many of these features are field boundaries, such as hedges, lines of trees, walls, fences, banks, or just grass strips. In 1990 the total estimated length of field boundaries was nearly 1.5 million km. 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 type of element, such as a hedge with a fence. Over two-thirds of boundaries (72%) contained a fence, and almost a third (31%) contained a hedge. Between 1984 and 1990, the total length of boundaries declined slightly but individual boundary types showed substantial losses or gains (Figure 15). Thus, hedges and walls decreased in total length, while fences and relict hedges (woody boundaries that had once been hedges) became more common.

- **Hedges** – 31% of all boundaries in Great Britain contain hedges; 81% of these are in England, with 51% in the pastoral landscape areas. Most hedges are found in combination with other boundary types, particularly fences in arable landscapes and banks in pastoral landscapes. Hedges are less common in marginal upland landscapes and absent from the uplands.

In net terms, 23% of hedges recorded in 1984 in GB had changed by 1990. Most of this change was due to changes to different boundary types (eg a hedge becoming a line of trees), probably because of changes in hedge management regimes. The 23% net loss of hedges represents the

balance between gains from new hedge planting and natural hedge regeneration (+4%), and losses from boundary removal (–11%), together with changes to (–20%) and from (+5%) other types of boundary.

- **Relict hedges** are boundaries that are recognisable as having once been hedges, but have become, for example, rows of trees or lines of shrubs and are no longer stock-proof boundaries. They form parts of 6% of all boundaries (75% of these in England). The length of relict hedges increased by 55% between 1984 and 1990, mainly as a result of hedges becoming lines of trees.
- **Walls** – 13% of boundaries contain walls; 47% of these are in Scotland and 39% in England. Most walls are found in the marginal upland landscapes but, perhaps surprisingly, there are more walls in arable landscape types (19%) than in the uplands (16%) where they are a more noticeable feature of the landscape.

The total length of walls decreased by 10% between 1984 and 1990, although in Scotland there was a small increase. Walls next to fences were twice as likely to be lost than walls on their own, perhaps because the former were already in decline. The greatest length of walls was lost in the marginal uplands, where the initial 1984 stock was highest, but a higher proportion of walls was lost in the arable landscape.

- **Fences** are the most widespread and common boundary component, occurring in 72% of all boundaries and being the most common single-element boundary type in all landscape types. Nearly half of all boundaries (46%) were formed by

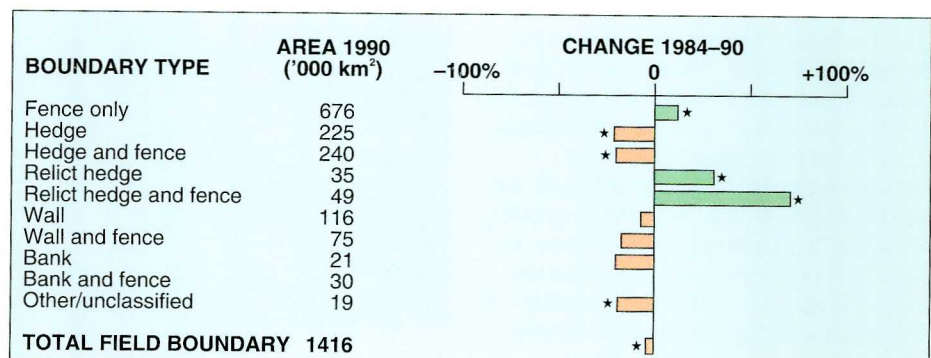


Figure 15. Length of field boundaries in 1990 and change from 1984 to 1990 for Great Britain (* changes significant at a national level; hedges include hedges besides walls and/or banks)

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. Within each square, survey teams:

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

Soil surveyors from the Soil Survey and Land Research Centre and the Macaulay Land Use Research Institute also mapped the soil types in each square.

The field survey repeated 256 1 km squares previously surveyed by ITE in 1977–78, and 384 squares surveyed in 1984. These earlier surveys form the basis for the assessment of countryside change given in this report. As the Land Cover Map of Great Britain and the freshwater component of the field survey were done for the first time in 1990, these could not be used to assess change, but form an important baseline against which future change can be assessed.

Land cover

Satellite-based mapping

The Land Cover Map (p90) shows the dominant land cover for each 25 m × 25 m area (pixel) of Great Britain. Land cover was classified into 17 key types, but the data can be examined for subdivisions of these types. The Map shows the predominantly agricultural nature of the British countryside, with 49% of the land being tilled or managed grass (Figure 13). Large areas of the country, particularly in upland and marginal upland areas, predominantly in Wales and Scotland, are covered by semi-natural land cover types. Thus, heath, moorland and bog make up over 50% of Scotland, 20% of Wales and 10% of England (Figure 13). In total, 8% of Great Britain is wooded – predominantly broadleaved and mixed woodland in England and Wales, but mostly coniferous woodland in Scotland.

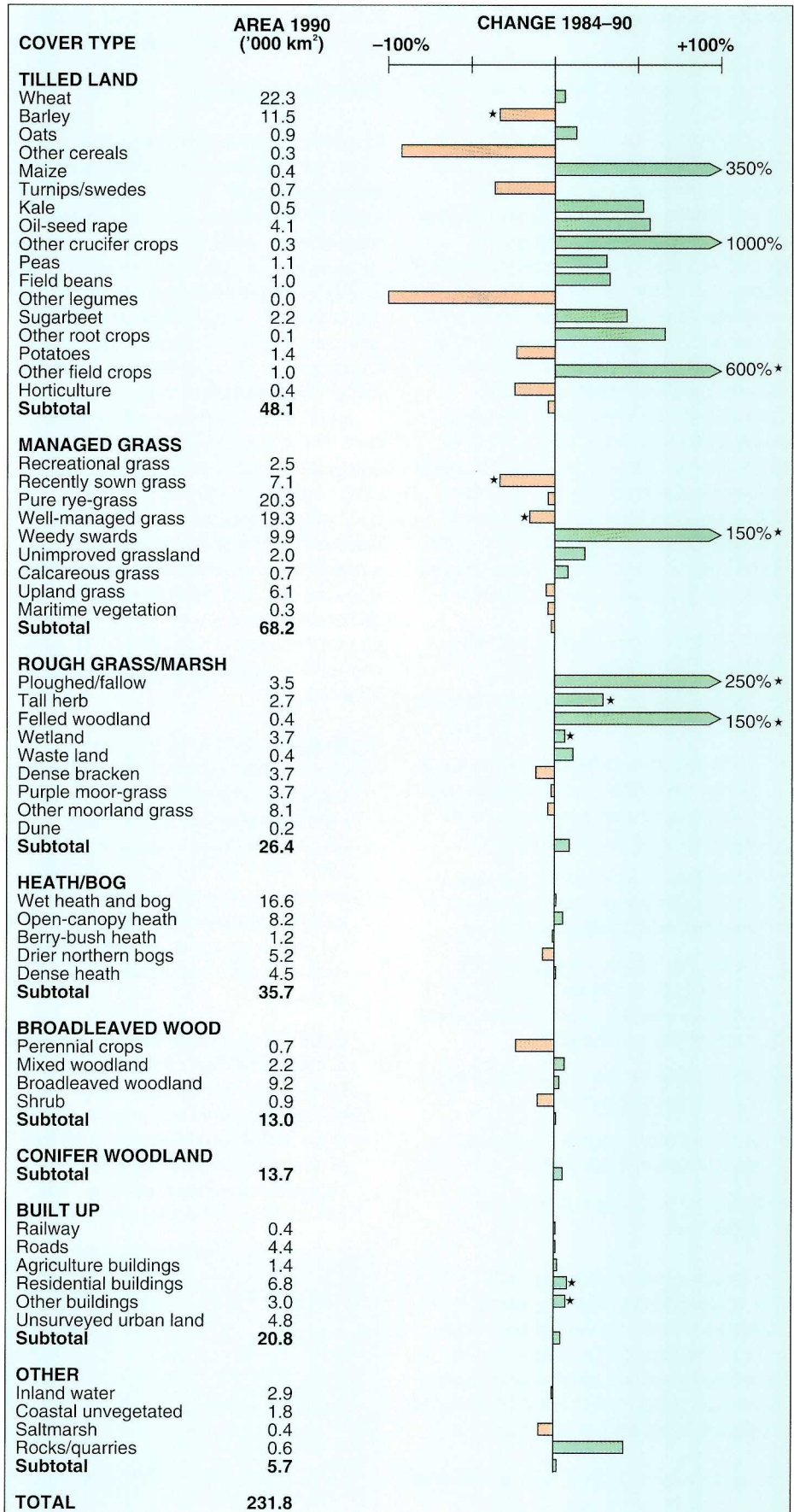


Figure 14. Land cover stock in 1990 and change between 1984 and 1990 (* changes significant at a national level). The 1990 stock figures are based on all 508 1 km squares surveyed in 1990. The 1984–90 change statistics are based on 381 1 km squares which were surveyed in both years

Acknowledgements

Countryside Survey 1990 required a large integrated, multidisciplinary team. The main teams were drawn from ITE Merlewood, EIC Monks Wood and the IFE Wareham Laboratory, but staff from all the other ITE stations were involved plus a team of surveyors recruited to help with the field survey.

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Habitat reinstatement advice for engineering projects

The Applied Ecology Group at ITE Banchory is often asked to give advice on reinstatement of habitats to engineers, developers and planners. Types of project concerned and the approaches adopted are described below.

Replacing destroyed vegetation cover is not particularly difficult anywhere in the UK (except on toxic or unstable substrates) if a uniform grass sward is all that is required. In the last decade, however, there have been increasing pressures for developers and land managers to reinstate with more appropriate vegetation where the ground affected is of some conservation or landscape value. Pressures have come from the public sector, planning authorities, and from statutory nature conservation agencies. Often the necessary advice can be provided by landscape architects or by ecological consultants. ITE has generally become involved when the work is part of a larger environmental impact assessment, when the habitat is difficult to restore, or when there is a research element. The Institute has a particular advantage in this field with an ongoing research programme testing new techniques, coupled with extensive experience of the management of natural habitats. Examples of projects in which there has been ITE involvement include road and bridge schemes, pipeline routes and at ski resorts. The input usually covers not only the initial establishment of vegetation but also its subsequent management and any related monitoring requirements.

Wildflowers for trunk roads and motorways

Revegetation of road verges and slopes was for many years dictated by the

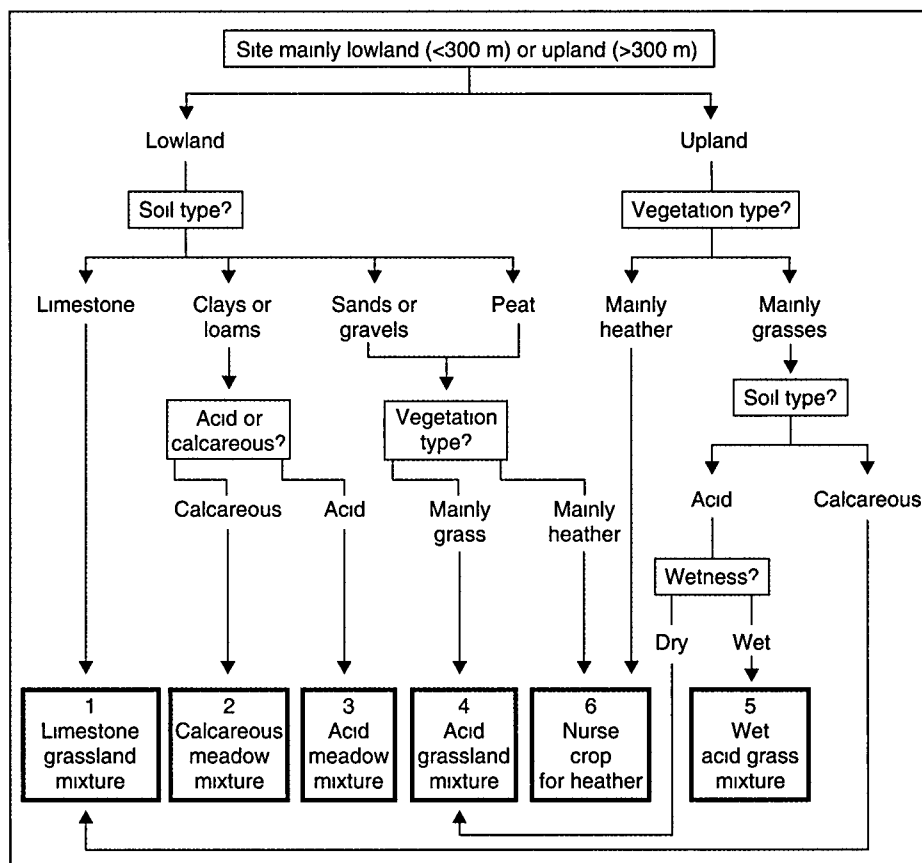


Figure 19 Key to the selection of wildflower mixtures (DOT 1993)

Department of Transport standard grass mixture. A contract to ITE (Monks Wood and Banchory) from the Department resulted in a more flexible set of guidelines, the *Wildflower handbook* (DOT 1993), recognising that, although there are sites where a simple grass mixture is appropriate, there are many situations where wildflower mixtures would be better. The *Handbook* uses a series of keys to help identify the appropriate approach for different types of site, taking into account features such as landscape setting, soil type, and previous vegetation. An example of one of the keys is given in Figure 19. Guidelines are also given for subsequent management, which is particularly crucial for successful wildflower swards.

Glen Coe arched bridge competition

In 1993, the Scottish Office ran a design competition for the replacement of an arched bridge in an area of high scenic value (Glen Coe). The entry from Ove Arup, Langs and ITE won. Environmental protection aspects of the design were the responsibility of ITE. Reinstatement prescriptions were based on the conservation of existing vegetation

resources. Turf from the site was categorised into a small number of basic types (Figure 20), for stripping, storage and replacement after the bridge was completed. The landscaping design incorporated small areas of scree to blend with surrounding similar ground. Supplementary procedures were adopted to ensure that the stream was not contaminated by demolition or construction material. The bridge has now been completed but monitoring of vegetation establishment will continue for two years.

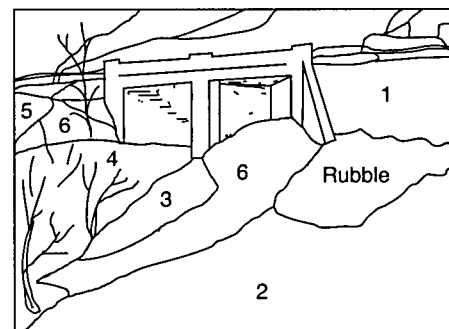


Figure 20 Vegetation categories below the original Glen Coe bridge prior to turf stripping and storage
1, embankment acid grassland, 2, wet flush grassland, 3, bracken, 4, rock ledges, 5, calcareous grassland, 6, acid grassland