



2 Landscapes

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2.1 Introduction

We value our landscapes because of their inherent interest, their contribution to both our national identity and our local distinctiveness, their artistic inspiration and for the services they provide to us.

The natural environment of England consists of a very wide range of landscapes, each formed by a number of factors, including the underlying geology, soils, climate, habitats, and human influence past and present.

Our landscapes extend from the upland hills to the lowlands, through the urban fringe and into the networks of green space of our cities, towns and villages, and on to our varied coastal seascapes. Each landscape type is valued by people for a variety of reasons and each is characterised by its own patterns of landforms, habitats and land use, which create local distinctiveness.

Local distinctiveness not only reflects the natural, historical and cultural diversity of English landscapes but also, with the increasing globalisation of economies, constitutes a unique resource that can contribute to directly improving people's wellbeing and prosperity. For example, it can help people connect agricultural products with their origins and may help link people's health with that of the countryside (see Chapter 4).

Landscapes, geology and habitats

England's diverse geology is important in its own right, scientifically and economically but, in addition, these geological and geomorphological processes have contributed to the creation of England's landscapes and habitats. For a relatively small country, this diverse geology has influenced the great variety of landscapes, and also their associated habitats (see Chapter 3). For example, the improved grassland and arable fields that form a large part of England's lowland landscapes, have developed in the main on deeper, better drained soils. These are now heavily influenced by land management practices as they are primarily used for food production. The chalk and limestone rocks and thinner soils result in a distinctive landscape rich in their own

characteristic wildlife, buildings and settlements. By contrast, the poorly drained acid soils of the uplands are dominated by peatlands, scattered settlements and extensive grazing or game management.

England's diverse coast, with its often spectacular scenery, is also a result of geological and geomorphological processes. Hard and soft rocks create headlands and sandy bays, and wind and tides create sand dunes and saltmarshes. Even under the sea, the scenery varies dramatically, with rock stacks and muddy beds each supporting very different wildlife.

Landscapes and people

Our landscapes mean more than just attractive scenery. They continue to inspire art and literature and influence our national culture. Our landscapes represent a coming together of the natural world, human society and people's needs and provide a range of ecosystem services (the services that the Earth's ecosystems provide, including food, water, disease management, climate regulation, spiritual fulfilment and aesthetic enjoyment). They have influenced the character of our towns and cities, and provide a place to relax, recreate and learn. This is examined further in Chapter 4.

The historic environment makes a particular contribution to the character and value of all of our landscapes. It includes archaeological sites, monuments and buildings; features and patterns of historic land use and management; and historic landscapes, such as parklands (see Section 2.5.1) and battlefields. It provides us with an important understanding of how our landscapes have developed over time. Similarly, common land provides a long-term perspective on the conservation of our natural environment, where landscape, biodiversity, access and historical values are all interlinked (see Section 2.5.2).

International context

Conservation of landscapes has now been recognised at the European level, through the European Landscape Convention (Council of Europe 2000). This is the first international treaty devoted exclusively to the protection, management and planning of all landscapes in Europe. It states: "Landscape means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors." The Convention applies to towns and villages, as well as open countryside; the coast and inland areas; ordinary or even degraded landscapes, as well as those that are outstanding.

Landscape-scale conservation

Healthy landscapes are crucial to providing high-quality ecosystem services. A rich natural environment has landscapes that are diverse, resilient to external pressures (see Chapter 5), with abundant wildlife and valued by people. Poor natural environments are characterised by simplified land use, crop monocultures, lack of diversity (from habitats and species, to culture and local identity) and fragmented habitats that are not only small but also isolated.

In a rich natural environment, habitats are linked, enabling wildlife – and people – to move between them. Many animal species occupy more than one habitat during their life cycle. Consequently, the isolation of habitats hinders not only movement but also completion of life cycles and even threatens a population's survival.

Increasingly, it is recognised that to conserve our full biodiversity and to allow systems to function more naturally, we need to plan conservation activities at a "landscape scale". In practice, many of the principles of landscape-scale conservation are already established in the uplands and on the coast. However, in many parts of lowland England, that is not true. Small pockets of wildlife-rich habitat are isolated from others by intensively managed and wildlife-poor farmland. This fragmentation of habitats is particularly evident for lowland grasslands and heathlands (see Sections 3.3 and 3.4), and the remnants of wildlife-rich habitat within urban areas (Section 3.10).

A landscape of disconnected fragments is also less likely to be valued by people as it lacks the aesthetic appeal, opportunities for recreation and historical and other features linked to a sense of local identity.



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2.2 Landscape characterisation and change

2.2.1 Landscape characterisation

England's landscapes are described and characterised at the national level through 159 Character Areas. Each Character Area represents a characteristic blend of geographical, ecological and historical variations in landscape features. Mapped using an analysis of national datasets, Character Areas do not ascribe value to landscape, but combine a consistent suite of baseline evidence with descriptions of character. Character Areas can be used to target schemes and resources. For example, they are the basis for implementing measures of the Higher Level Stewardship agri-environment scheme, to ensure that individual agreements contribute to the conservation and enhancement of the landscape character of the area, its historic environment and biodiversity.

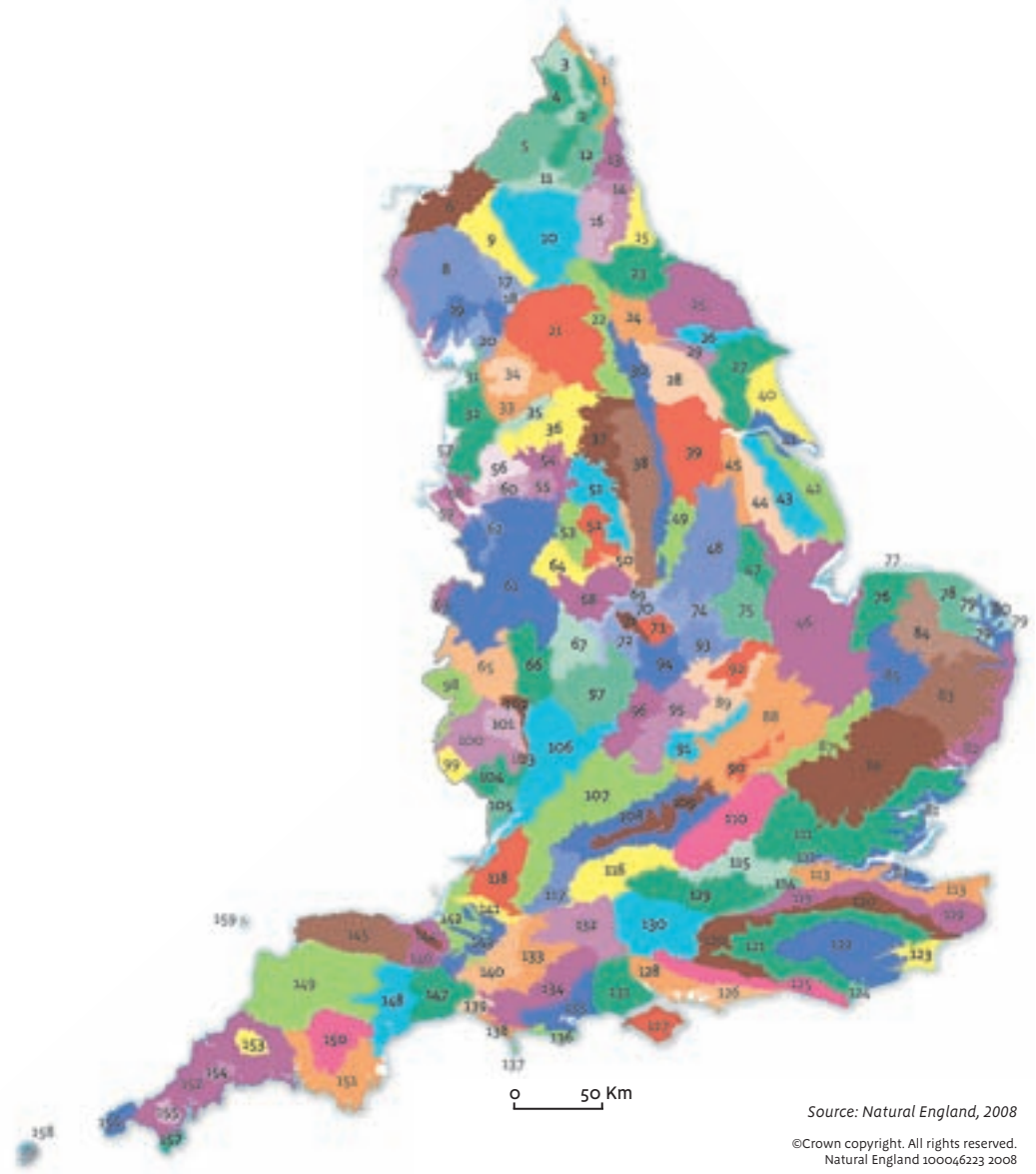
While Character Areas (Figure 2.1) show the broad variations in England's landscapes, they are not sufficiently fine-scale to describe landscape at a local (e.g. district or county) level. For this, Landscape Character Assessment (LCA) has been devised. Up-to-date LCAs have been prepared for approximately 60% of shire counties and most National Parks and AONBs. In many cases, LCAs are being used to inform local planning policies as well as to guide landscape management and other local strategies (Landscape Character 2008). The ongoing local level Historic Landscape Characterisation (HLC) work by English Heritage is potentially very helpful to the LCA process, by increasing understanding of our evolving landscapes. HLC should, within a few years, provide nationwide coverage of historic landscapes with a standard classification (English Heritage 2005a).

2.2.2 Landscape change

Our landscapes are dynamic and subject to many forces of change. We need to understand how change is impacting upon their diversity and character so that strategies and policies can be put in place to ensure that our future landscapes evolve to function as healthy ecosystems as well as reflecting cultural values and distinctive qualities. A deeper understanding of the relationship between landscape structure and natural, cultural and economic values will enable us to manage the consequences of long-term environmental change.

Figure 2.1 England's Character Areas

See Figure 2.2 overleaf for key

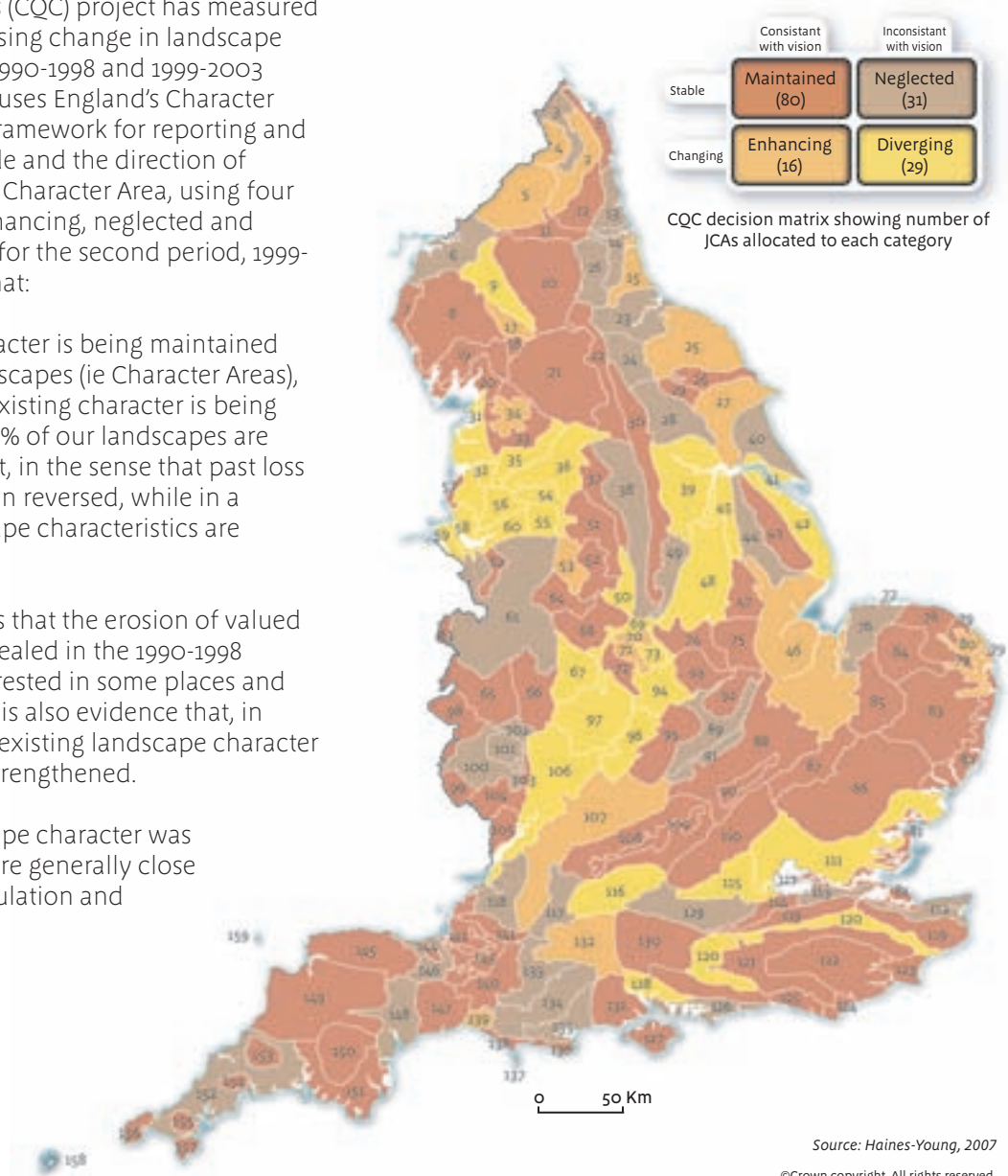


2.2.2.1 Assessment of landscape character change

Nationally, the monitoring of landscape change has been undertaken through a combination of quantitative and qualitative assessment. The Countryside Quality Counts (CQC) project has measured landscape change by assessing change in landscape character for two periods, 1990-1998 and 1999-2003 (Haines-Young 2007). CQC uses England's Character Areas as the geographical framework for reporting and assesses both the magnitude and the direction of landscape change for each Character Area, using four categories: maintained, enhancing, neglected and diverging. The assessment for the second period, 1999-2003, (Figure 2.2) showed that:

- Existing landscape character is being maintained in 51% of England's landscapes (ie Character Areas), whilst in a further 10% existing character is being enhanced. However, 20% of our landscapes are showing signs of neglect, in the sense that past loss of character has not been reversed, while in a further 19% new landscape characteristics are emerging.
- The assessment suggests that the erosion of valued landscape character revealed in the 1990-1998 assessment has been arrested in some places and slowed in others. There is also evidence that, in many key localities, the existing landscape character has been sustained or strengthened.
- Areas where the landscape character was neglected or diverging are generally close to major centres of population and transport routes.

Figure 2.2 Assessment of landscape character change 1999-2003 - Headline Indicator



1	North Northumberland Coastal Plain	55	Manchester Conurbation	105	Forest of Dean and Lower Wye
2	Northumberland Sandstone Hills	56	Lancashire Coal Measures	106	Severn and Avon Vales
3	Cheviot Fringe	57	Sefton Coast	107	Cotswolds
4	Cheviots	58	Merseyside Conurbation	108	Upper Thames Clay Vales
5	Border Moors and Forests	59	Wirral	109	Midvale Ridge
6	Solway Basin	60	Mersey Valley	110	Chilterns
7	West Cumbria Coastal Plain	61	Shropshire, Cheshire and Staffordshire Plain	111	Northern Thames Basin
8	Cumbria High Fells	62	Cheshire Sandstone Ridge	112	Inner London
9	Eden Valley	63	Oswestry Uplands	113	North Kent Plain
10	North Pennines	64	Potteries and Churnet Valley	114	Thames Basin Lowlands
11	Tyne Gap and Hadrian's Wall	65	Shropshire Hills	115	Thames Valley
12	Mid Northumberland	66	Mid Severn Sandstone Plateau	116	Berkshire and Marlborough Downs
13	South East Northumberland Coastal Plain	67	Cannock Chase and Cank Wood	117	Avon Vales
14	Tyne and Wear Lowlands	68	Needwood and South Derbyshire Claylands	118	Bristol, Avon Valleys and Ridges
15	Durham Magnesian Limestone Plateau	69	Trent Valley Washlands	119	North Downs
16	Durham Coalfield Pennine Fringe	70	Melbourne Parklands	120	Wealden Greensand
17	Orton Fells	71	Leicestershire and South Derbyshire Coalfield	121	Low Weald
18	Howgill Fells	72	Mease/Sence Lowlands	122	High Weald
19	South Cumbria Low Fells	73	Charnwood	123	Romney Marshes
20	Morecambe Bay Limestones	74	Leicestershire and Nottinghamshire Wolds	124	Pevensey Levels
21	Yorkshire Dales	75	Kesteven Uplands	125	South Downs
22	Pennine Dales Fringe	76	North West Norfolk	126	South Coast Plain
23	Tees Lowlands	77	North Norfolk Coast	127	Isle Of Wight
24	Vale of Mowbray	78	Central North Norfolk	128	South Hampshire Lowlands
25	North Yorkshire Moors and Cleveland Hills	79	North East Norfolk and Flegg	129	Thames Basin Heaths
26	Vale of Pickering	80	The Broads	130	Hampshire Downs
27	Yorkshire Wolds	81	Greater Thames Estuary	131	New Forest
28	Vale of York	82	Suffolk Coast and Heaths	132	Salisbury Plain and West Wiltshire Downs
29	Howardian Hills	83	South Norfolk and High Suffolk Claylands	133	Blackmoor Vale and Vale of Wardour
30	Southern Magnesian Limestone	84	Mid Norfolk	134	Dorset Downs and Cranborne Chase
31	Morecambe Bay and Lune Estuary	85	Breckland	135	Dorset Heaths
32	Lancashire and Amounderness Plain	86	South Suffolk and North Essex Clayland	136	South Purbeck
33	Bowland Fringe and Pendle Hill	87	East Anglian Chalk	137	Isle of Portland
34	Bowland Fells	88	Bedfordshire and Cambridgeshire Claylands	138	Weymouth Lowlands
35	Lancashire Valleys	89	Northamptonshire Vales	139	Marshwood and Powerstock Vales
36	Southern Pennines	90	Bedfordshire Greensand Ridge	140	Yeovil Scarplands
37	Yorkshire Southern Pennine Fringe	91	Yardley-Whittlewood Ridge	141	Mendip Hills
38	Nottinghamshire, Derbyshire and Yorkshire Coalfield	92	Rockingham Forest	142	Somerset Levels and Moors
39	Humberhead Levels	93	High Leicestershire	143	Mid Somerset Hills
40	Holderness	94	Leicestershire Vales	144	Quantock Hills
41	Humber Estuary	95	Northamptonshire Uplands	145	Exmoor
42	Lincolnshire Coast and Marshes	96	Dunsmore and Feldon	146	Vale of Taunton and Quantock Fringes
43	Lincolnshire Wolds	97	Arden	147	Blackdowns
44	Central Lincolnshire Vale	98	Clun and North West Herefordshire Hills	148	Devon Redlands
45	Northern Lincolnshire Edge with Coversands	99	Black Mountains and Golden Valley	149	The Culm
46	The Fens	100	Herefordshire Lowlands	150	Dartmoor
47	Southern Lincolnshire Edge	101	Herefordshire Plateau	151	South Devon
48	Trent and Belvoir Vales	102	Teme Valley	152	Cornish Killas
49	Sherwood	103	Malvern Hills	153	Bodmin Moor
50	Derbyshire Peak Fringe	104	South Herefordshire and Over Severn	154	Hensbarrow
51	Dark Peak			155	Carmenellis
52	White Peak			156	West Penwith
53	South West Peak			157	The Lizard
54	Manchester Pennine Fringe			158	Isles of Scilly
				159	Lundy

The study also assessed change by landscape character theme:

- **Woodlands:** 85% of England's landscapes are either being maintained or enhanced in terms of woodlands and trees. The neglected areas are mainly in the south west and north west.
- **Boundary features:** In 64% of England's landscapes, the boundary features are in the neglected category. The exceptions are in the north west and the areas of eastern England around the Wash, where the quality of boundary features is being sustained.
- **Agriculture:** 64% of areas show that the agricultural landscape is maintained or enhanced. The areas classified as neglected or diverging from their former agricultural landscape character tend to be concentrated in central and southern England, notably the West Midlands.
- **Settlements:** For the majority of England's landscapes (61%), a new character of settlement and development patterns is emerging. Most of the landscapes where character has been maintained in relation to settlement and development are associated with the uplands or the National Parks.
- **Semi-natural features:** The character of 75% of England's landscapes is maintained or enhanced, linked to Site of Special Scientific Interest (SSSI) condition, Stewardship and Environmentally Sensitive Area (ESA) agreements.* Landscapes showing neglect are mainly in a block extending from the East Midlands through the Yorkshire & Humberside region into the North East.
- **Historic features:** 23% of Character Areas were unclassified due to insufficient data. Where an assessment was considered possible, 65% of those landscapes were assigned to the neglected category in relation to its historic features.
- **River and coastal features:** The majority of landscapes (64%) are considered as maintained or enhanced. Those that are neglected occur in a belt through south and central England, northwards through the Yorkshire and Humberside region and the North.

The results of the assessment of the **magnitude of change** showed that 71% of our landscapes were stable or showing low rates of change in landscape character between 1999 and 2003. For the remaining 29% of our landscapes there was greater rate of change. This was evident, for example, in a belt from the Severn and Avon Vales through the West Midlands to Humberside (Figure 2.3).

The results for the assessment of the **direction of change** between 1999-2003 showed that for 62% of our landscapes, change is consistent with the characteristics that define the area. For the remaining 38% of landscapes, change is inconsistent with the underlying characteristics of the area (Figure 2.4).

2.2.2.2 Analysis of longer-term change since 1990

The earlier 1990-1998 CQC assessment showed that:

- 36% of Character Areas were stable or showed changes that were consistent with either maintaining or strengthening their character; and
- 64% were diverging, in the sense that they showed marked patterns of change that were transforming or eroding the elements that made them distinctive.

Comparing the data for the 1990-1998 and 1998-2003 assessments reveals longer-term change in the English landscape, illustrating where character is being sustained and where there is long-term erosion (or neglect) of character. The number of Character Areas with patterns of change that either maintain or enhance character has increased from 36% to 61%. The number of Character Areas with evidence of neglect or erosion of character has decreased. This evidence suggests that the character of the majority of English landscapes, at Character Area scale, is being sustained. Figure 2.5 shows the geographical distribution of these landscape changes.

* See Glossary for definition of these and other terms.

Figure 2.3 Magnitude of landscape change 1999-2003

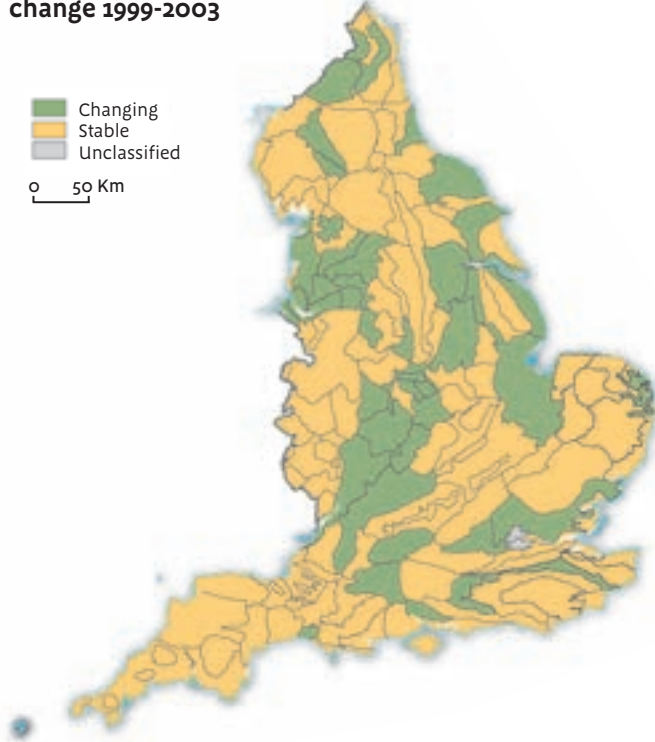
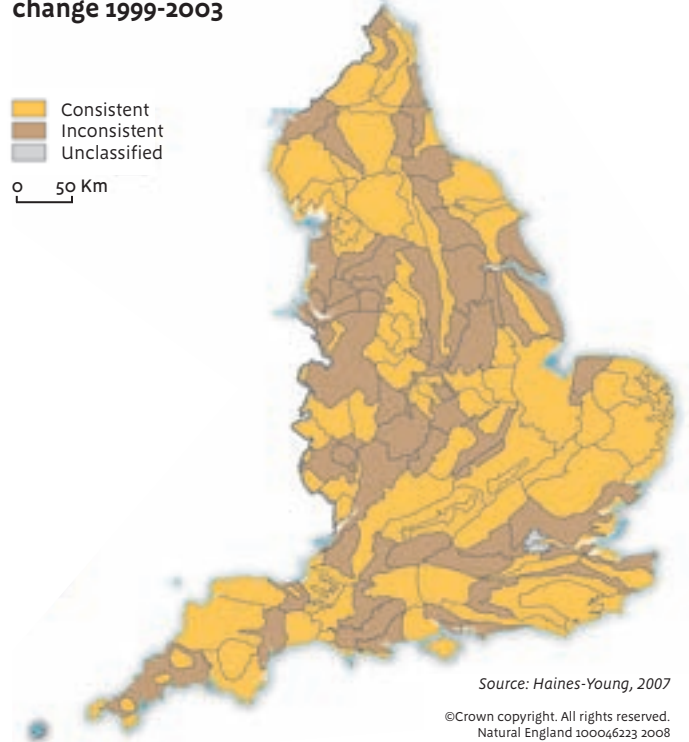
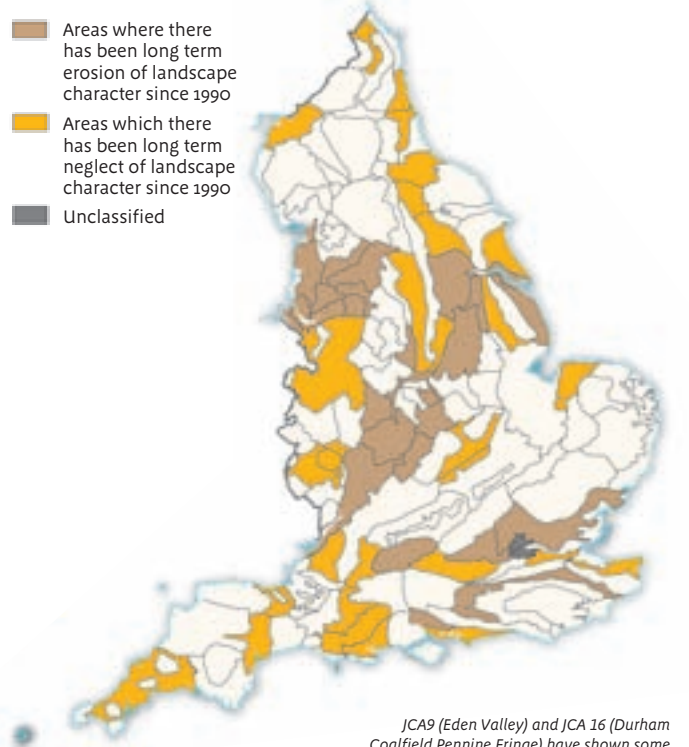
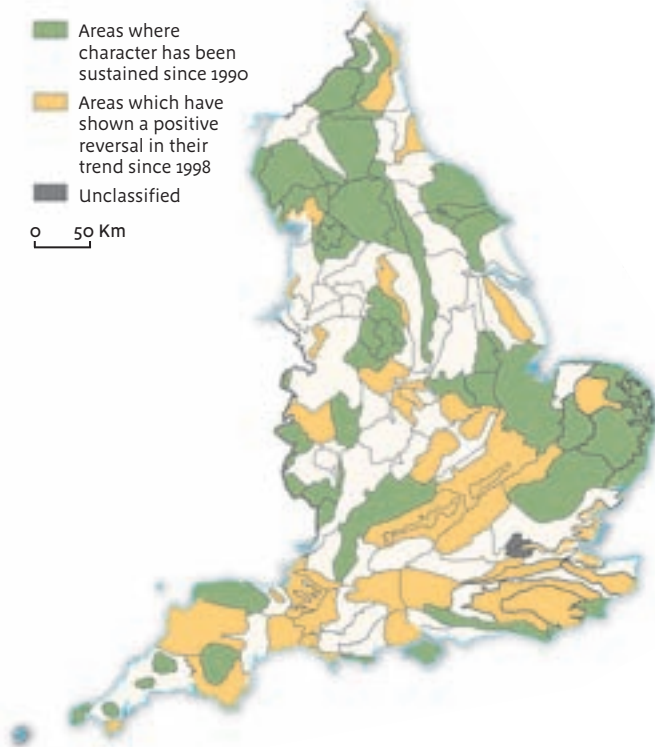


Figure 2.4 Direction of landscape change 1999-2003



Source: Haines-Young, 2007
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Figure 2.5 Long-term landscape change: analysis of 1990-1998 and 1999-2003 assessments



JCA9 (Eden Valley) and JCA 16 (Durham Coalfield Pennine Fringe) have shown some erosion of landscape character since 1998.
 Source: Haines-Young, 2007
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2.3 Designated and defined landscapes

While all of England's landscapes are considered to have their own distinctive qualities, this section describes how some are afforded additional recognition and protection through national and international designations. These landscapes are rich in natural and cultural heritage.

2.3.1 National Parks and Areas of Outstanding Natural Beauty

2.3.1.1 Protection

National Parks and Areas of Outstanding Natural Beauty (together termed protected landscapes) are designated under the provisions of the 1949 National Parks and Access to the Countryside Act in order to preserve a number of the finest landscapes in England and Wales for the nation’s benefit (Figure 2.6).

National Parks have two statutory purposes:

- To conserve and enhance their natural beauty, wildlife and cultural heritage.
- To promote opportunities for the public understanding and enjoyment of these special qualities.

Policies and decisions that could have an impact upon National Parks have to take these purposes into consideration. If there is conflict between the two purposes, then the first purpose takes precedence – this is known as the Sandford Principle. National Park authorities also have a duty to foster the economic and social wellbeing of communities in pursuit of these purposes.

The Broads in East Anglia was designated through its own Act of Parliament, but is included within the family of National Parks. As well as the two statutory purposes of National Parks listed above, the Broads has a specific third purpose: to protect the interests of navigation. The Broads is not bound by the Sandford Principle.

Areas of Outstanding Natural Beauty (AONBs) are areas outside National Parks that, in Natural England’s opinion, merit designation in order to conserve and enhance the natural beauty of their landscapes.

The overall purpose of AONBs is complemented by two aims:

- Recreation will not be an objective of designation but AONBs should be used to meet the demands for recreation as far as this is consistent with the conservation of natural beauty and the needs of agriculture, forestry and other users.
- In pursuing the purpose of designation, account should be taken of the need to safeguard agriculture, forestry and other rural industries, and of the economic and social needs of local communities.

National Parks are already required to produce and implement management plans. Now, the Countryside and Rights of Way Act 2000 (CROW) requires AONB managing authorities to prepare management plans setting out their policies for conserving and enhancing the natural beauty of the area, and how they will carry out their functions.

2.3.1.2 Extent of National Parks and AONBs

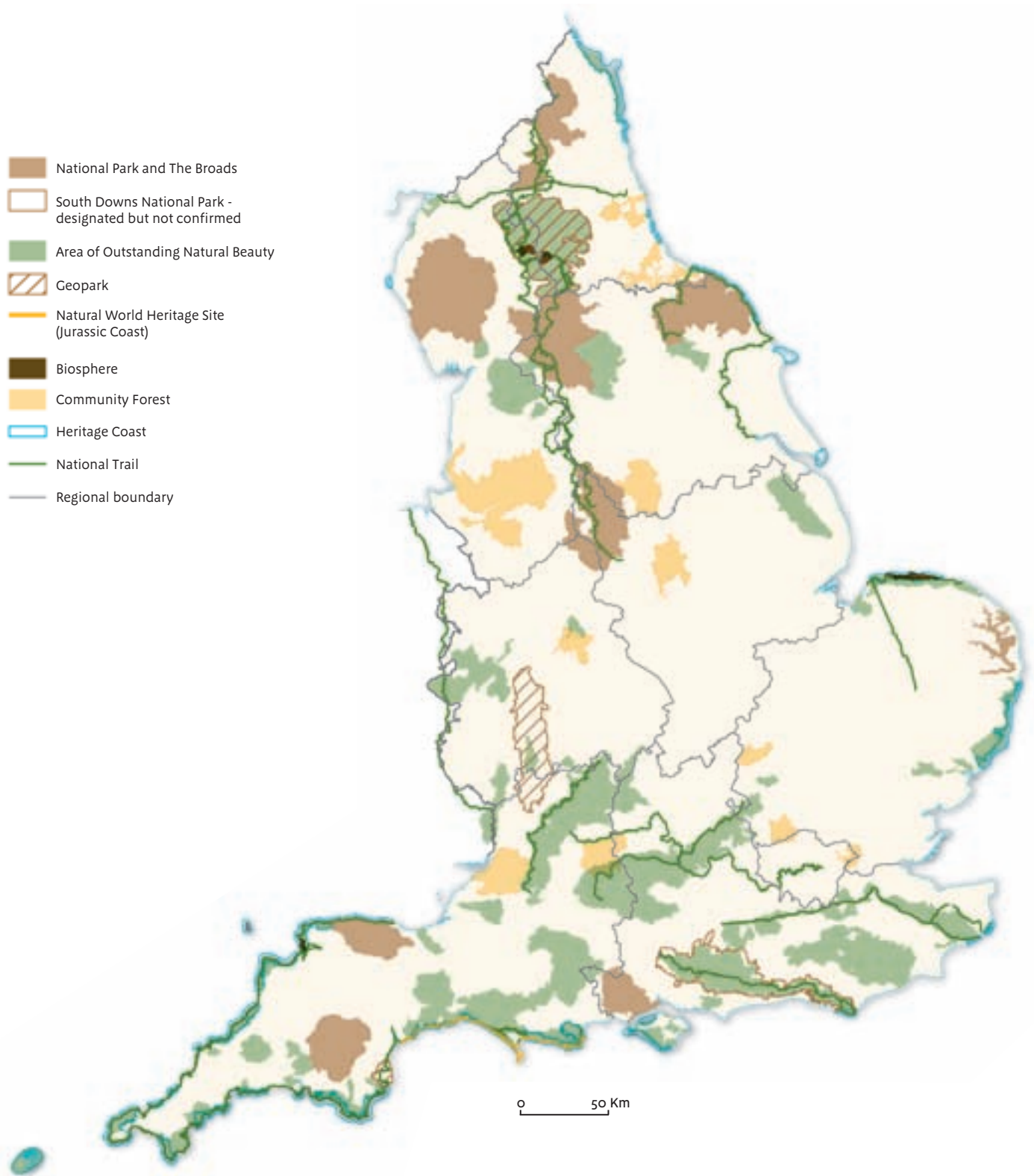
Twenty three per cent of England is designated as National Parks or AONBs, with 18% of these designated landscapes also being notified as SSSIs (Table 2.1). Conversely 51% of the area of SSSI is designated as National Park or AONB. England has eight National Parks (of which the Lake District is the largest (Figure 2.7)) plus The Broads, which is of equivalent status. Together, they cover an area of 1,050,886 ha and account for 8% of England’s total land area. The majority (92% by area) of our National Parks are in the upland areas of northern and south western England, although only 41% of designated landscapes rise above the 300 m contour.

Table 2.1 Overlap of landscape designation with SSSIs

Designation	Area (ha)	Area in SSSIs (ha)	% of AONB, NP that is also SSSI	% of SSSI that is also AONB, NP
AONB	2,042,832	264,601	13	24.6
National Park (NP)	1,050,886	286,767	27	26.7
AONB/NP	3,093,718	551,368	18	51

(Source: Natural England, 2008)

Figure 2.6 Designated and defined landscape interests



Source: Natural England, 2008

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Welcome aboard for car-free exploring

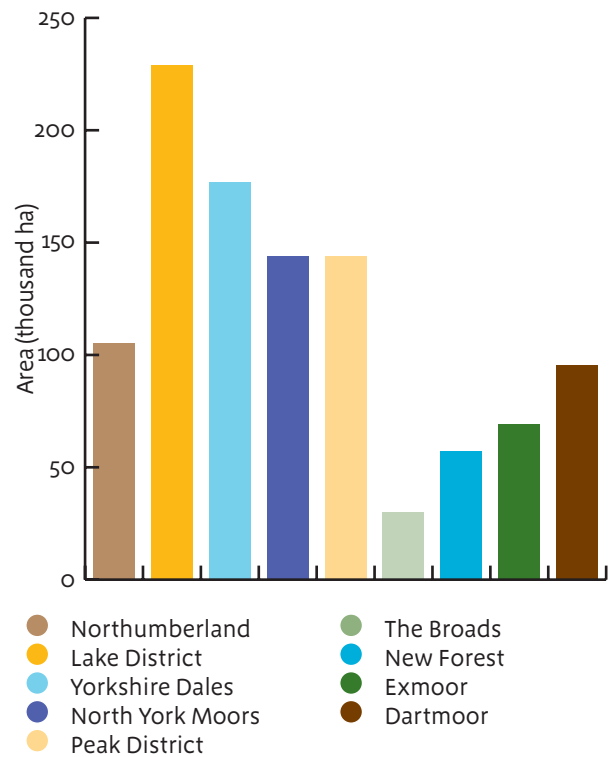
The Shropshire Hills Area of Outstanding Natural Beauty is even more beautiful when someone else is doing the driving, and the Shropshire Hills Shuttles enable visitors to leave their cars behind.

There are three separate shuttle routes through three distinctly different landscapes – Long Mynd, Stiperstones and the Secret Hills. The routes meet at a central point so that visitors can hop off one shuttle and onto another. Each stop along the route is a chance to get out and explore. The easy-access offered to these areas by shuttle routes means that more visitors will get a chance to appreciate these stunning landscapes, increasing awareness of the need to protect, conserve and enhance them. Reducing the number of cars using these routes also reduces congestion and cuts carbon dioxide emissions and air pollution.



© Transport for Everyone in South Shropshire (TESS)

Figure 2.7 Size of National Parks



(Source: National Parks Portal, 2008)

The New Forest is the most recent National Park, confirmed in 2005. In addition, the South Downs was formally proposed as a National Park in 2002, but its designation has not yet been confirmed and has recently been the subject of a further public inquiry. Natural England is currently working on proposals for extensions to the Lake District and Yorkshire Dales National Parks in the area of Cumbria between the two Parks.

There are 36 AONBs, covering 2,042,832 ha or 15% of England's total land area. The smallest AONB is the Isles of Scilly (1,600 ha) and the largest the Cotswolds (204,142 ha). Only 11% of the area of AONBs is in the uplands, comprising just four AONBs.

Information on the condition of habitats within National Parks and AONBs is presented in Section 3.2 and on the overall condition in Section 6.3.

2.3.2 Heritage Coasts

2.3.2.1 Protection

England's coastline is attractive and popular, and provides some of our most distinctive landscapes. Heritage Coasts are special coastlines managed so that their natural beauty is conserved and, where appropriate, the accessibility for visitors improved. They are a non-statutory landscape designation, unlike the formally designated National Parks, and are defined by agreement between the relevant maritime local authorities and Natural England. Most local authorities have tended to transfer their funding and management interests in Heritage Coasts to AONB teams (where they exist) who take a strategic role in their management.

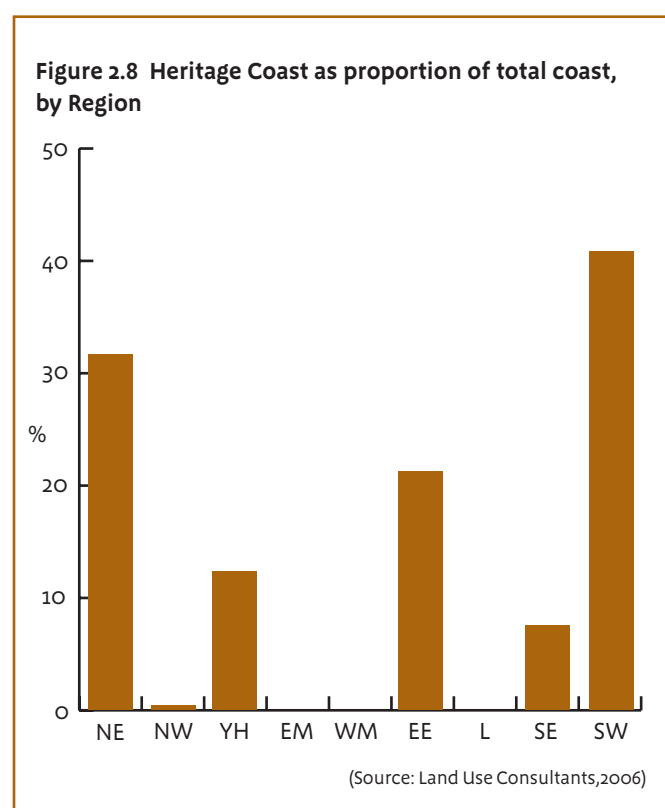
The summarised national purposes of Heritage Coasts are:

- To conserve, protect and enhance the natural beauty of the coasts, their marine flora and fauna, and their heritage features.
- To facilitate and enhance their enjoyment, understanding and appreciation by the public.
- To maintain and improve the health of inshore waters affecting Heritage Coasts and their beaches through appropriate environmental management measures.
- To take account of the needs of agriculture, forestry and fishing, and of the economic and social needs of the small communities on these coasts.

(Source: Countryside Commission, 1992)

2.3.2.2 Extent

The first Heritage Coast to be defined was the famous white chalk cliffs of Beachy Head in Sussex, the most recent the Durham Coast. Now, 1,611 km of the English coastline, comprising 32 stretches, is conserved as Heritage Coast (Figure 2.6). Eighty nine per cent is within 12 AONBs and a further 5% is within two National Parks. The South West and North East Regions have the greatest proportion of their coastline designated as Heritage Coast (Figure 2.8).



2.3.3 Biosphere Reserves

2.3.3.1 Protection

Biosphere Reserves are areas nominated by national governments and designated under UNESCO's Man and the Biosphere Programme.

They seek to fulfil three complementary functions:

- To contribute to the conservation of landscapes, ecosystems & species;
- To foster economic & human development; and
- To provide support for research, monitoring, education & information exchange.

2.3.3.2 Extent

England has three Biosphere Reserves: Branton Burrows (north Devon coast), Moor House/Upper Teesdale (north Pennines), and on the North Norfolk coast (Figure 2.6). They are areas of terrestrial and coastal/marine ecosystems where, through zoning and tailored management approaches, the conservation of ecosystems and their biodiversity is combined with the sustainable use of natural resources for the benefit of local communities.

All three reserves are of importance for both landscape and biodiversity values, as shown by the overlap between designations (Table 2.2).

Table 2.2 Area of Biosphere Reserves and overlap with SSSI and NNR

Reserve name	Area (ha)	% is SSSI	% is NNR
Branton Burrows	1,351	100	0
Moor House/Upper Teesdale	7,149	100	99
North Norfolk Coast	5,418	95	94
Total	13,918	98	88

SSSI = Site of Special Scientific Interest

NNR = National Nature Reserve

(Source: Natural England, 2008)



2.4 Geodiversity

2.4.1 Geology and geomorphology

The fundamental structure of England's landscapes is determined by the underlying geology (structure, composition and history of the Earth), geomorphology (landforms and the processes that create them) and soils. England's geological diversity has been the subject of interest for a long time, with William Smith's geological map of England, Wales and parts of Scotland (Smith 1815) being widely accepted as the first geological map in the world. Great Britain was the birth place of geology, and a great deal of early pioneering work took place here. As a consequence, many internationally used geological terms such as those for Wenlock, Ludlow, Devonian, Bathonian, Oxfordian or Bartonian periods of geological time take their names from English sites which have, as a consequence, become internationally important reference sites. This pioneering work bestows very high international heritage status on conservation work in this field.

The British Geological Survey map shows that, in general terms, the rocks of England are younger in the south east and older in the west and north (Figure 2.9). Geological features are commonly exposed on the coast, in upland crags, quarries, mines and road and railway cuttings. Important geomorphological features and processes are present, particularly in upland and lowland glaciated areas, coastal areas, rivers and caves. Given the link between geology and landscape, it is not surprising that the overall pattern of Character Areas (Figure 2.1) broadly reflects the geological and soil maps of England (Figures 2.9 and 2.12).

Figure 2.9 Simplified geological bedrock map of England

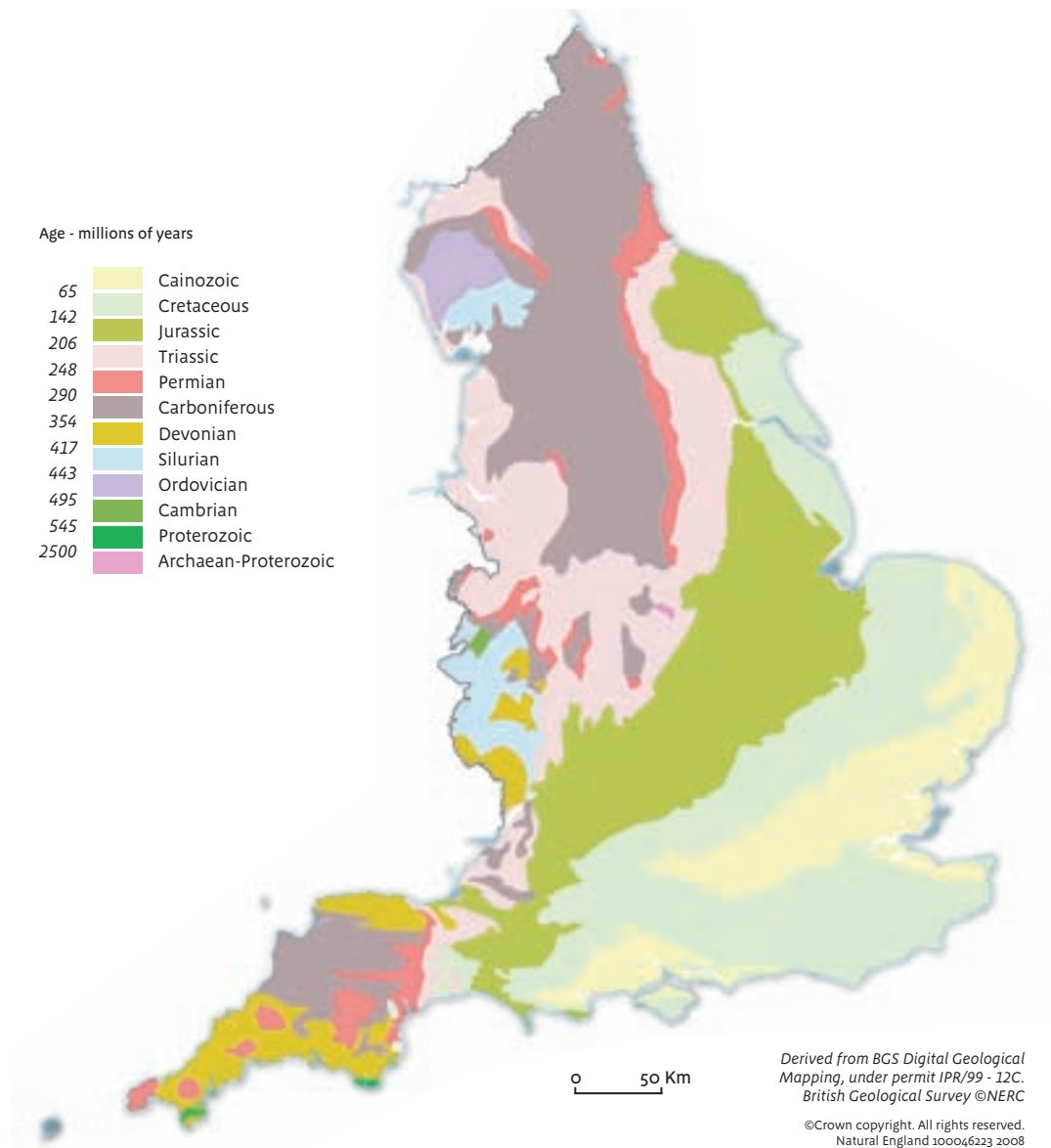
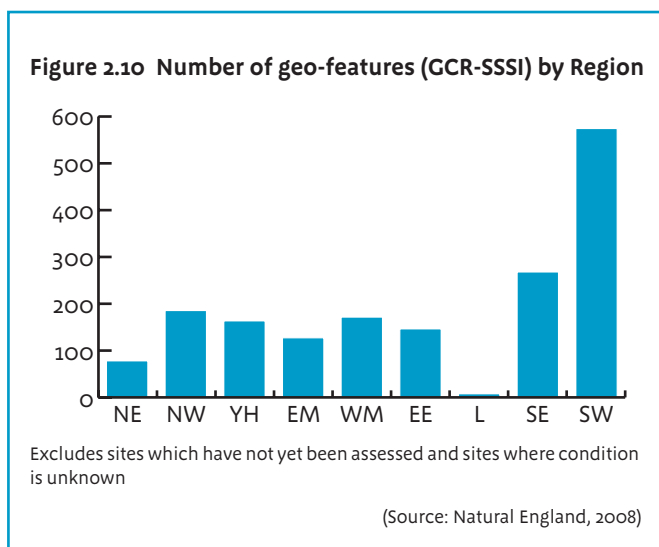


Table 2.3 GCR categories, number of geo-features and their condition

GCR Category	Total No. of geo-features	Percentage				
		GCR category	Favourable/recovering	Unfavourable no change/declining	Destroyed/part destroyed	Not assessed/not known
Geomorphology	190	11	76	8	1	15
Igneous Petrology	95	5	94	5	1	0
Mineralogy	96	5	78	7	13	1
Palaeontology	226	13	86	12	<1	1
Quaternary geology and geomorphology	286	17	88	11	<1	<1
Stratigraphy	791	46	83	15	2	<1
Structural and metamorphic geology	51	3	92	6	2	0

(Source: Natural England, 2008)



2.4.1.1 Protection – National SSSI geodiversity features

In England there are 1,214 Sites of Special Scientific Interest (SSSIs) designated for their geodiversity features. Before being notified as SSSIs, geodiversity sites must first be selected as Geological Conservation Review (GCR) sites (Ellis *et al.* 1996).

The GCR identifies nationally important features of geological interest. In total, there are 1,704 notified GCR features in England within the 1,214 SSSIs. Because many SSSIs have more than one GCR feature and some GCR features extend over more than one SSSI, this gives a total of 1,735 SSSI-GCR combinations, which are referred to as ‘geo-features’ in this report. GCR features are categorised into seven major groups for reporting (Table 2.3). Across the regions, the South West contains over a third of the total number of geo-features (Figure 2.10).

There are no formal international designations for geodiversity sites equivalent to the SPA and SAC designations for biological features. However, the geodiversity of the Dorset and East Devon Coast is recognised through World Heritage Status (see 2.4.2.1).

2.4.1.2 Protection – Local geodiversity sites

The system of Regionally Important Geological/geomorphological Sites (RIGS) aims to help protect sites of regional and/or local interest. RIGS are usually identified and selected by local RIGS groups or Geology Trusts against criteria that include research, educational, historical and aesthetic value. They typically include quarries, road and rail cuttings, coastal exposures of rock strata, and both active and static geomorphological features. There are currently 2,577 RIGS in England, with a further 660 proposed for notification. They do not have statutory protection, but are considered a material consideration in the planning system. RIGS have been included alongside local wildlife sites in recent Defra guidance to encourage a consistent approach to management of both local geological and wildlife sites (Defra 2006b). There is currently no agreed methodology for measuring the condition of RIGS in England.

Geodiversity in the wider landscape is indirectly protected by National Park, AONB and SAC designations but, with a few exceptions such as the North Pennines, little of it has been assessed specifically for its geodiversity conservation value.

Dinosaurs make learning fun

Fossil-hunting, dinosaur footprint tracking and sculpting a six-foot plesiosaur – just some of the activities that are bringing geology, history and conservation to life in North Yorkshire.

Started in 1999 the Dinosaur Coast Project and its follow-up *Making the Dinosaur Coast Accessible for All* aim to increase awareness of, and access to, the geological heritage of North East Yorkshire.

The Jurassic rocks exposed along the Filey to Staithes coast are some of the most fossil-rich in the world, and the project began when Scarborough's Museum and Gallery Service discovered they needed more display space. Rather than taking a more conventional approach, they decided to take the bones out to the people.

"There is a wealth of opportunities for people of all ages to find out, through enjoyment, all about dinosaurs, geology and the power of nature," says Will Watts, Dinosaur Coast Project Officer. As well as hundreds of events, an accessible geology resource has been created and many groups – from young offenders to natural history organisations – have been involved in activities (Source: Scarborough Borough Council 2003-2004).



© Dinosaur Coast Project/Scarborough Museums Trust

2.4.1.3 Condition

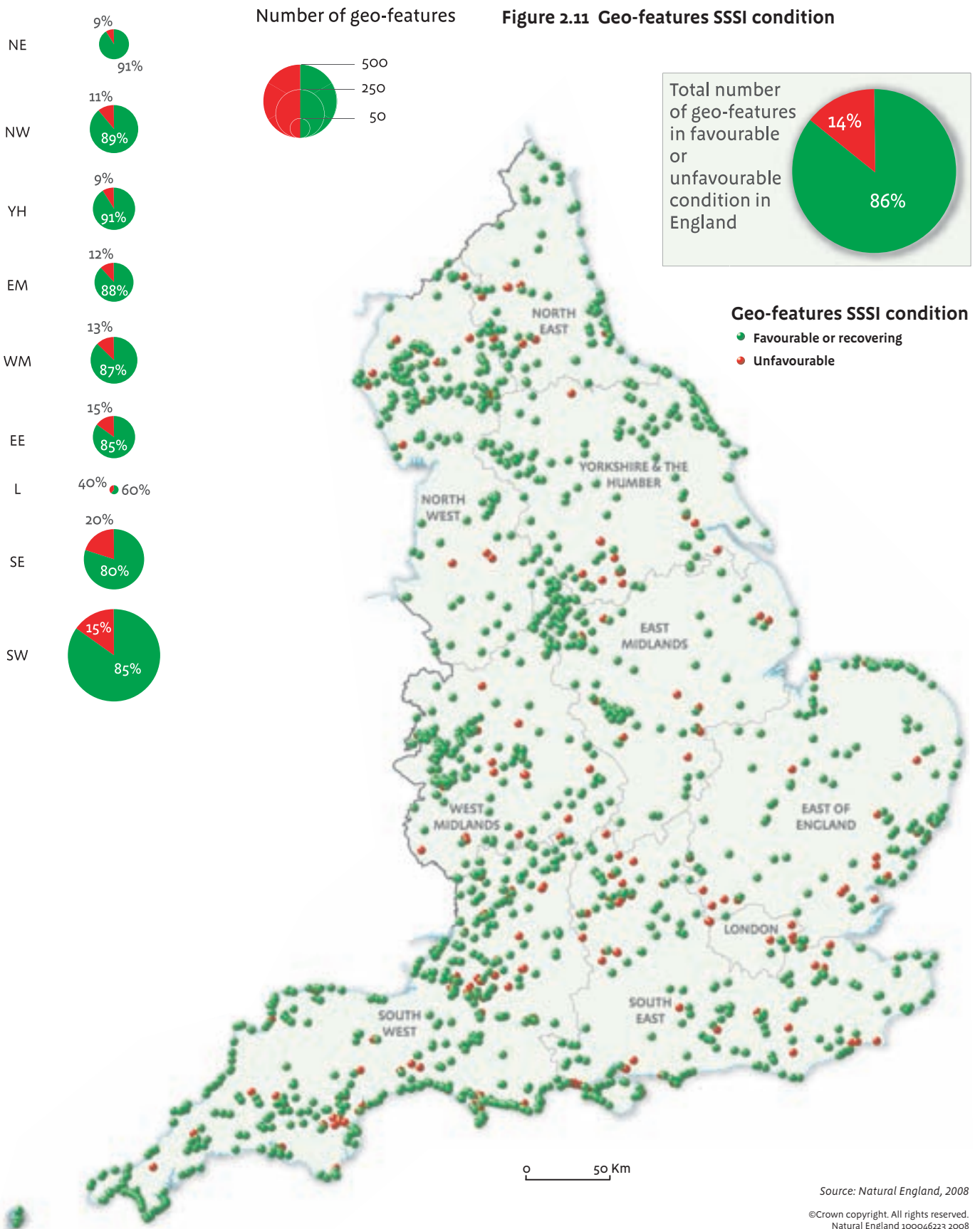
The overall condition of geodiversity SSSIs is represented by the condition of geo-features. About 86% of geo-features are currently in favourable or unfavourable recovering condition (Figure 2.11). (For explanation of condition categories see Section 3.2.4.2.) There is little difference in condition between the seven major GCR categories (Table 2.3) with the exception of mineralogy (sites selected for their minerals). This has a below-average proportion of sites in favourable condition and a higher proportion of part-destroyed or destroyed sites, reflecting the sensitivity of mineral sites as a finite resource that is easily damaged by removal of material.

There is a higher than average proportion of coastal and natural inland sites, such as river sections and outcrops in upland areas, in favourable condition. Natural erosion here helps maintain exposures of geological features – the features need to be exposed in order to study them. In contrast, inland man-made sites (such as disused quarries and cuttings) have more sites in unfavourable condition, as these geological exposures are not subject to cleaning by erosion and hence are more vulnerable to becoming obscured by vegetation and scree.

There is little significant variation in site condition regionally (Figure 2.11). Overall, there is a slightly higher proportion of sites in favourable condition in the north than the south of England. This partly reflects the higher number of natural outcrop sites in the north in contrast to the softer rock lowland sites in the south, which are generally more difficult to manage.

Causes of unfavourable condition of geological/geomorphological sites include:

- Coastal protection schemes that obscure geological exposure and disrupt natural processes.
- Loss of geological exposures in disused quarries through vegetation encroachment, slumping of faces or landfill.
- Loss of exposure on road or railway cuttings as a result of vegetation encroachment or works to stabilise rock faces.
- Loss of mineral deposits in underground mines as a result of flooding or collapse of mine passages.
- Loss of and damage to geodiversity features as a result of development.
- Damage to fossil and mineral sites due to inappropriate collecting.



The social and economic value of England's geodiversity

England has a particularly rich and diverse range of geological resources. These rocks, fossils, minerals and landforms provide a range of social, economic and cultural benefits to society thereby enhancing people's wellbeing and quality of life.

Webber *et al.* (2006) investigated the extent to which people value the benefits of our geodiversity by using 'choice experiment' methods to assess how much people would be willing to pay to protect and enhance two geological sites: Wren's Nest National Nature Reserve and the Jurassic Coast World Heritage Site. For both sites, people were found to particularly value the educational experience of a site visit and expressed a higher willingness-to-pay for the provision of educational material at each. Similarly, people expressed a higher willingness-to-pay for the preservation of rare fossils against alternative site management arrangements that may result in damage or loss of geological resources. Fossil collecting under a 'code of conduct' was also found to be much more highly valued than alternative access or management scenarios.

The study also undertook economic impact analysis on the Isle of Wight to determine the size of the local economic impacts that geodiversity brings to the Island: 39% of tourists in a survey had visited the area specifically for this reason. The study estimated that geology-based tourism accounted for approximately £11 million of the £352 million that tourism on the island was worth in 2004/2005. Applying income and employment multiplier coefficients, the study concluded that geology-based tourism generated between £2.6 million and £4.9 million in local income and supported between 324 and 441 full time equivalent local jobs in that year.



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2.4.2 Designated geodiversity landscapes

2.4.2.1 World Heritage Sites

The Dorset and East Devon World Heritage Site (WHS), otherwise known as 'The Jurassic Coast', is the only WHS in England that has been designated by UNESCO primarily for its natural (rather than cultural) features. Among the other 18 World Heritage Sites in England are Stonehenge and Durham Cathedral & Castle. Many World Heritage Sites have been selected for their cultural identity, but some of these, such as the Cornwall and West Devon Mining Landscape WHS, also have strong links with the natural environment, geodiversity and their associated landscapes.

The Jurassic Coast runs from Exmouth to Swanage (153 km) and includes Triassic, Jurassic, Cretaceous and Quaternary coastal geology covering a period of 185 million years of geological history. Its associated coastal geomorphology features include Chesil Beach, Lulworth Cove and the Axmouth to Lyme Regis Undercliffs National Nature Reserve.

The site was designated by UNESCO for the contribution it makes to worldwide geological and geomorphological science. The WHS demonstrates the international value of England's geology. It contains 79 geo-features and overlaps with the Dorset and East Devon Areas of Outstanding Natural Beauty. Together, these provide the local mechanisms for the management, conservation and protection of the site, guided overall by the WHS Management Plan.

2.4.2.2 Geoparks

There are three Geoparks in England, which form part of the network of 32 European Geoparks and 53 Global Geoparks. Typically each covers large areas of significant international geological heritage interest, often more than 100,000 ha.

Abberley and Malvern Hills Geopark straddles the counties of Gloucestershire, Herefordshire, Shropshire and Worcestershire. It includes the Malvern Hills AONB, which has 19 geo-features and 100 RIGS. The North Pennines Geopark shares a boundary with the Area of Outstanding Natural Beauty across County Durham, Cumbria and Northumberland and contains 33 geo-features. Half of the Geopark is notified as SSSI. The much smaller English Riviera Geopark straddles both the urban and coastal area of Torbay in Devon. It includes one of the highest concentrations of protected geological sites in England, with 16 geo-features and 15 RIGS (Table 2.4).

Geoparks are important for their scientific or educational value, their aesthetic qualities or their geological rarity. In addition, Geoparks must generate socio-economic benefits through geotourism and are managed by local partnerships. The international network of Geoparks is endorsed by UNESCO, which provides a platform for active cooperation between experts and practitioners in the management of our geological heritage.

The condition of Geoparks is assessed through the condition of geo-features and by four yearly inspections by the European Geopark Network to ensure management criteria are being met. Fifty seven of the 68 geo-features in Geoparks (84%) are currently in favourable condition.

Table 2.4 Geoparks, area and geo-features

Geopark	Area (ha)	Number of geo-features
Abberley & Malvern Hills	119,414	19
North Pennines AONB	198,507	33
English Riviera		16
land	6,200	
seabed	4,100	

(Source: Natural England, 2008)

2.4.3 Soils

England’s soils are diverse, reflecting the wide range of underlying rock types and drainage, and are variable in their characteristics. Soil types can change over short distances as a result of complex interactions between underlying geology, landform, past and existing land use and climate. Soils support our natural habitats, and are essential for the production of food, timber and fibre. They are vital for carbon storage and regulating water flow, and influence the character of our landscapes.

2.4.3.1 Extent

There are currently 698 soil types described for England and Wales. These have been simplified into 27 classifications of ‘Soilscapes’ (Figure 2.12). Soil types are also a major component of Agricultural Land Classification maps, which indicate the productive potential of land.

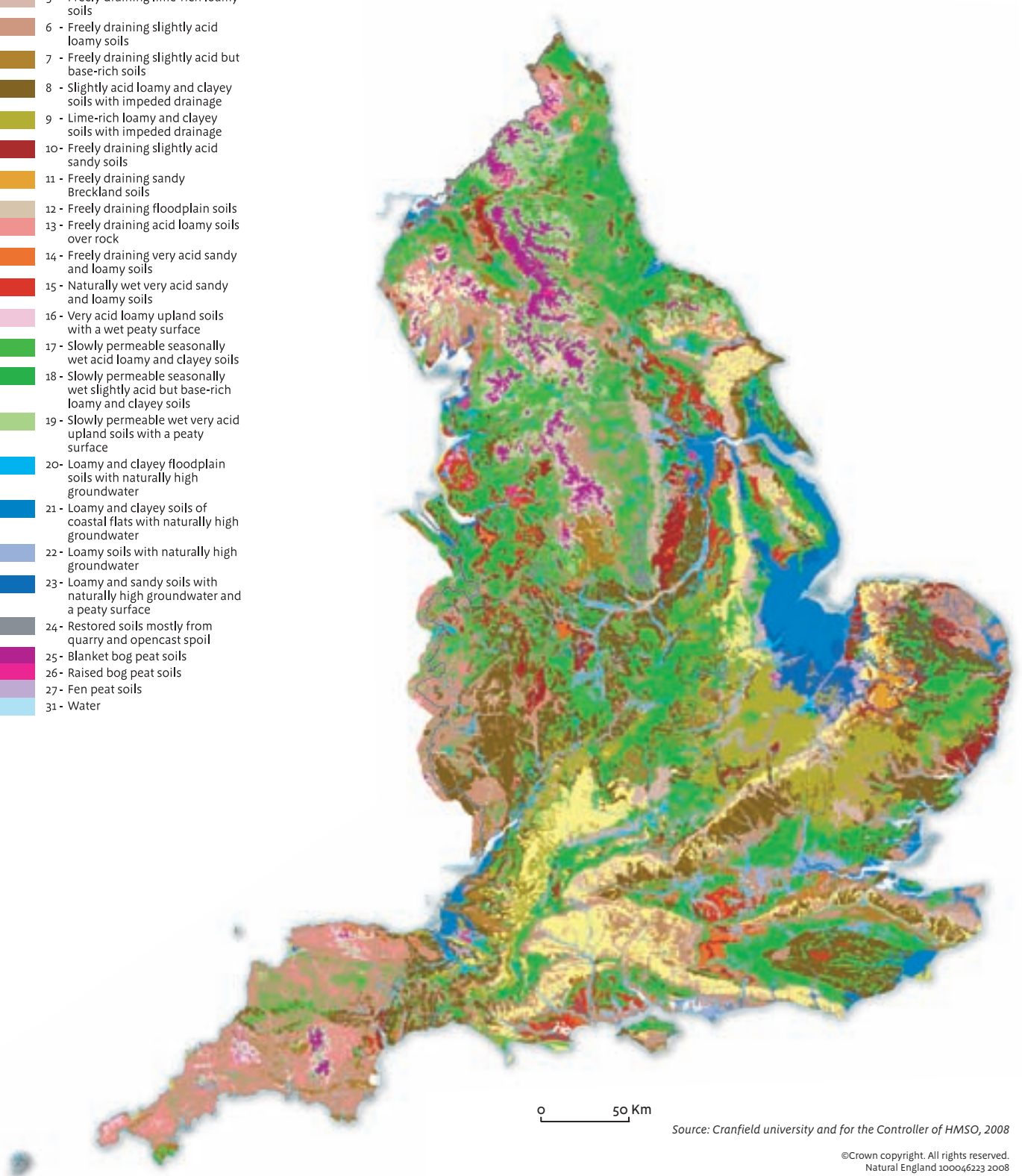
2.4.3.2 Protection

No statutory protection exists specifically for England’s soils, although they are indirectly protected by other legislation, such as that for planning or the prevention of pollution and contamination. There are also obligations on farmers in receipt of the Single Farm Payment to manage soils in accordance with the requirements of ‘Good Agricultural and Environmental Condition’. However, the importance of soils as a non-renewable multi-functional resource and the potential damage to their condition through inappropriate management has only recently been given attention. Soils are often resilient to pollution or poor management, so degradation of condition and quality may not be immediately recognised, unless highlighted by damage to other aspects of the natural environment such as water quality and aquatic habitats.

The protection of soils is now gaining national and European attention as we face global environmental issues, such as climate change, desertification, deforestation and changing agricultural practices. This is demonstrated by Defra’s First Soil Action Plan for England 2004-2006 (Defra 2004b) and developing Soil Strategy, and the EU Water Framework Directive.

Figure 2.12 Soilscape distribution

- 1 - Saltmarsh soils
- 2 - Shallow very acid peaty soils over rock
- 3 - Shallow lime-rich soils over chalk or limestone
- 4 - Sand dune soils
- 5 - Freely draining lime-rich loamy soils
- 6 - Freely draining slightly acid loamy soils
- 7 - Freely draining slightly acid but base-rich soils
- 8 - Slightly acid loamy and clayey soils with impeded drainage
- 9 - Lime-rich loamy and clayey soils with impeded drainage
- 10 - Freely draining slightly acid sandy soils
- 11 - Freely draining sandy Breckland soils
- 12 - Freely draining floodplain soils
- 13 - Freely draining acid loamy soils over rock
- 14 - Freely draining very acid sandy and loamy soils
- 15 - Naturally wet very acid sandy and loamy soils
- 16 - Very acid loamy upland soils with a wet peaty surface
- 17 - Slowly permeable seasonally wet acid loamy and clayey soils
- 18 - Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils
- 19 - Slowly permeable wet very acid upland soils with a peaty surface
- 20 - Loamy and clayey floodplain soils with naturally high groundwater
- 21 - Loamy and clayey soils of coastal flats with naturally high groundwater
- 22 - Loamy soils with naturally high groundwater
- 23 - Loamy and sandy soils with naturally high groundwater and a peaty surface
- 24 - Restored soils mostly from quarry and opencast spoil
- 25 - Blanket bog peat soils
- 26 - Raised bog peat soils
- 27 - Fen peat soils
- 31 - Water



2.4.3.3 Soil condition

There is no single comprehensive framework for monitoring soils in the UK, but there is a range of monitoring schemes to meet different objectives. The UK Soils Indicators Consortium (which includes Natural England) is helping to develop a UK set of soil indicators and monitoring scheme to help fill this evidence gap.

Elements of soil condition are monitored through the National Soil Inventory by the National Soil Resources Institute (NSRI) and through the Countryside Survey, which in 2000 became the first national survey of soil biodiversity. However, little is known about soil biodiversity or the complex soil ecosystem that drives the essential soil forming, carbon and nutrient cycling processes. Recent evidence (Bellamy *et al.* 2005) suggests that the level of organic matter in soil has declined in England, although there is some uncertainty about these findings and some contradictory evidence from the Countryside Survey 2000 (Environment Agency 2002). Changes in soil organic matter content are currently the subject of research as soil organic matter is important for soil fertility, stability and water retention, and a key indicator of soil health.

Loss of carbon from soils to the atmosphere is likely to reduce the effectiveness of the UK programme to reduce carbon emissions. Ten billion tonnes of carbon are estimated to be stored in UK soils, with over half stored in peat. There is evidence that peat soils are being degraded, particularly in the uplands, and losing carbon at significant rates (Holden *et al.* 2007). This is detrimental to both biodiversity and landscapes and also to ecosystem services with water storage, water quality and flood-risk implications.

Causes of unfavourable condition of soils include:

- Poor structural condition and susceptibility to erosion through inappropriate management of agricultural land.
- Soil contamination (local and diffuse) from metals, hydrocarbons and other organic pollutants, pathogens and substances that can acidify and/or enrich soil with nutrients.
- Local contamination, which can arise from active mining and industrial processes and accidental spills.
- Diffuse pollution from aerial deposition, agricultural uses of land, and run-off from roads, urban areas, industrial and construction sites.
- Development of buildings and infrastructure giving rise to soil sealing, compaction, increased run-off and risk of flooding, erosion and contamination.
- Coastal erosion and sea-level rise.



2.5 Cultural landscapes

Cultural heritage makes a particular contribution to the character of our landscapes, and here we highlight two elements: historic parkland and common land.

2.5.1 Historic parkland

Parkland remains one of the most distinctive of all landscape features in England. While some parklands were laid out in the medieval period, many were created or heavily modified in the 17th, 18th and 19th centuries. As well as being of cultural and historic environment value, parks today provide the location of much of England's remaining wood-pasture. The biodiversity interest of parkland and wood-pasture is examined in Section 3.5.

At the turn of the 20th century, the Ordnance Survey mapped the extent of parkland and associated woodland at just over 400,000 ha (this period was considered as the 'high water mark' for the extent of parkland landscapes in England). At least 35% (143,000 ha) of this stock was woodland associated with a park. Almost 100 years later, the amount of parkland recorded by the Ordnance Survey had reduced to approximately 220,000 ha – a significant loss of some 45%. The woodland component still accounted for 143,000 ha or 65% of the total stock. In many instances, this woodland has become isolated in the countryside and does not adjoin existing parkland.

In total, some 180,000 ha of parkland and associated woodland has been lost. Analysis of available data (ODPM 2001) shows that approximately 16,000 ha has been lost to urban and other forms of development. The majority, however, has been lost due to changes in agricultural land management, mostly through changes from pastoral management to cropping (RPA 2005) – at least 100,000 ha is now managed for other crops or land cover types. The remaining 64,000 ha was lost to other non-agricultural uses, most notably golf courses. As an indication, some 227 former parks now have a golf course associated with them (Ordnance Survey 2004).

Just over a quarter of parkland that was in existence almost one hundred years ago receives payments under agri-environment schemes. Some 64,000 ha that was defined as parkland in the early 20th century are under agreement as well as 47,000 ha still defined as parkland in 1995. However, the existence of an agreement does not mean that parkland areas are being restored – in fact, for many, the payments relate to arable crops.

2.5.2 Common land

Commons of the 21st century are relics of ancient land-use systems. The recent legislation governing common land, the Commons Act of 2006, repeals the Commons Act of 1285 ('The Statute of Westminster'), demonstrating the antiquity of common land. Collective management for agricultural purposes was widespread and perhaps universal before the Norman Conquest. The codification of custom and practice into legally recognised rights came through the development of common law established after the Conquest. The manorial system, within which commons formed part of the pasture, woods, arable, meadow and waste, was the prevailing system through which commons were managed until the system went into demise in modern times. Other land management systems, such as the Royal Forests, which once covered one quarter of England, also afforded strong security to commoners, whose rights were given express protection in the Magna Carta and the Carta de Foresta, both passed in the 13th century.

2.5.2.1 Extent

In medieval times, common land probably covered over half of England. Now there are 7,052 surviving commons (defined as those registered under the 1965 Commons Registration Act or specifically exempted from it) extending to just 398,414 ha or 3% of England. Despite the antiquity of common land systems, this Act was the first attempt to quantify such rights and land in England and Wales. The Act did not cover commons with their own local or private Acts of Parliament – these include the New Forest (c22,000 ha), Epping Forest (c2,500 ha), and 17 other commons or suites of sites, ranging from Mitcham Common at Merton (174 ha) to Cassiobury Common (Watford) at less than 1 ha.

Area of common land by Region

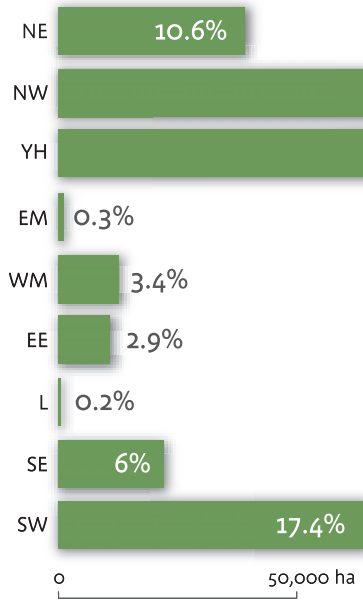
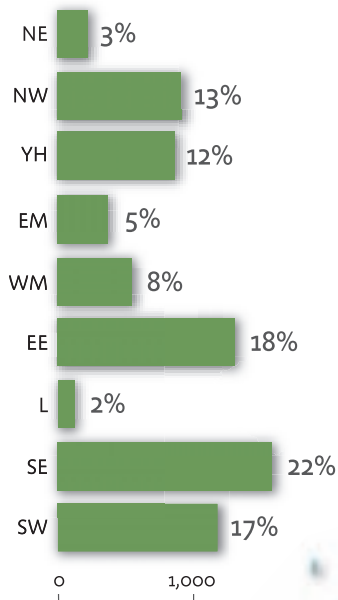


Figure 2.13 Registered common land in England*

Number of commons by Region



* Land registered in accordance with 1985 Commons Registration Act, therefore excluding the New Forest, Epping Forest and certain commons exempted from the Act
Source: Natural England, 2008

Registered common land occurs in all regions and counties, but has an extremely uneven distribution in both area and number (Figure 2.13). Some 35% of all English common land is in the North West Region, and the three northern regions together with the South-West, account for over 87% of common land by area. In contrast, the East Midlands Region has only 0.3% of the total. However, these data contrast with the number of registered commons. For example, the South East, which has only 6% of common land by area, has 22% of the total number of commons, more than any other region. Overall, the southern lowlands have large numbers of very small commons, whereas the northern and western uplands have fewer but larger commons.

Common land covers virtually all terrestrial and coastal environments, ranging from saltmarsh, dune and intertidal shingle, to upland scree and freshwater. Upland and acid soils predominate, with over 50% of the total common land area comprising just three habitats – acid grassland (23%), heathland (17%) and blanket bog (11%). Broadleaved semi-natural woodland covers 4% (but across 44% of commons) and less than 1% is calcareous grassland (Aitchison *et al.* 2000).

2.5.2.2 Definition and types of common right

Common land is generally defined as land where legally recognised rights exist that enable certain people (right holders) to take the produce of land even though the land belongs to someone else. It is a popular misconception that common land belongs to everyone. Such ideas, while legally incorrect, have persisted since at least Tudor times, showing the powerful link between communities and what they consider ‘their’ commons.

While land was formerly used communally for a diverse range of domestic and agricultural purposes, only certain categories of common rights have survived with any certainty today. Of these, pasturage (the right to graze domestic stock), is by far the most familiar and most registered. Twenty per cent of commons having rights to graze cattle, 16% rights for sheep, and 13% rights for horses. Other types of common rights include estovers (the right to take sticks or limbs for fuel and minor works, or bracken for bedding) on over 10% of commons, turbary (the right to cut peat or turves for fuel) 8%, pannage (the right to graze pigs on acorns or beechmast in autumn), and piscary (the right to fish). There are also rights to exploit the soil (minerals, freemining), and the animals (*ferae naturae*) – for example, the right to take certain wild animals such as waterfowl for domestic, but not recreational purposes. There are no data available on what common rights are exercised today and how often.

2.5.2.3 Designation and public benefits

Commons probably contribute to a more diverse range of social and environmental benefits than any other single category of land. Despite the modest area of common land surviving, it is of great value to the public. Table 2.5 shows the range of national and international designations associated with common land. Over 88% of all common land has at least one of these statutory designations and most commons are available for public access.

Table 2.5 Contribution of common land to nature conservation, landscape, access and historic environment

Designation	Area (ha)	Common within designation (ha)	% of all common land	% of designation
National Park	1,051,275	176,660	48	17
AONB	2,063,611	112,204	30	5
SSSI	1,076,980	211,003	57	20
SAC	967,923	179,528	49	19
SPA	727,890	122,107	33	17
Ramsar	374,932	8,265	2	2
Scheduled Ancient Monument	49,742	5,504	1	11
Land with any above designations	4,082,621	323,739	88	8
Access land under CRoW	935,685	369,394	100	39.5

See Glossary for definition of terms.

Common land total = 369,394 ha

(Source: Natural England, 2008)

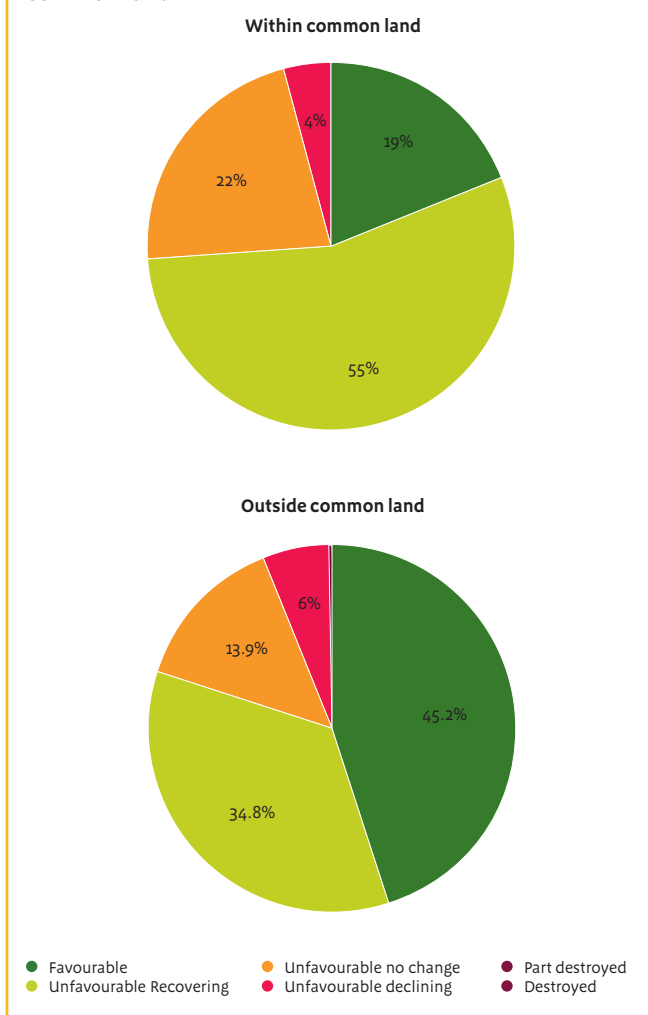
The particular values of common land are:

- Access**
 Of 935,685 ha of mapped access land under the CRoW Act, 40% (370,000 ha) is registered common. Commons such as New Forest and Epping Forest, also enjoy certain rights for recreation.
- Landscape character**
 Common land contributes to landscape character, from the small community commons to those that form part of the vast hills and fells of the Lake District. Seventy eight per cent of all common land lies within National Parks (48%) or AONBs (30%). Many commons outside these protected landscapes have settlements clustered around them, where associated links between common and settlement reinforces a sense of local identity.
- Biodiversity**
 Twenty per cent of land designated as SSSI contains common land and 57% of common land is designated as SSSI. Much of this is also of international importance (Table 2.5).
- Historic environment and culture**
 Eleven per cent of all Scheduled Ancient Monuments are associated with common land. This is likely to be because the unploughed soils of commons offer greater protection. As commons have become integrated into local communities, they are often referred to through art and literature and may also be the settings for traditional local customs and gatherings, many traceable through history.

2.5.2.4 Condition

There is no monitoring programme in place against which overall condition of each of the 7,052 English commons can be calculated for each of the public values and designations above. However, the picture for the 57% of common land designated as SSSI is likely to be replicated across all commons.

Figure 2.14 Condition of SSSI within and outside common land



SSSI common land is in less good condition than SSSI land outside commons (Figure 2.14). A major reason for this is the difficulty in negotiating collective management and agri-environment funding when there are multiple right owners and stakeholders concerned with the wide range of public values.

The most frequent causes of adverse condition on upland commons are overgrazing, inappropriate moor burning and poor drainage management. In contrast, lowland commons, especially in the south-east, often suffer from undergrazing. Such commons may be located in areas with few domestic stock and many of those people holding common rights are now no longer farmers. The number of active graziers may be very small compared to the number holding rights. In Minchinhampton, Gloucestershire for example, where rights have existed since the late 13th Century, there are just six active commoners amongst 250 holders of 1,300 rights.

Where there are few active commoners, management of lowland commons usually requires intervention through community and volunteer groups. However, members of such groups may not have a full understanding of how commons used to look and how they were managed. For example, there may be a reluctance to use grazing animals where there is no living memory of this.

2.5.2.5 New legislation

The Commons Act 2006 is the first consolidating statute after 700 years of legislation on common land. The Act contributes to the management of commons by providing the mechanism for commoners and those interested in common land to set up Commons Councils. The Act also provides a streamlined process for gaining consent for works on common land, and such applications will have to take account of effects on public interests, including landscape, biodiversity, access and the historic environment.

Chapter 2 Landscapes

Evidence gaps

Areas where we believe we need more evidence on the condition of England's natural environment, how it is used and the most effective mechanisms to address the challenges we face.

- 1 More refined evidence on the condition of landscapes and changes in landscape character.**
- 2 A common monitoring framework and indicators for protected landscapes (National Parks and AONBs).**
- 3 A national dataset and common recording standards to enable reporting on the distribution and condition of locally and regionally important geological sites.**
- 4 Better evidence on the socio-economic benefits of geodiversity sites.**
- 5 Greater understanding of the role of soils in carbon storage and in supporting biodiversity.**
- 6 Evidence on the condition of, and cultural significance of, common land.**