



▲ Wye Valley, nr Rhayader • © Michael D Smith

9. An overview from a user's perspective

9.1 Introduction

At some level, change is a continuous feature of the countryside. This is readily apparent, for example, in seasonal patterns of vegetation growth and death, in the rotational nature of farming systems, in longer-term trends of natural succession, and in forestry cycles of felling and planting. At another level, however, much of this change takes place within what often seem to be largely stable landscapes: enclosed farmland, within which rotational practices result in a shifting pattern of arable crops, remains, for the most part, enclosed farmland; timber is removed from woodland, which then regenerates or is replanted, and remains woodland.

As individuals, our perception of change in the countryside is influenced both by the length of time over which we are able to observe our environment, and by the area of land (and water) we are able to regularly observe. The nature of change is important too in determining how easily we might observe it – large step-changes are more obvious than gradual changes that may take many years to become visually apparent. So, our impression of how dynamic or stable our immediate surroundings are, will be gleaned from the frequency of dramatic or sudden changes we see in the landscape.

More gradual changes, in the floristic composition of fields or hedge bottoms, for example, may be less readily observed. More difficult still for an individual observer, is combining a set of such local changes into a picture of change across a wider area – change across Wales as a whole, for instance, which is the subject of this report.



▲ Windfarm, mid Wales • © Richard Evans

Constructing an objective picture of change that is, as far as possible, immune to such spatial and temporal influences as those described above is a large part of what Countryside Survey aims to do. Through the use of a systematically designed sampling scheme based on randomly located 1 km squares, Countryside Survey aims to construct a representative picture of the Welsh countryside; by repeating the work periodically (and surveys have now been completed in 1978, 1984, 1990, 1998 and 2007) Countryside Survey aims to detect changes within it.

Why is this important? In part, because it helps to support an informed, objective evaluation of the success of efforts in Wales to manage natural resources in a sustainable way. Countryside Survey can help to identify changes that might be consistent with or, alternatively, be at odds with society's aims and needs, and thus contributes to the evidence base that is required to adapt and develop policy. This evidence base will grow with the continued analysis of the data to determine the drivers of change in the countryside such as land management, air pollution, variable weather patterns and climate change and their interaction. For example, is current land management resulting in the sustainable use of our soils? Will climate change make soils more or less vulnerable to particular land management practices? The data will also help answer some basic scientific questions such as what is the effect of changing biodiversity of plants on soil biodiversity and how do they interact and affect the different functions which the countryside provides for us? To what extent does the changing successional status of linear features and small habitat patches affect their viability as refuges for previously more widespread species? How do these same changes impact the permeability of the landscape for the movement of biota (native and non-native) in the face of climate change? To what extent can we use information on plant species composition and habitat structure from Countryside Survey to infer likely climate-driven changes in habitat suitability for animals such as birds and butterflies?

Countryside Survey has itself changed since its beginning in the late 1970s. This has included changes to bring a clearer alignment with the terminology of newer policies (especially the UK Biodiversity Action Plan), changes to take advantage of new technology, and – especially relevant here – changes in the number of 1 km squares recorded that now provide a basis for separate country-level assessments of state and trend. In Wales, the 2007 survey saw a large increase in the number of squares recorded (from 64 in 1998 to 107 in 2007) with the intention of being better able to report on the state of the Welsh countryside, and on changes occurring within it. With 2007 being the first survey in Wales to be based on an enhanced sample, the immediate benefits relate to the increased precision with which Countryside Survey estimates the current extent and condition of different elements of the countryside. Some additional benefit is apparent in the ability of Countryside Survey to reliably detect changes in these elements, but the full benefit of this increase in sample size will be realised in the future when comparing results from future surveys with those from the 2007 survey.

This report presents some early findings of the 2007 survey. In particular, it presents an improved baseline of the amounts and condition of habitats, key soil parameters and other elements of the landscape such as hedges and ponds. Changes in these are also presented where statistically significant, but in the knowledge that future surveys will provide a more powerful means of detecting geographically representative changes. Given the smaller sample size in previous surveys, a cautious approach has been taken in interpreting reported changes. Also, this report presents the first reporting round of an ongoing programme of research and analysis that will, over time, enable a more refined interpretation of the results.

9.2 The policy context

A hierarchical framework of policy and decision-making impinges upon the Welsh environment. Policy and legislative context is provided by the European Union and UK government; then, within Wales, the hierarchical pattern is manifest in the development and implementation of strategies at national, regional and local levels. Decisions made at each of these levels, and the actions that flow from such decisions, all contribute to the changes that are recorded in the countryside by Countryside Survey. In addition to these strategic decisions, there exists a further layer of decision-making, that performed by individuals whose actions directly affect the environment in which they live and work. Whilst sometimes influenced by policy, decision-making at this level may be subject to a wide range of additional individual motivations resulting from both economic and social factors. Moreover, some pressures on the environment may be rather more resistant to policy influences, most notably climate change. As a result of such less controllable factors, the relationship between policy and observed patterns of environmental change may not always be a strong and direct one.

A number of strategies at national level have been worked out that, in combination, aim to provide a framework for the integrated delivery of economic and social objectives. This finds its current expression in the Cymru'n Un/One Wales agenda of the Welsh Assembly Government. Within this suite of strategies, and of particular relevance to this report, is the vision of a distinctive and sustainable Welsh environment which lies at the heart of the Environment Strategy for Wales⁵³.

9.2.1 Environment Strategy context

The Environment Strategy both identifies and seeks to address a series of challenges that reflect the various pressures acting upon the environment:

- **Climate change**
- **Unsustainable resource use**
- **Degraded ecosystems**

⁵³ Note that some of the objectives of the Environment Strategy are also taken forward by other strategies, notably the Sustainable Development Scheme, the Climate Change Strategy, the Waste Strategy, the Wales Spatial Plan and the Wales Rural Development Plan.

- **Loss of biodiversity**
- **Poor quality local environments**
- **Environmental hazards**
- **Loss of landscape and heritage quality and distinctiveness**

Countryside Survey provides information that is relevant to most of these, and an initial assessment of Countryside Survey results in relation to each of these is presented later in this chapter.

Within this high-level framework, a range of sectoral strategies and programmes exist that variously impact on those aspects of the environment investigated by Countryside Survey. In the context of Countryside Survey, especially important are those relating to agricultural policy. In addition woodland policy, water policy, and the Town and Country planning system also impinge on aspects of countryside change that Countryside Survey records, to varying degrees. The new devolved Wales Biodiversity Action Plan process also aims to address countryside change, by influencing national and regional policies and strategies, and by promoting and supporting direct action for habitats and species.

Given the particular influence that agriculture exerts over the Welsh countryside, additional information is provided below on changes that have occurred between 1998 and 2007. Additional information is also provided in relation to woodland policy.



▲ Mathry, grazing pasture • © Clive Hurford

9.2.2 Agricultural Context

1. There has been a major change in the type of subsidies provided under Pillar 1 of the Common Agricultural Policy (CAP), which although somewhat reduced still accounts for some two-thirds of Welsh agricultural spending.

- During the period 1997- 2005, subsidies for sheep and cattle were provided on a headage basis. Since 2005 however, most farmers have been entitled to claim the Single Farm Payment. Whilst this is related to the level of subsidy paid during the period 2000-2002, it no longer depends on the actual level of production.
- The introduction of the Single Farm Payment removed the incentive to maximise livestock numbers, whilst at the same time driving a greater focus on market requirements. For example, the total number of sheep and lambs declined from 10.8 million in 1997 to just under 9 million in 2007. At the same time there has been a trend towards the use of larger heavier animals with anecdotal evidence suggesting that farming activity may now be focussing on the better quality land coupled with less use of rougher and more remote areas of grazing.
- All farmers in receipt of the Single Farm Payment must now abide by the terms of the cross-compliance system retaining their land in Good Agricultural and Environmental Condition⁵⁴. Support payments can be reduced or may be withheld entirely should there be a breach in the required standards. The bulk of these relate to existing legal obligations, together with a smaller number of non-statutory requirements covering issues such as the management of soils and traditional field boundaries.

2. There has been a significant increase in participation in agri-environment schemes since they were launched in 1986 and throughout the period of the survey.

- Between 1999 and 2008, the number of agri-environment agreements increased from 4,120 to 8,620 whilst the coverage increased from 262,000 ha (16% of the Welsh agricultural area) to 680,000 ha (41%)⁵⁵. This increase has been driven partly by the increased funding available under the Wales Rural Development Plan, but also reflects the significant coverage (c.300,000 ha) achieved under the less demanding Tir Cynnal entry-level scheme which was introduced in 2005.
- The replacement of Environmentally Sensitive Areas (ESA) and Tir Cymen schemes by the more demanding Tir Gofal scheme in 1999 placed a much greater emphasis on field boundary restoration; re-introduction of mixed farming practices (incorporating small-scale arable cropping and the use of cattle alongside sheep) and the use of streamside corridors and unfenced buffer strips. Participants were

⁵⁴ See www.wales.gov.uk

⁵⁵ Rural Development Plan for Wales 2000-2006 (page 294) and Sustainable Farming and Environment: Action towards 2020 (page 56).

also required to make a significant commitment to habitat restoration as well as to habitat maintenance. Over 330,000 ha (20% of the Welsh agricultural area) had been entered into Tir Gofal agreements by March 2007⁵⁶.

3. There has been a steady increase in the area of land devoted to organic farming.

- Between 1999 and 2008, the area of land managed under organic farming schemes increased from 2,350 ha⁵⁷ to 75,400 ha⁵⁸ whilst the number of agreements increased from 61 to 797.

4. Market forces are likely to have had a major impact throughout the survey period:

- The milk price has fallen in real terms driving many farmers out of the dairy industry. The remaining farms tend to be larger or more specialised. Despite the continued loss of dairy farms (reducing from 4,960 in 1997 to 4,200 by 2007) the size of the national dairy herd has actually increased (from 280,000 to 340,000)⁵⁹ but these cows are likely to be located on more profitable units better placed to invest in measures designed to reduce pollution such as slurry stores, separation of clean and dirty water etc.
- Beef and sheep prices improved towards the end of the survey period, but overall profitability has remained low in real terms. Prices for key inputs such as fertiliser and fuel increased significantly towards the end of the survey period, increasing the incentive to use such inputs more efficiently.
- Arable prices increased sharply towards the end of the survey period, but have now fallen back. Specialised arable farms occupy a very small proportion of the Welsh agricultural area (<3%) meaning that any changes within this sector are unlikely to have had a major impact on the countryside, other than in primarily arable areas such as the lowlands of South Pembrokeshire, Vale of Glamorgan and Vale of Clwyd.

5. Other factors likely to have affected agricultural land use during the survey period include:

- The delivery of significant support from European Structural Funds (in particular Objective 1 of the European Regional Development Fund) using the mechanism of the Wales Rural Development Plan during the period 2000-2006. In particular, a large number of Farm Investment Grants and a smaller number of Farm Enterprise Grants were provided as part of the Farm Development Planning process, with some £21.5M disbursed over the period 2000/01 – 2007/08⁶⁰. Farm Investment Grants were used to improve on-farm infrastructure (livestock housing, slurry stores etc) whilst

Farm Enterprise Grants were used to help farm businesses diversify into a wider range of commercial activities.

- The housing market remained strong throughout much of the survey period. This is likely to have accelerated the ongoing trend (driven by a complex mix of factors including changing lifestyle aspirations as well as market forces) towards greater specialisation, the decline of medium sized farms and the simultaneous formation of increased numbers of both larger and smaller enterprises. In particular, a strong residential market will have contributed substantially to the growth in the number of small-holdings, hobby farms, livery stables and blocks of land used primarily for keeping horses.

6. The Environmental Impact Assessment (Agriculture) (Wales) regulations were first introduced in 2002 and apply to all uncultivated and semi-natural areas in Wales:

- The regulations are designed to allow agricultural changes that do not significantly affect the environment or landscape whilst providing protection for land of special environmental, cultural or historical value. The regulations require that a screening decision be obtained from the Welsh Assembly Government before agricultural intensification is undertaken on semi-natural or uncultivated land.
- Since 2002 the Assembly have dealt with 348 applications under the regulations (to end of 2008).
- A benefit of these regulations is the educational value of discussions with the farmer during a site visit from an ecologist. Farmers are often willing to protect habitats on their farm but are often unaware of what areas may be of special importance.

9.2.3 Woodland context

Established policy largely protects woodland from change to agricultural use. The underlying principles of forestry policy over the last twenty or so years have been: (1) the sustainable use of our existing woods and forests; and (2) a steady expansion of tree cover to increase the many, diverse benefits that forests provide. Woodlands for Wales (2009) reiterates this with objectives that include:

- more woodlands and trees are managed sustainably;
- woodlands are better adapted to deliver a range of benefits;
- woodland cover in Wales increases.

⁵⁶ Wales Audit Office Report on Tir Gofal, November 2007 (page 52).

⁵⁷ Wales Rural Development Plan 2000 - 2006, (page 306).

⁵⁸ Sustainable Farming and Environment: Action towards 2020 (page 56).

⁵⁹ Data accessed from 'Farming Facts & Figures, Wales 2005' and 'Farming Facts & Figures, Wales 2008'. Welsh Assembly Government.

⁶⁰ Data accessed from 'Farming Facts & Figures, Wales 2005' and 'Farming Facts & Figures, Wales 2008'. Welsh Assembly Government.

Since the mid-1970s, when aggressive agricultural expansion threatened woodlands in parts of the UK, mechanisms such as the felling licence system⁶¹, and latterly the Environmental Impact Assessment Regulations⁶² have reduced the risk of woodland being removed for agriculture. The pressures to increase the area of land in agricultural use have been low over the past decade. Such losses of woodland cover as have occurred are thought largely to reflect the provision of new infrastructure (such as roads) or development.

Planning Policy Wales (2002) emphasises the importance of trees and woodlands as wildlife habitats and for their contribution to landscape character and beauty. Local planning authorities are directed to protect trees and woodlands where they have natural heritage value or contribute to the character or amenity of local areas. Special emphasis is placed on the protection of Ancient Semi-natural Woodlands, because they are irreplaceable⁶³.

Most woodland under management in Wales is grant aided by the Forestry Commission Wales. In 2006 the Woodland Grant Scheme was replaced by Better Woodlands for Wales, which is based on production of a management plan and is designed to deliver a range of environmental benefits. Grant rates are tiered so that, for example, restocking coniferous woodland is likely to be funded at a lower rate than broadleaf woodland. Incentives to restore Plantations on Ancient Woodland Sites (PAWS) are greater than the incentive to maintain plantation woodland. This is in line with the commitment to increase the area of restored ancient woodland and deliver Biodiversity Action Plan targets for woodland restoration.



▲ Woodland conservation management • © CEH

More than half of the 178,000 ha of privately owned woodland in Wales has never been in a woodland grant scheme and therefore is unlikely to be actively managed⁶⁴. Agri-environment schemes have helped to increase the area of woodland which is fenced to allow levels of grazing to be controlled, but extensive areas of native woodland remain heavily grazed. There are some benefits as certain bird species such as pied flycatcher, are more common in

heavily grazed oak woodlands. But in the longer term uncontrolled grazing represents a threat to the continued survival of these woods, and the poorer woodland structure is generally lower in biodiversity value.

Woodland expansion has been generally low in the past decade, largely due to high prices for agricultural land, and an unwillingness to commit land to such a significant change of use.

9.3 Synthesis of Countryside Survey results

9.3.1 A snapshot of the Welsh Countryside in 2007



▲ nr Llanrhaeadr • © Michael D Smith

The snapshot of Wales that the 2007 survey provides largely mirrors pictures of the Welsh countryside that other surveys and studies have provided in recent years⁶⁵. Countryside Survey indicates that, together, semi-natural grassland and enclosed farmland (91% of which is Improved Grassland) make up 60% of Wales (**Figure 9.1**). Of the semi-natural grassland types, Neutral Grassland is most extensive (accounting for 55% of all semi-natural grassland) and species records indicating a high frequency of Perennial Rye-grass (*Lolium perenne*) (**Chapter 3**) suggest that most of this has undergone some degree of agricultural improvement. Improved Grassland and Neutral Grassland combined, account for 47% of the land cover of Wales.

Comprehensive surveys by CCW indicate that patches of unimproved Neutral Grassland are often small and very localised. Calcareous Grassland has an even more local distribution. Acid Grassland by contrast often occupies much larger areas, especially throughout upland Wales. Woodland is the next most extensive type, and occurs as patches of various sizes from small to very large. Coniferous Woodland especially often takes the form of very large blocks in some areas. A similar pattern of infrequent, localised but locally large areas characterises the distribution of Broad Habitats such as Bog and Dwarf Shrub Heath, as well as the distribution of most urban and other built land.

⁶¹ Forestry Commission (2007) *Tree Felling – Getting permission* (Page 4 Proposed conversion to agriculture).

⁶² Environmental Impact Assessment (Forestry) (England & Wales) Regulations 1999.

⁶³ Planning Policy Wales (2002) Welsh Assembly Government.

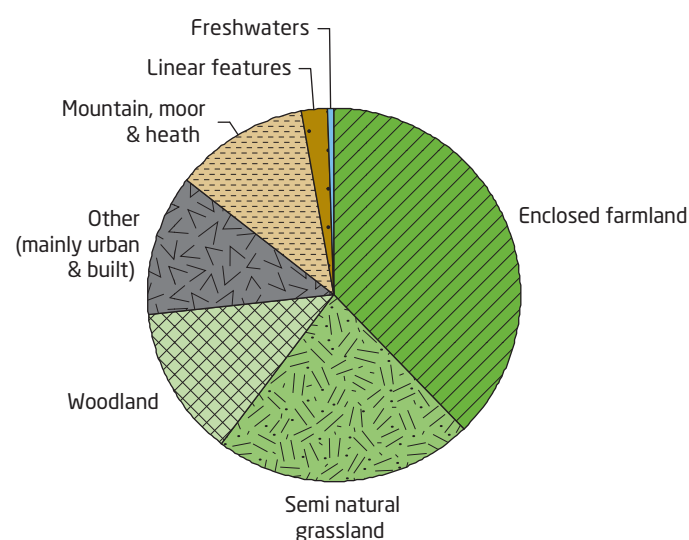
⁶⁴ *Woodlands for Wales, The Welsh Assembly Government's Strategy for Woodlands and Trees*. WAG, 2009.

⁶⁵ Habitat Survey of Wales, Land Cover Map 2000, earlier Countryside Surveys.

Our soils in Wales contain important stores of carbon which have accumulated over the last 11,000 years since the last glaciation. Across all vegetation types the stock of carbon in soil (0-15cm) is an average 63 t/ha. When calculated for Wales as a whole carbon in soil (0-15cm) is 144 Teragrams (10^{12} grams) equivalent to 10% of the value for Great Britain as a whole. It should be remembered, these values for soils (0-15cm) do not represent the total soil carbon stock of the different habitats. For example, there are large stocks of carbon in bog soils, since they are deeper and richer in carbon compared to most other habitats. Nevertheless, the top soil horizons are thought to be the most susceptible to change over time as they are more immediately affected by land management activities and environmental change and thus resources have been focussed on this top soil layer. Mean pH of this topsoil in Wales is 5.56 which is intermediate between that of Scotland (5.09) and England (6.51) and is an average pH arising from a complex mix of geology, soil types and land management in Wales.

Countryside Survey provides information on two freshwater Broad Habitats: Standing Waters & Canals; and Rivers & Streams. Combined, these represent only 1.2% of the area of Wales (Figure 9.1) but are important habitats for people and wildlife. The majority (83%) of open water bodies (Standing Waters & Canals Broad Habitat) are in the upland zone whilst the majority (62%) of watercourses (Rivers & Streams Broad Habitat) are in the lowland zone. Additionally, there are 47,000 ponds in Wales with 70% of these in lowland areas.

▼ **Figure 9.1:** Relative proportions of land cover in Wales in 2007. Composed of seven Broad Habitat groups (equivalent to chapter groupings).



9.3.2 Changes in the Welsh Countryside

A simple comparison of the pictures of Wales painted by the various surveys mentioned above suggests that the Welsh countryside has not undergone enormous changes in its make-up in recent decades. The dominant components of the Welsh countryside – various types of grassland and woodland – have remained as such. Semi-natural habitats of high nature conservation value occur within this matrix – in the uplands, extensive areas of heath and bog are present in some areas; in the lowlands, less modified habitats often exist only as small fragments, and larger areas are less common (raised bogs and coastal habitats are examples). Greatest losses of semi-natural habitats occurred during an earlier period, through conversion for more intensive agricultural use.

The changes (and the lack of changes) in habitat extent reported by Countryside Survey are in line with this broadly stable pattern. For many habitats, Countryside Survey provided no evidence of any change in extent, but for a few habitats, there was evidence of change, sometimes restricted to just the upland or lowland zone (Table 9.1).

It is tempting to try to relate some of these changes directly to one another – to balance up an increase in one type against a decrease in another (for example, to suggest that the increase in Acid Grassland in the upland zone is in part a result of the reduction in Neutral Grassland in the same zone, perhaps as a consequence of relaxation of management of semi-improved grassland allowing the influence of the underlying acid geology to become more prominent). In most cases it would be premature to do this. Further analysis of spatial turnover of habitat area in the survey squares, and their associated uncertainty, is required before we can be confident about the actual exchanges between types and the extent to which these can be generalised across the countryside. Having said that, it is possible that exchanges between Acid and Neutral Grassland have occurred, and we should probably expect some of this anyway, simply as a result of the difficulty in differentiating between types that, in reality, grade into one another. Changes in the area mapped as Bracken Broad Habitat is another instance where mapping sensitivity, perhaps combined with weather effects and differences in timing of survey, may have made a significant contribution to reported change. It is also entirely plausible that the increase in Acid Grassland is a consequence of areas no longer being recorded as Bracken Broad Habitat even though bracken appears to have remained a major component of the vegetation. In a few cases (the increase in bracken, for example), methodological issues seem likely to have contributed to results; but such limitations are present in most large surveys and, through further analysis, it should be possible to identify the contribution that real change has made to reported changes.

The reported changes that we expect to be less sensitive to mapping sensitivity include the increase in Built-up areas & Gardens across Wales, the increase in Arable & Horticulture in the uplands and the increase in Broadleaved, Mixed & Yew Woodland in the lowlands. Of these, the change in arable and built land can only reflect actual changes in land use (neither type develops naturally from another type through shifts in management intensity).

▼ **Table 9.1:** Summary of changes in Broad Habitat extent in Wales between 1998 and 2007 based on results from Countryside Survey.

a) No evidence of change				
• Improved Grassland	• Dwarf Shrub Heath			
• Calcareous Grassland	• Bog			
• Coniferous Woodland	• Fen, Marsh & Swamp			
• Standing Water & Canals	• Montane			
• Rivers & Streams	• Inland rock			

b) Evidence of increase (1998 to 2007)				
	Broad Habitat	Size of change (ha)	95% confidence limits	
Upland Zone	Arable & Horticulture	+ 4,272	+ 1,956	+ 9,764
"	Acid Grassland	+ 13,045	+ 1,100	+ 25,022
Lowland Zone	Broadleaved, Mixed & Yew Woodland	+ 8,851	+ 1,243	+ 15,814
All Wales	Built-up Areas & Gardens	+ 14,674	+ 5,809	+ 24,030

c) Evidence of decrease (1998 to 2007)				
	Broad Habitat	Size of change (ha)	95% confidence limits	
Upland Zone	Neutral Grassland	- 33,255	- 1,964	- 53,127
"	Bracken	- 26,589	- 3,366	- 55,521
All Wales	Bracken	- 46,659	- 7,413	- 94,473

▼ **Table 9.2:** Summary of changes in landscape features in Wales between 1998 and 2007 based on results from Countryside Survey.

a) No evidence of change				
• Lines of trees/shrubs/relict hedge	• Bank/grass strip			
• Wall	• Fence			

b) Evidence of increase (1998 to 2007)				
	Landscape feature	Size of change (km - linears; no. - ponds)	95% confidence limits	
Lowland Zone	Lines of trees/shrubs/relict hedge/fence	+ 2,039	+ 788	+ 3,080
"	Ponds	+ 5,903	+ 2,639	+ 13,152
All Wales	Lines of trees/shrubs/relict hedge/fence	+ 2,666	+ 1,153	+ 3,943
"	Ponds	+ 5,976	+ 1,605	+ 14,841

c) Evidence of decrease (1998 to 2007)				
	Landscape feature	Size of change (km - linears; no. - ponds)	95% confidence limits	
Upland Zone	Total woody linear features	- 2,740	- 1,499	- 3,942
"	Hedges	- 3,030	- 1,739	- 4,356
All Wales	Hedges	- 3,228	- 706	- 5,835

Similarly, the increase in woodland might reflect a change in land use through new planting, but could also result from successional changes – the development of scrub for example resulting from a reduction in management on other habitats.

For the increase in Built-up areas & Gardens, some further analysis has been completed that provides additional details about the nature of the change and the type of habitat that has moved into this category since 1998. Most of the change is a result of many small changes, typically related to new buildings (both urban and agricultural) but also to the creation of new gardens, with most change at the expense of either Improved or Neutral Grassland.

This change also appears to be consistent with increased funding to farmers under EU Objective 1 funding for new buildings and waste storage facilities.

Changes in the abundance of landscape features are summarised in **Table 9.2**. Among the various types of boundary features characterising enclosed farmland, changes were recorded only in the woody types (hedges and lines of trees). The emerging pattern suggests reduced management of hedges resulting in an increase in 'lines of trees' at the expense of more regularly managed hedges. During the same period, the number of ponds increased substantially, mainly in lowland Wales.



▲ Overgrown streamside plot, south Wales • © CEH

Beneath this level of gross change, where one habitat is transformed into another, an additional layer of changes occurs within habitats. These changes are usually less immediately apparent to the casual observer but can provide an indication of the first signs of changes in habitat composition that, in some cases, eventually lead to one habitat type changing into another. In other cases, it might simply reflect a sustained change in the quality or condition of the habitat. Rather than the step-changes in habitat type resulting from changes in land use, changes within habitats provide an indication of the more subtle shifts that can occur as a result of pressures such as climate change, air pollution, changes in management intensity and invasive alien species. At this early stage, no attempt has been made to establish links between individual changes and the action of individual pressures. This is a complex area, with suites of pressures potentially interacting and contributing in combined fashion to any single recorded change. Work to identify some of these relationships is currently underway and will be reported separately in 2010 as part of a project to quantify the status and delivery of ecosystem services across Britain. At this stage, however, we are able to attempt some preliminary assessment of whether recorded changes are consistent with existing understanding of the impact of particular pressures on the environment and whether recorded changes are thought to have additional significance ecologically, for example by impacting on fauna not recorded directly by Countryside Survey. There is also interest as to whether recorded changes are consistent with environmental policy aspirations.

Looking across the full range of habitats, a number of patterns emerge. First, there is a general trend for decreasing species richness (**Figure 8.4**). The size of the reduction was relatively small over the most recent survey period when averaged across all habitat types, but larger when examined over the longer period between 1978 and 2007, and particularly large within some habitats or locations (most notably along the banks of watercourses). Within this general pattern, there were more specific declines in the species richness of food plants used by butterfly larvae and farmland birds; this is particularly pronounced for butterfly larval food plants. Changes within other measures of vegetation condition suggest a general tendency for vegetation to have become characterised by an increased component of shade-tolerant species and taller, more competitive species. At the same time, species characteristic of open ground have tended to become less prominent in defining vegetation character. However, trends in these attributes (and others such as Ellenberg pH Score and Ellenberg Fertility Score) do vary somewhat between different habitats and landscape locations, and more detailed accounts can be found in the individual chapters of this report. Another notable change was the improvement in the physical characteristics of streams between 1998 and 2007.



▲ Unmanaged semi-natural grassland • © David Allen

Countryside Survey reports on a growing number of indicators that convey aspects of soil quality and the potential for supporting a range of key ecosystem services. Outcome 14 of the Environment Strategy for Wales is to manage soil to safeguard its ability to provide ecosystem services. The importance of these different services varies from place to place so that for example, crop production is important on fertile, level, well-drained lowland soils whilst downstream flood control and carbon storage are ensured by intact peatlands at the head of upland catchments. Countryside Survey is one of the few national datasets available which enable trends in soil (0-15cm) to be objectively followed for a wide range of habitats and thus to be scaled up to report for Wales as a whole.

▼ **Table 9.3:** Overall ecological trends in vegetation in Main or Linear Plots in each Broad Habitat for Wales between 1990 and 2007. Based on summarising significant changes in vegetation characteristics given in each Broad Habitat chapter. Species richness change is indicated if either the total number of species, number of butterfly larval food plants or number of lowland farmland bird food plants changed.

Broad Habitat	Species richness	Succession/shading (S) or disturbance/more open conditions (D)	More (M) or less (L) competitive species
Broadleaved, Mixed & Yew Woodland	↓	-	M
Coniferous Woodland	-	-	-
Linear Features	↓	S	M
Improved Grassland	↓	S	M
Neutral Grassland	-	-	-
Acid Grassland	-	-	-
Bracken	↑	-	-
Dwarf Shrub Heath	-	S	M
Fen, Marsh & Swamp	↓	-	-
Rivers & Streams	↓	S	M

The results indicate no major change in soil (0-15cm) carbon concentration for Wales as a whole and for all habitats with one exception; coniferous forests between 1998 and 2007. The message of no major change in soil carbon concentrations is consistent with that reported for Great Britain. It should be remembered these are results for soil 0-15cm only and not the whole soil profile. It does not include soil lost by erosion although a reduction in carbon concentration would be expected if the latter was widespread as soil decreases in carbon concentration down the soil profile. This result does not match the large decrease in soil carbon concentrations (0-15cm) reported by the National Soils Inventory monitoring programme in England and Wales between 1978 and 2003. The reasons for the difference in results between the two surveys are being investigated. Analysis is also focussed on spatial patterns of soil carbon concentration observed across Wales and their association with different vegetation types, land use and management, and other drivers of change.

A major change for Countryside Survey in 2007 was the introduction of data which enables calculation of carbon stock (0-15cm). This takes into account not only the carbon concentration of soil in the top 15cm but also the amount of soil. The amount of soil may change due to changes in compaction for example due to the use of heavy machinery or increased animal numbers. The increased information this provides has resulted in soil carbon stock being selected as an indicator of soil quality for State of the Environment Reporting. In Wales future surveys will contribute to determining change in soil carbon stock and the State of the Environment Reporting process. However, the 2007 baseline is extremely valuable in its own right. For example, when the 2007 carbon stock of soils (0-15cm) under arable land in Wales is compared to that which is observed in England, it may in the first instance appear that such soils (0-15cm) in Wales are degraded of carbon in comparison to those in England, but actually this result is very positive as it illustrates that in Wales the majority of soils used for arable cultivation are mineral in nature with a naturally low carbon stock and thus more appropriate for such land use.

The data from Countryside Survey reported here suggest that reductions in emissions of sulphur from industrial and power plants driven by UK-level air pollution control strategies have been successful in increasing the pH of soils (0-15cm) between 1978 and 2007. This is important as this will help buffer acidity in streams and rivers and also help plants which could not tolerate increased soil acidity. However, the rate of recovery appears to have slowed recently as there were sustained increases in pH only in some Broad Habitats dominated by less organic and less acidic soils between 1998 and 2007. Reasons for this are being investigated to help determine if this is a natural equilibrium for the more organic soils, an effect of continued elevated nitrogen deposition, which contributes to acidic rain, or land management practices or climate-driven phenomenon.

9.4 An initial evaluation of Countryside Survey results

In this section, an attempt is made to evaluate the significance of the reported results from two perspectives. An assessment is made of both the ecological and policy significance of the results. These assessments draw upon results relating both to the current state of habitats and landscape features, and results relating to change in these. In a few cases, assessments of state are made by comparing current estimates with established reference values or explicit targets reflecting environmental/countryside policy objectives.

No attempt is made here to evaluate the current habitat composition of Wales described by the 2007 'snapshot' against any broader vision of a Wales that seeks to meet multiple societal demands. Spatial planning is a major area of growing interest – how to plan (in a spatially explicit way) for an environment that delivers a required range of ecosystem goods and services. An evaluation of this sort requires present-day national habitat maps, a more explicit expression of what such a Wales could look like, and analysis of what trade-offs would need to be made. Is it possible, for example, to target improved food production in areas not valued for other

functions such as carbon storage, water flow regulation, and support of biodiversity? Countryside Survey helps to meet the need for up-to-date habitat maps through the production of an updated UK Land Cover Map based on satellite imagery. Another initiative relevant here, again using remote imagery, is the work by CCW to update the maps of the 1979-1997 Habitat Survey of Wales. The Integrated Assessment of Countryside Survey data is being used to identify potential trade-offs between different land uses and will be an essential data source for the UK National Ecosystem Assessment⁶⁶.

While the Countryside Survey field survey provides spatially restricted information about the distribution of habitats (limited to that within 1-km sample squares), the minimal representation of certain types in the sample does tend to emphasize the localised nature of their distribution. Such localised, fragmented distribution of habitats has a potentially profound ecological significance, especially in the face of pervasive pressures such as climate change. Improved connectivity of habitats is seen as an important means of making the environment more resilient to the effects of climate change, facilitating the movement of species through landscapes as the climatic limits to their distribution alter. Some of the changes recorded by Countryside Survey are considered below in terms of what they might mean in relation to habitat connectivity.

9.4.1 *The influence of land use*

Countryside Survey has detected clear patterns of increase and decrease in some habitats, namely an increase in Arable & Horticulture in the uplands, an increase in Broadleaved, Mixed & Yew Woodland in the lowlands, and an increase in Built-up areas & Gardens across Wales. The increase in built land and cultivated land has been mainly at the expense of Improved and Neutral Grassland (itself mostly showing signs of agricultural improvement, see above), both generally seen as being of fairly low nature conservation value, so probably of limited ecological significance. The ecological significance of the increases in arable and woodland will be influenced by the landscape context in which they have occurred, and by the nature of the habitats that they have replaced. Assuming they have not replaced habitats of existing high nature conservation value (an assumption that requires checking through further analysis), these increases could be viewed positively – the increase in Broadleaved, Mixed & Yew Woodland is consistent with the aims of the UK Biodiversity Action Plan, and the increase in arable is consistent with aims of agri-environment schemes, in particular with the objective of schemes such as Tir Gofal in seeking to restore farmland bird populations. Both of these changes may reflect responses to the financial support available to farmers and other land managers. Planting of new woodland has been supported by Better Woodland for Wales. Changes in arable production within the uplands may be related to the increased uptake of agri-environment schemes; the expansion of organic farming and the introduction of new agricultural practices (such as the production of arable silage) as part of a continued effort by livestock farmers to reduce the costs of inputs such as straw and animal feeds by growing more of their own supplies.



▲ Poppies and Corn Marigolds • © Clive Hurford

Other changes in habitat extent (Bracken, Neutral and Acid Grassland) might be related to changes in management or the action of other pressures but they may also be influenced by methodological issues, and further work is required to determine the relative contributions of these factors to reported change.

The pattern of stability across many habitats suggests, at least, that they are not being converted in any large degree for more intensive land uses. But equally, such stability provides little evidence of progress towards meeting the habitat expansion targets set out in the Biodiversity Action Plan. Some caution should be exercised here, however, and we should not exclude the possibility that Countryside Survey has too little statistical power to detect all changes that are taking place – this is especially likely for rare habitat types of high nature conservation value, where both gains and losses might go undetected; the apparent stability of Calcareous Grassland might be a case in point. In some cases, policy encourages a degree of stability – for example, woodland is protected by the felling licence system and a presumption against the transfer of woodland to agricultural land use. Similarly, conversion of semi-natural vegetation to Improved Grassland is protected by the Environmental Impact Assessment (EIA) (Agriculture Wales) Regulations 2007.

9.4.2 *The influence of land management practices*

Among the various changes in condition recorded within individual habitat types, and in certain landscape locations, for example along hedges, roadsides and streamsides, the declining pattern of species richness is striking and seemingly at odds with the aim of reducing or halting biodiversity loss⁶⁷. But we should be cautious in rushing to a simplistic conclusion. A decline in species richness might not always be viewed negatively; in some situations it may be a consequence of other, desirable changes. In woodland, for example, a reduction in species richness may in part be a consequence of the gradual maturation of woodland that is recovering from major disruption caused by extensive felling in both World Wars, combined with a generally low level of management intervention in the last few decades.

⁶⁶ www.unep-wcmc.org/eap/ukNationalIEA.aspx

⁶⁷ Explicit aim of biodiversity action at global and national levels, with target to achieve this by 2010.

Even the most dramatic of reported declines in species richness – the decline on streamsides – need not be viewed as universally negative. A range of measures (including Agri-Environment Schemes and management agreements on Sites of Special Scientific Interest) have provided support for the creation of streamside corridors, and streams have been fenced and managed to meet a number of objectives – provision of improved habitat for fish, provision of corridors for mammals, buffering of watercourses from the impacts of adjacent agriculture, and improvement of bankside stability. The exclusion of grazing animals from such areas results in increased growth of vegetation and successional change – and Countryside Survey results suggest that changes of this sort have indeed occurred. These changes may in turn have contributed to the improvement in the physical characteristics of streams. So, there is a tension here between the provision of some specific environmental benefits and the less desirable, but general reduction in species richness. Examples such as this serve to illustrate that complex trade-offs are required if the countryside is to be managed in a balanced way for the achievement of multiple objectives.

Observed patterns of change are not only consistent with specific changes in management of the sort described above. Some of the changes recorded by Countryside Survey might be related to more general long-term trends in land use and management. Many of these changes appear consistent with successional processes that may in turn be a result of changes in the way the countryside has been managed over the last 50 or more years. In lowland Britain in particular, evidence from a range of sources points to a shift away from landscapes characterised by a mixture of farming practices and lower nutrient inputs⁶⁸. Instead, many rural landscapes have become progressively more simplified and generally richer in nutrients⁶⁹. Agriculturally marginal habitats are now much less likely to be exploited (with a greater risk of abandonment, particularly in the lowlands) whilst agricultural activity on the more productive land is focused on maximising profitability through economies of scale and increasing specialisation.

9.4.3 The influence of air pollution, weather and climate change

Air pollution, including sulphur dioxide, is of particular concern to Wales where 58% of semi-natural habitats receive acidic deposition at rates likely to cause damage in the long term i.e. the critical load for acidity is exceeded⁷⁰. There is clear evidence this acidic deposition has led to a decrease in the pH of both soils and waters in Wales with associated change in plant and animal communities. However, emission control policies have been successful in reducing sulphur deposition which is a major component of acid rain. The observed increase in soil pH over the survey period corresponds to this decrease in sulphur deposition over a similar time period suggesting a positive policy impact related to reduction of sulphur emissions and atmospheric deposition. Initial exploration of the data suggests that changes in soil pH are correlated with consistent changes in plant species composition, however quantitative analysis of the role of changes in sulphur deposition in driving these interactions has yet to be completed.



▲ Port Talbot • © Richard Evans

Another component of air pollution identified in previous Countryside Surveys as a potential driver of ecosystem change, is nitrogen deposition. Atmospheric nitrogen originates from power plants, transport, industrial and agricultural sources making it a complex pollutant to control. Currently, 87.5% of semi-natural habitats in Wales receive nitrogen deposition at rates likely to cause damage to sensitive components of the ecosystem (i.e. their critical load for nutrient nitrogen is exceeded). Previous analysis of Countryside Survey data across the whole of Britain showed that small but significant amounts of the observed change in plant species composition were widespread and indeed correlated with atmospheric nitrogen deposition⁷¹. Analyses that incorporate the 2007 data and seek to attribute observed changes to nitrogen deposition among other contending drivers, are ongoing and not yet complete. Whilst signals of eutrophication are present in the results presented here – most notably in small habitat fragments within areas of Improved Grassland (**Table 2.6b**) and Acid Grassland (**Table 3.7b**) – detection of change in vegetation condition is not in itself a reliable indicator of correlative relationships with possible causal factors.

Further analyses are also needed to determine if the weather around the time at which each 1-km square was surveyed translate into detectable impacts on vegetation condition measures. For example, changes in weather may have encouraged more moisture-loving species and greater accumulation of biomass, with the result that fewer seasonal vegetation gaps exist to be exploited by weedy species. It has also been proposed that the substantial change in bracken cover may be linked to the impact of very high rainfall in parts of Wales in the summer of 2007 (see **Chapter 6**). Even for soils, weather may be important – the expansion of soil in wetter conditions may lead to the soil sample coring technique sampling to a shallower depth. Analyses are underway to examine all these possibilities as it is important to differentiate the impact of within-year weather effects from those that might be linked to the recent warming trend as well as other drivers highlighted above.

⁶⁸ Chamberlain *et al* (2000) *J. Appl. Ecol.* **37**, 771–788.

⁶⁹ Smart *et al* (2006) *J. Appl. Ecol.* **43**, 1128–1137.

⁷⁰ www.critloads.ceh.ac.uk

⁷¹ Smart *et al* (2004) *WASP Focus* **4**, 269–278.



▲ Passing rain • © Richard Evans

Warmer conditions may also be expected to cause a reduction in soil carbon concentrations but Countryside Survey data suggests no change is detectable to date.

A warming climate might be expected to favour a range of non-native species. However, Countryside Survey suggests that such species are relatively scarce in the wider countryside, and that overall, non-native species richness has decreased since 1978 (*Fig 8.4*). Depending upon the non-native species type and landscape location, different factors could be involved; gap-colonising ruderals would not be favoured by increased biomass linked to wetter and warmer growing seasons whilst shade-intolerant herbs are likely to be reduced by increased growth of shrubs and trees.



▲ Flooding in the Welsh borders • © Colin Barr

9.5 Implications for policy

The development of more wooded vegetation on streamsides and other linear features, along with the shifts in physical structure of some hedges, and the increase in extent of Broadleaved, Mixed & Yew Woodland in lowland Wales might be seen as contributing to the increased connectivity of the countryside. Increased connectivity theoretically makes it easier for a range of species to move across patchy landscapes thereby ameliorating the impacts of previous fragmentation and increasing resilience in the face of climate change. Increased woody cover will also tend to favour shade-tolerant rather than shade-intolerant species, the latter more typical of non-wooded semi-natural habitats such as grasslands and fens. Once again, there appears to be a trade-off here between the realisation of an environmental benefit (increased connectivity) and a potential loss of diversity. Given the strong probability of ongoing climate warming, the loss of species is not consistent with maintaining a diverse species pool that has maximum flexibility to respond to expected environmental change.

Maintenance of biodiversity within habitats depends in part on the existence of habitats in a range of different states, with different species typically favouring different stages of development. If most stands of any particular habitat converge towards a uniform structure and composition, then opportunities are reduced for the wider range of species that can exist when a range of habitat states is present. So, while the reduction in species richness seen in streamsides (for example) can be associated with measures that bring some particular environmental benefits, if the measures are applied very widely, then a balanced delivery of environmental objectives is unlikely to be achieved. Previous work on Great Britain-wide patterns of change showed that between 1978 and 1998, reductions in mean species richness have been accompanied by a reduction in the variety of types of plant across the countryside⁷². This has tended to result in a residual mosaic of more species-poor habitats characterised by their own typical dominants. The situation is not quite so simple though since, in some situations species richness increased. Further work is needed that includes the latest survey data and determines the extent to which these patterns can be detected in the separate UK countries and whether changes in species richness are correlated with changes in habitat diversity or area, and therefore with land-use change.

The loss of species from streamsides, or from other habitats, might not be viewed negatively if these same species were retained elsewhere in the immediate countryside (the loss might be viewed as an appropriate trade-off against delivery of other environmental benefits). Analysis of earlier Countryside Survey data has proposed the importance of small fragments of semi-natural habitat (such as exists on streamside, alongside hedges, and in other small patches (as measured in Countryside Survey by targeted plots)) as refuges for species declining elsewhere in the countryside. But analysis of current data suggests that species richness is decreasing across a wide range of such locations, suggesting that there may be limited scope for declines in some areas to be compensated for by maintenance of higher levels elsewhere.

⁷² Smart *et al* (2006) *Proc.Roy.Soc.B.* **263**, 2659-2665.



▲ Diverse successional habitats across the Welsh landscape, Epynt
• © Michael D Smith

The decline of species used as food plants by farmland birds and butterfly larvae suggests an immediate additional significance. This trend in food plant abundance is in line with trends shown by the two species groups since the 1970s. UK farmland bird populations have declined by 48% since 1970, and woodland birds by 21% (though since 2000 the trend in the latter has stabilised)⁷³; UK populations of butterfly species associated with semi-natural habitats ('specialists') have declined since 1976 while populations of species found in the wider countryside ('generalists') have remained stable (and both appear to have been stable since 2000)⁷³. A similar pattern of decreasing populations of birds of farmed habitats is evident within Wales. Further work is required to produce equivalent trend indices for butterfly populations in Wales.



▲ Small Tortoiseshell • © Richard Evans

The value for biodiversity conservation of retaining a wide range of habitat states in the countryside (reflecting different stages in their development) was mentioned above. A similar argument might be advanced in relation to other features – maintenance of landscape diversity (as well as associated biodiversity) might be served through the retention of features such as hedges, walls and ponds in a range of states, contributing to what has been called 'ecological infrastructure' in the EU Biodiversity Action Plan for Agriculture⁷⁴. Convergence towards a single or just a few states would result in increased uniformity across landscapes (though it may be that a degree of such uniformity at local levels helps define local landscape character). The decrease in length of managed hedge and corresponding increase in lines of trees, detected by Countryside Survey, suggests one pattern of change among woody field boundaries that is indicative of reduced management intervention. But other results are more consistent with the opposite trend – the low proportion of hedges meeting the criteria that define good condition is likely to be at least partly a result of intensive management. This suggests the possibility that there may be a degree of polarisation occurring in relation to hedgerow management, with quite intensive intervention in some instances, and minimal intervention in others. In any case, most hedges fail to meet biodiversity objectives.

Hedgerows are one Priority Habitat type where we can, without additional analysis, compare results from 2007 with targets set under the UK Biodiversity Action Plan. Targets have been developed that reflect the aims of maintaining and increasing the extent of hedgerows, and of achieving a particular structural and compositional state. The lack of any significant change in the length of woody linear features across Wales suggests that some combination of agri-environment schemes, cross-compliance and the Hedgerow Regulations has effectively halted net loss. The length of hedgerows covered by the UKBAP is likely therefore to have remained stable, though with no progress towards meeting hedgerow expansion targets. The results relating to hedgerow condition are less positive, and a higher proportion of Welsh hedges fail structural and margin criteria than hedges elsewhere in Britain. Assessed against all criteria, only 7% of Welsh hedges met the desired condition criteria. Over half of hedgerows have a structure that fails to reflect that sought under the UK Biodiversity Action Plan, and many of those that do have satisfactory structure are seen as having too narrow, missing or otherwise inadequate margins. In Wales, unlike in England, there is no cross-compliance for a 1 m strip of vegetation to be left uncultivated and unsprayed along boundary features, and agri-environment schemes offer the only mechanism for influencing this.

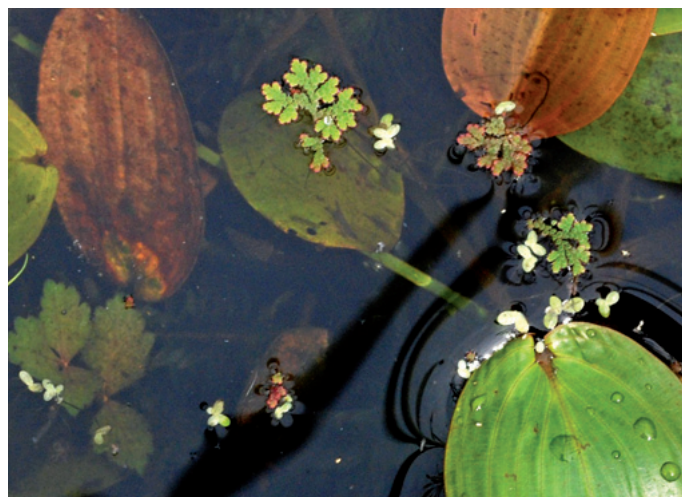
⁷³ UK Biodiversity Indicators in Your Pocket (2009). Online at www.jncc.gov.uk/biyp

⁷⁴ http://europa.eu/legislation_summaries/agriculture/environment/l28024_en.htm

The relative abundance of walls in different states (*Chapter 4*) also hints at a degree of polarisation, with a relatively high proportion of walls in excellent or sound condition but also a high proportion in deteriorating or worse condition. This same pattern is apparent in both the upland and lowland zones, though proportionately more walls in the uplands are in a worse condition. There is some suggestion in the data that the pattern seen in the upland zone may, over time, be observed in the lowland zone. Without intervention, the high proportion of lowland walls in the earlier stages of deterioration will only become increasingly derelict. It seems likely that, at some point, such changes as these would translate into an impact on the distinctive character of certain Welsh landscapes.

The increase in the number of ponds is a positive result, helping to reverse the substantial losses experienced as a result of agricultural intensification during the mid 20th Century. However, when compared against reference values indicating unmodified conditions, most are seen to be of poor or very poor ecological quality. Lowland ponds are created for a variety of reasons, and some may have been created only recently as a result of attempts to store water, an activity supported by grants and incentives. However, the young age of ponds does not alone appear to account for the high proportion of poor/very poor quality – initial evidence suggests that longer established ponds are also often of poor ecological quality. This is not surprising since lowland standing waters are at significant risk of nutrient enrichment from agricultural run-off in Wales, and are particularly vulnerable owing to their high water residence times and proximity to agricultural activity. If an improvement in the ecological quality of ponds is desired, in addition to an increase in their number, then advice on location of new ponds might need changing. Action to address nutrient enrichment through agri-environment schemes or other measures is also likely to be needed.

For soils, the benefit of continued reductions in sulphur emissions are clear in the increased soil pH observed for the more mineral soils. Data analysis is ongoing to determine if other drivers of change such as nitrogen deposition or land management are slowing recovery in the organic soils where pH did not significantly increase between 1998 and 2007. If this is the case, then this may need to be considered in future policy development. Soil carbon concentration results indicate no major changes over the last 30 years. However, this could be a combination of a complex mix of factors some of which may increase soil (0-15cm) carbon concentrations e.g. increased carbon inputs from plants due to nitrogen deposition and increased carbon dioxide in the atmosphere, whilst some may reduce carbon concentrations e.g. intensive land management and a warmer climate. Only by further analysis of Countryside Survey datasets in combination with experimental and survey data from other studies and modelling approaches will be able to advise on the likely future trends of soil carbon and the causes of these changes.



▲ Lowland pond plants; *Potamogeton natans* and the invasive non-native *Azolla filiculoides* • © Clive Hurford

Overall, what emerges from this initial evaluation of the results of Countryside Survey, is a mix of both positive and negative changes. This is outlined in *Table 9.4*. In some cases change may imply a positive outcome for some Environment Strategy challenges and a negative outcome for others, reflecting the complex trade-offs sometimes involved in making decisions about land management.

▼ **Table 9.4:** An evaluation of the status of habitats, landscape features, soils and freshwaters in Wales from Countryside Survey in 2007 in light of Environment Strategy key challenges. **Red** = results suggest an undesirable outcome not consistent with tackling the challenge. **Green** = desirable outcome consistent with tackling the challenge. **Orange** = equivocal result with both inherently positive and negative aspects or where uncertainty prevents a more accurate evaluation.

Environment Strategy Challenge	Messages from Countryside Survey
Climate change	No change in soil carbon concentration (0-15cm) contrary to previous reports for England and Wales. The trend towards warmer conditions could be expected to increase carbon loss from soils but compensatory increases are possible due to increased plant growth due to elevated CO ₂ and nitrogen deposition and reduced intensity of some land management practices.
	An increase in woodland extent, and in tree and shrub dominated vegetation on linear features might contribute to improved landscape connectivity.
	There is no direct evidence of climate change impacts though weather patterns in the short term, at least, could have influenced vegetation condition measurement. Analyses seeking to attribute observed signals to climatic drivers are scheduled but not yet complete.
	The general pattern of reduced species richness is at odds with maintaining a diverse pool of species able to respond to environmental change.
Unsustainable resource use	No change in soil carbon concentrations suggesting current land use and management practices are not causing wide-scale loss of soil carbon (0-15cm).
Degraded ecosystems	Physical characteristics of headwaters improved and number of ponds increased.
	Increase in tree and shrub cover on streambanks increases buffer-zone function and enhances interception of enriched run-off.
Loss of biodiversity	No change in species richness across the major areas of Acid Grassland, Neutral Grassland and Dwarf Shrub Heath.
	Non-native species, including invasives, are scarce in the wider countryside and non-native species richness has declined. The extent to which some of these declining species could be potentially important functional components of future communities requires further research.
	Increase in area of Broadleaved, Mixed & Yew Woodland in lowland Wales. Full evaluation requires information on habitats lost to new woodland and potential drivers of the change.
	36% reduction in plant species richness on streambanks since 1978 associated partly with increased tree and shrub cover.
	Declines in the species richness of food plants of butterfly larvae and farmland birds have direct implications for these animal groups.
Loss of landscape and heritage quality and distinctiveness	Rate of hedgerow removal has declined.
	Walls are in overall better condition in lowlands but a large cohort is deteriorating.
	There is a large proportion of derelict walls in the uplands.
Poor quality local environments	An increase in built environment category suggesting possible reduction of green space surrounding urban environments and in rural settings as much of the increase replaced Improved or Neutral Grassland and Boundary & Linear features.
Environmental hazards	Changes in pH of soils (0-15cm) are consistent with recovery of ecosystems from acidification following large-scale reductions in sulphur emissions.
	87.5% of the area of semi-natural habitats in Wales still receive atmospheric nitrogen above the Critical Load. Previous work has attributed a small part of the GB-wide change in plant species composition in Countryside Survey to nitrogen deposition. Further analyses are needed to extend this attribution work to the 2007 data and to determine the relative importance of the range of potential drivers of the eutrophication signal in Wales.
	Only 5% of ponds in Wales are in good condition possibly due to diffuse pollution sources.
	No change in the biological condition of headwater streams. Further analysis is required to distinguish between stretches showing a) lack of improvement from a degraded state, b) stability at good condition.

Further information and future analysis

More details of the methodology, analyses and results from Countryside Survey can be found in other companion reports and data resources available from the Countryside Survey website.

This report for Wales is one of a suite of reports that have either already been published or are scheduled for publication in the next year or two. The UK results of Countryside Survey were published in November 2008, and this report is one of several country reports that are being produced in summer 2009.

More detailed analysis of particular components of the survey – soils, streams and ponds – will be reported later in 2009 in separate themed reports. A detailed, integrated assessment of Countryside Survey data alongside other datasets, exploring what the results mean for provision of selected ecosystem goods and services, will be reported in 2010. While these reports will make use of the fuller Countryside Survey dataset, rather than a single country dataset, the results will have considerable relevance for Wales. Rather than marking the end of our evaluation of what Countryside Survey results mean for the Welsh countryside, this current report only marks the beginning.

Reports:

- UK Headline Messages – *published November 2008*
- UK Results from 2007 – *published November 2008*
- Detailed Northern Ireland Countryside Survey results – *published 2010*
- England Results from 2007 – *due to be published August 2009*
- Scotland Results from 2007 – *published 25th June 2009*
- Ponds – *due to be published Summer 2009*
- Streams – *due to be published October 2009*
- Soils – *due to be published November 2009*
- Integrated Assessment – *due to be published 2010*

Data resources:

- Web access to **summary data** – a systematic summary of the results used to inform the UK and country level reports – *launched in November 2008 and updated in January 2009*
- Web access to the **actual data** – data from individual survey squares used to generate all the results presented in Countryside Survey reports from the 2007 survey – *licensed access available from June 2009*
- The UK Land Cover Map for 2007 – *September 2009*

The data generated by Countryside Survey will continue to be investigated in conjunction with other information such as climate, pollution and agricultural statistics. It is anticipated that future analysis of Countryside Survey data will lead to many scientific journal articles over the coming years. These investigations will improve understanding about the possible causes of the changes detected in the countryside and, for example, provide an opportunity to explore the results for Priority Habitats in more detail.

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The Countryside Survey partnership has endeavoured to ensure that the results presented in this report are quality assured and accurate. Data has been collected to estimate the stock, change, extent and/or quality of the reported parameters. However, the complex nature of the experimental design means that results can not necessarily be extrapolated and/or interpolated beyond their intended use without reference to the original data.



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www.countryside.gov.uk