State of the natural environment in the South East

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NATURAL ENGLAND

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Pudmore Pond, Thursley National Nature Reserve (NNR). The reserve's mixture of mire and wet heath is one of the finest examples of its type in southern England

Foreword

This year (2009) sees the 60th Anniversary of the 1949 National Parks and Access to the Countryside Act, which provides much of the original framework for the conservation and enhancement of our landscapes and wildlife.

In the South East this has coincided with the landmark decision that the South Downs will become the country's 12th National Park, securing a precious asset for millions to enjoy in a way that has significant benefits for their health and wellbeing, improving their appreciation of why the natural environment matters.

The South East has some of the country's finest landscapes and wildlife alongside high density populations. This has served the region well, presenting great opportunities for healthy recreation, learning and enjoyment and contributing to our economic success. However, increasing demands on our natural environment from significant new growth, housing, energy and food production, challenge the provision of essential 'ecosystem services' such as clean water and flood defence. Reconciling these potentially competing demands will require us to build a shared definition of environmental capacity based on an understanding of the true benefits to society of a healthy natural environment and its contribution to economic recovery and improvements to quality of life for communities across the region.

The effects of climate change are a global challenge and evidence is growing that temperatures are changing far faster than previously thought. We must quickly focus on how we are going to cope with and adapt to 50 years of now unavoidable change. In the South East, sea level rise and increased risk of severe storms present a significant and immediate threat to our coastal communities and natural coastline. We believe that working with the natural mobility and adaptability of our shores will help secure cost-effective and long-term solutions to coast defence.

Our landscapes need to be more robust. Past changes in land use and management practices mean the natural components of our region's landscapes have become highly fragmented. This makes them less able to support healthy ecosystems that are resilient to the changing climate and provide the services we require.

The evidence presented in this report shows we still have much work to do to conserve our wildlife and landscapes in the long term, and to show how a healthy natural environment can make a real difference to people's lives, especially in times of economic uncertainty. However, it also reveals that where strong partnerships work together, we can and do make a huge positive difference. We need to provide concerted regional leadership to ensure the natural environment remains a key part of what makes our region valued and special.

Alan Law
Regional Director

Our natural assets

This section describes the value and state of the natural environment of the South East. It focuses on those features of our landscapes, biodiversity and geology that are of particular significance in the region, either for their intrinsic worth, or for the essential services and benefits they provide us.

Landscape

Biodiversity

Enjoying the natural environment

River Test, Hampshire

The Meon valley in the Hampshire Downs, part of the South Downs proposed National Park

Landscape

In the South East our varied geology and geomorphology, together with man's long history of the use of our land, have created a unique range of landforms and habitats. From the riverside meadows of the Upper Thames to the great chalk cliffs at Dover, these landscapes are highly valued and full of cultural and historical significance, offering many opportunities for recreation, relaxation and learning.

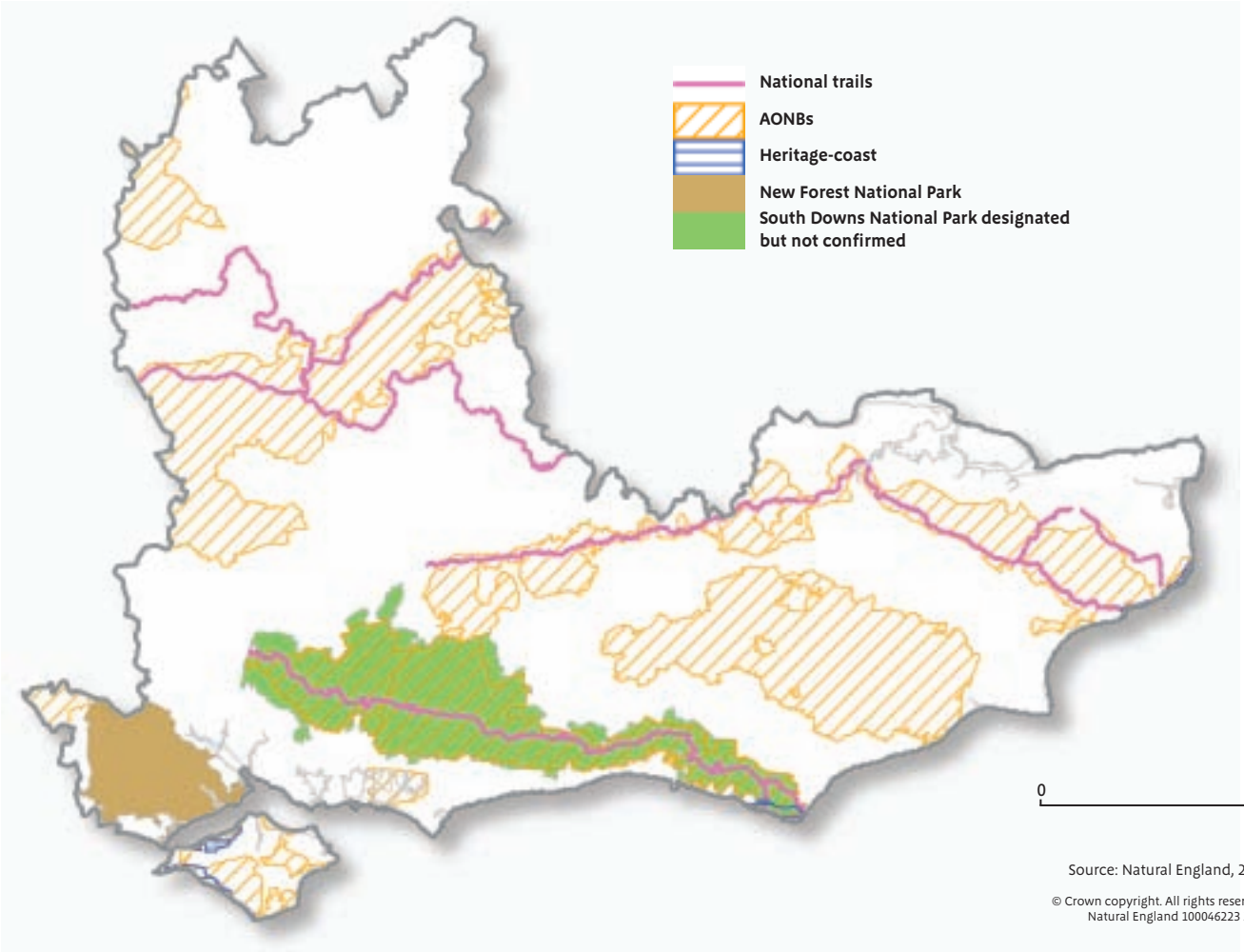
Protected landscapes

More than 36% of the South East is protected by national designations, reflecting the disproportionate significance of our landscapes.

The New Forest National Park and the South Downs proposed National Park together cover approximately 10% of the region and provide opportunities to explore and enjoy some of our finest woods, heaths and chalk downland. We have 11 Areas of Outstanding Natural Beauty (AONBs) – more than any other region – ranging from the ridges and valleys of the High Weald draped with small, irregular fields, ancient woods and hedges, to the tidal flats, inlets and creeks of Chichester Harbour.

Probably the best-known features of our coast are the dramatic white chalk cliffs of Dover in Kent, Beachy Head and Seven Sisters in Sussex and the Needles off the Isle of Wight. They are all designated as Heritage Coasts and, as well as being iconic features of our South East coastal landscape, these chalk exposures are of international scientific interest, comprising 40% of the European coastal chalk resource.[1]

Figure 1 Protected landscapes in the South East



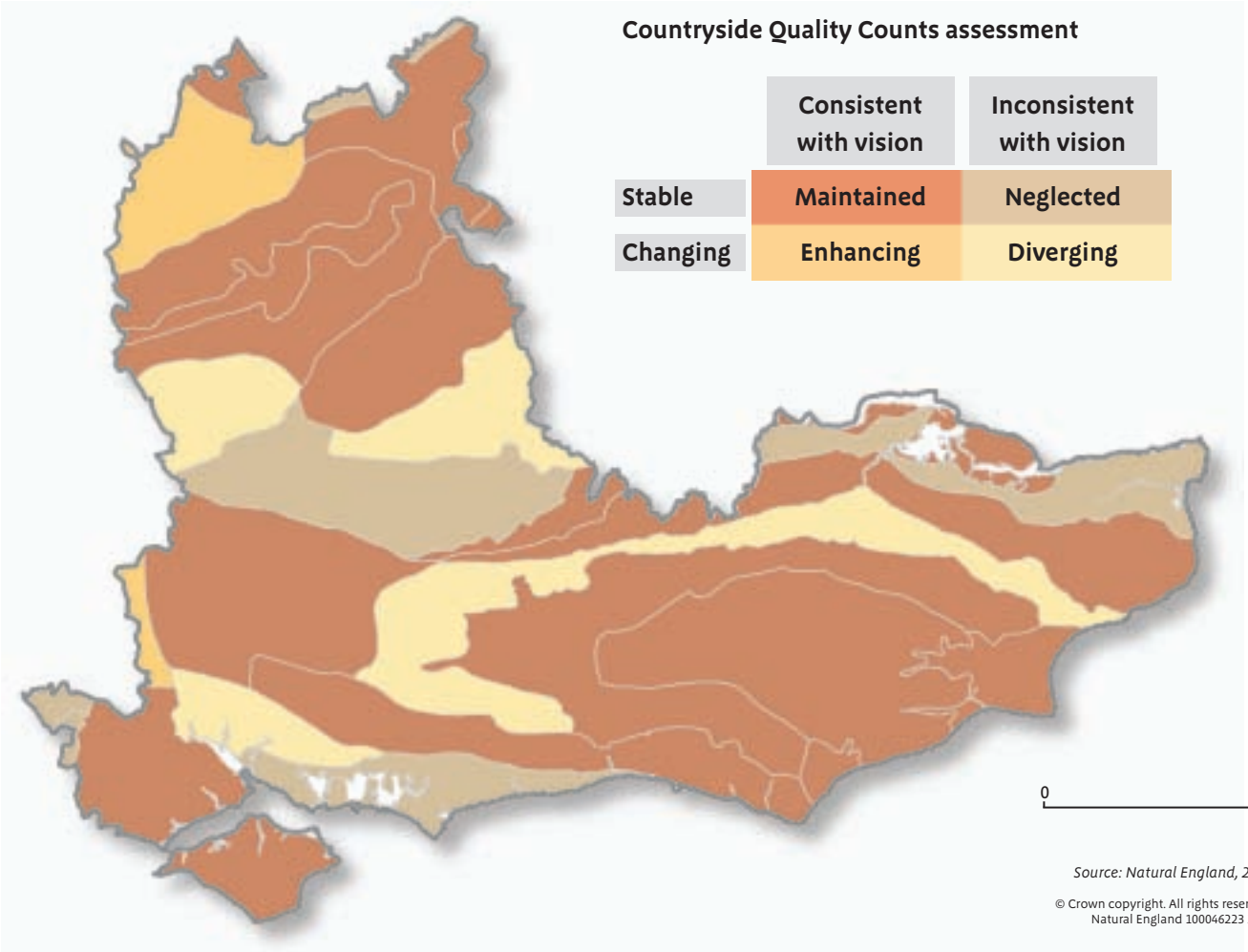
Landscape character and change

Despite this high level of protection, intensive land use and increasing pressure from growth and development continue to threaten the quality and character of our region's landscapes. The Countryside Quality Counts (CQC) project recently assessed change in landscape character over the period 1999 to 2003.[2] Ten of the 30 National Character Areas in the South East (covering approximately 25% of the region) were found to be neglected or diverging. This means that many of the valued features that define the character of our landscapes had been or were being eroded. The principal causes were development pressures and agricultural change.

Common land

The South East has more than 1,100 commons, around a fifth of all those that remain in England. These are a significant part of our cultural heritage, representing an earlier history of 'common' usage of land and a once important part of the rural economy. Historic commoner's rights of grazing, coppicing and turf cutting have been fundamentally important in shaping some of our most valued landscapes and wildlife habitats, particularly heathlands and wood pasture. Outside the New Forest few commoners in the South East now exercise these rights but the public's right to walk on all registered commons mean they remain an important public asset.

Figure 2 Assessment of landscape character change 1999-2003 headline indicator



Geodiversity

The South East is underlain by rocks that range in age from early Jurassic (200 million years ago) to the present. They consist of clays, sands, sandstones, gravels and limestones that have been gently folded. The differing hardness of these rocks combined with folding and subsequent erosion have contributed to the evolution of the diverse landscapes we see today.

Fossils and other features contained in these rocks provide evidence that South East England was repeatedly submerged and travelled through a range of climatic zones as Europe drifted northwards from the tropics.

Dinosaurs were first known to science from the South East, and the Weald and the Isle of Wight remain internationally important for the variety of dinosaur remains. Fossil plants, fishes, reptiles and birds in the London clay of the Isle of Sheppey, another area of international importance, tell us that 53 million years ago the land was fringed by mangrove swamps. The remains of early man discovered here date from around 450,000 years ago - two of the only five such discoveries from the Middle Pleistocene period in Europe.

There are 269 Sites of Special Scientific Interest (SSSIs) in the South East designated as nationally important for their geodiversity. 80% of these are in favourable or recovering condition. The main factors adversely affecting the condition of the remaining sites include inappropriate coastal management, neglect leading to slope failure or vegetation growth, flooding or infilling of quarries.

Biodiversity

The varied landscapes and geology of the South East support a wealth of habitats and species, many of which are of national or international importance. We value this rich regional biodiversity both for its intrinsic worth and also for the contribution it makes to our prosperity and wellbeing. It serves as an important indicator of the overall health of our natural environment and provides services that we depend upon, such as crop pollination and air and water purification.

Lowland heathland

Lowland heathland is the product of traditional extensive grazing management combined with rotational cutting and burning following historical clearance of woodland on poorer soils. This characteristically open landscape is dominated by low-growing, acid-tolerant vegetation such as heathers and gorses, and provides important habitat for insects, reptiles and birds including the sand lizard, woodlark and nightjar.

The South East has almost 25,000 ha of lowland heathland, which represents approximately 20% of the global resource, making us important custodians of this rare and threatened habitat. In England, 80% of the lowland heathland has been lost since 1800. This decline has been mirrored in the South East where, for example, in West Sussex the area of heathland fell from 7,500 ha in 1813 to 670 ha in 1981.[3]

Some of the finest remaining examples include the New Forest in Hampshire (one of the largest areas of this habitat in Europe), Ashdown Forest in East Sussex, the largely Ministry of Defence-owned heaths of the Thames Basin and the National Nature Reserves at Thursley and Chobham Common in Surrey.

Large red damselfly on heathland in Surrey

The majority of the heathland in the South East is now highly protected. However, its condition and the biodiversity it supports continue to be threatened by lack of management, leading to the encroachment of trees and scrub and the simplification of vegetation structure.

Chalk grassland

The chalk grassland of the South East is the product of a long history of extensive sheep grazing and used to occupy large areas of the open downland landscapes of the region. It develops on thin, lime-rich soils and is characterised by low-growing, alkaline-tolerant herbs and grasses. It is one of the richest wildlife habitats in England, with up to 50 species of plant per square metre in the most diverse swards. This diverse flora includes a number of rare and scarce orchids, including early spider-orchid and late spider-orchid (both South East specialities), musk orchid and man orchid. It is also important for butterflies, providing breeding habitat for a number of uncommon species such as Adonis blue, silver-spotted skipper and Duke of Burgundy.

Recent changes in agricultural practice leading to arable conversion have added to historic losses and the remaining resource is now much reduced and highly fragmented. For example, in Sussex 25% of the area of this habitat present in 1966 had been lost by 1980.[4] However, the South East still has approximately 8,700 ha of chalk grassland, between a quarter and a third of the total UK resource.

Some of the finest examples are found on the North Downs near Folkstone and Wye in Kent, around Box Hill in Surrey and on the South Downs outside Brighton and Lewes.
Much of our remaining chalk grassland in the South East is protected as SSSIs and some as internationally important Special Areas of Conservation (SACs), but securing the grazing management necessary to maintain its biodiversity remains a significant challenge.

Common blue butterfly on common spotted orchid at Noar Hill Nature Reserve on the Hampshire Downs

Chalk rivers

Chalk rivers are a speciality of South East England. They have a characteristic plant community often dominated in mid-channel by river water crowfoot and starworts, and along the edges by watercress and lesser water-parsnip. Particularly fine examples include the Rivers Kennet, Lambourn, Itchen, Test and Avon, all of which are designated SSSIs and in some cases SACs. The majority of chalk river SSSIs are currently in unfavourable condition. The causes include: over-abstraction, diffuse pollution from agriculture, channel modification (deepening and straightening) and inappropriate fisheries management.

Hornbeam coppice in ancient woodland in the Sussex Weald

Arable plants

The light and chalky soils of the southern downlands provide some of the richest areas in the country for arable plants. These wild annuals thrive on frequent disturbance and have found an ecological niche growing amongst our arable crops. The success of modern agriculture in controlling these "weeds" means that many once widespread species are now increasingly rare. The South East is host to rapidly declining species such as pheasant's-eye, red hemp-nettle, spreading hedge-parsley, shepherd's-needle, fine-leaved fumitory and narrow-fruited cornsalad.

Red hemp-nettle. Plantlife has indentified six sites in the UK as being of European importance for arable plants. Two of these are in the South East: Ranscombe Farm on the North Downs in Kent, and Longparish on the edge of the River Test valley.

Ancient woodland

Ancient woodlands, defined by Natural England as areas that have been wooded continuously since at least 1600 AD, are our most important woodlands, rich in biodiversity and historic features. The South East has 40% of England's ancient woodland, giving our region a unique responsibility for the conservation of this irreplaceable wildlife and cultural asset.

Significant woodland types in the South East include our beech and yew woodlands of the North Downs, South Downs, and Chilterns, while the New Forest has one of the most extensive areas of managed wood-pasture in north-west Europe. Ancient woodlands in the South East also support a range of specialist species such as the formerly more widespread pearl-bordered fritillary butterfly and dormouse.

The cessation of traditional woodland management such as coppicing is the most important factor affecting the condition of our woodlands and the biodiversity they support. Other significant factors include invasion by non-native species (such as rhododendron) and deer browsing.

Coast and seas

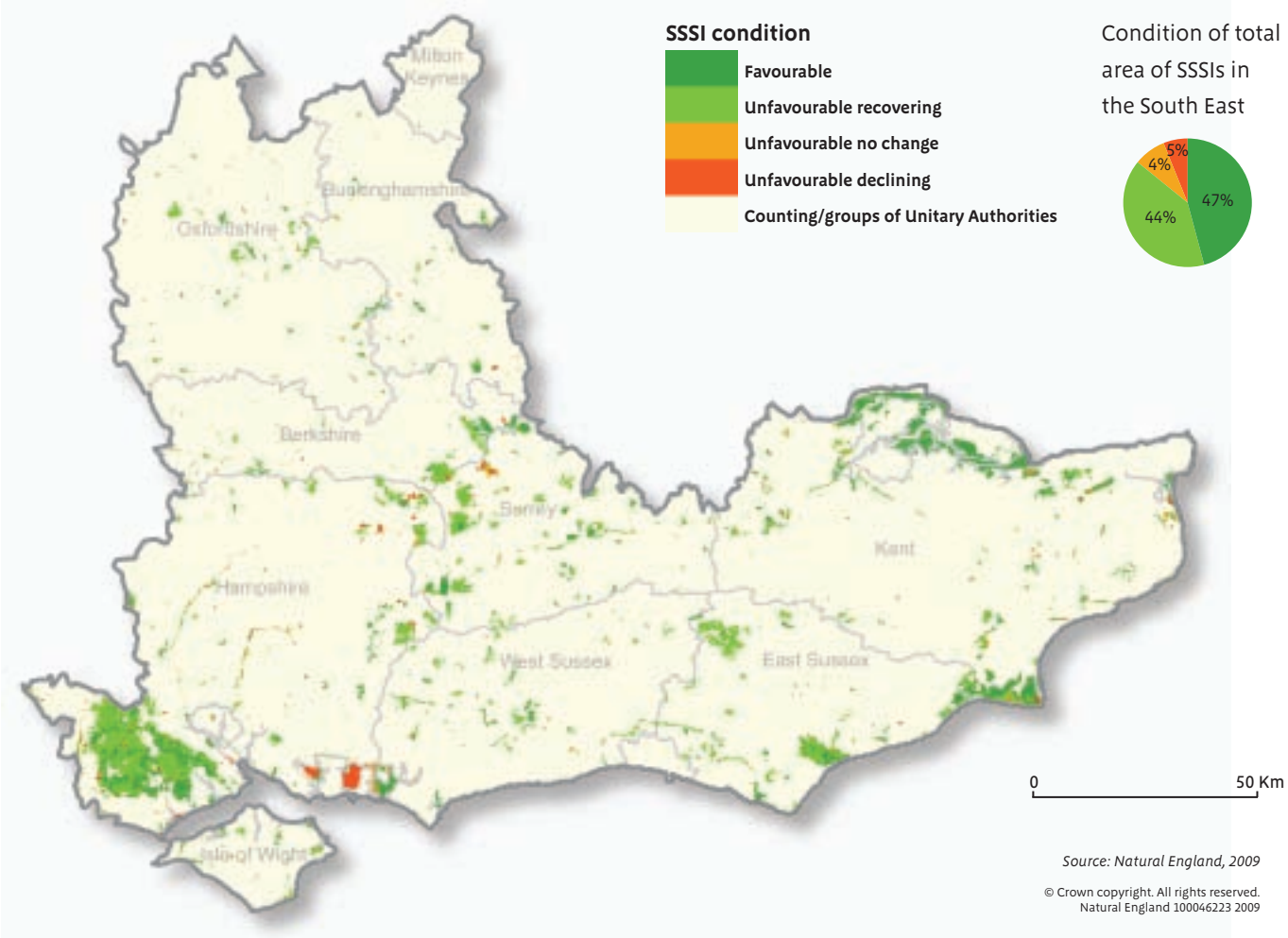
The chalk cliffs and reefs of the South East are of international scientific interest. In Thanet in Kent caves extend up to 30 m into the cliffs and support a wide range of unique fauna and flora. Some of the country's most notable underwater chalk reefs occur off the Isle of Wight and the Kent coast, supporting extensive kelp forests, sponge and fish species. Our coastal waters are also home to Europe's largest population of native oyster together with species special to the South East such as the Thames Blackwater herring.

More than half of England's vegetated shingle beaches lie within our region, representing a significant proportion of the European resource of this globally rare habitat. Dungeness in Kent is the most diverse and extensive example of stable vegetated shingle in Europe. Typical plants found growing on the shingle include sea kale, yellow horned-poppy, sea holly and the nationally rare sea pea.

The South East has some of the largest sheltered estuaries in the country, such as Chichester Harbour, supporting hundreds of thousands of waterfowl in winter. We also have some of the most important saltmarshes and a major share of the UK's coastal lagoons, including those at Pennington and Bembridge.

The two most important factors adversely affecting the condition of our coastal habitats are elevated nutrient levels in our estuaries resulting from diffuse pollution inland, and habitat loss through coastal squeeze, where space for intertidal habitats is reduced by sea-level rise pushing against hard sea defences.

Figure 3 Sites of Special Scientific Interest (SSSI) condition



Source: Natural England, 2009

BAP habitat	Total Area (ha)	NNR	SPA	SAC	Ramsar	SSSI	% of SSSI favourable or recovering
Saline lagoons (Coastal lagoons)	422	18	336	39	344	348	94%
Littoral rock	827	25	601	534	601	827	85%
Maritime cliff and slope	1,370	15	14	362	14	1,120	100%
Sand dunes	1,043	60	105	503	105	1,021	87%
Vegetated shingle	2,721	840	450	2,001	145	2,596	92%
Intertidal mudflats and saltmarsh	23,038	1,107	21,087	9,265	20,891	22,144	73%
Lowland acid grassland	1,008	27	316	446	204	826	68%
Lowland calcareous grassland	8743.5	886	418	2,284	0.0	7,869	95%
Lowland meadows	3,091	78	873	360	876	2,530	88%
Purple moor-grass and rush pastures	43	0.0	0.0	0.0	0.0	9.0	100%
Lowland heathland	29,613	854	20,792	17,474	9,528	23,738	92%
Coastal and floodplain grazing marsh	36,420	1,585	8,340	646	12,199	16,360	95%
Fen	6,830	106	5,414	5,598	5,450	6676	94%
Lowland raised bogs	29	0.0	0.0	0.0	0.0	29	100%
Reedbed	783	225	404	234	419	648	84%
Broadleaved, mixed and yew woodland	157,010	1,969	10,066	14,837	8,831	30,688	96%
Coniferous woodland	2,603	0.0	2,456	179	0.0	2,603	100%
Wood-pasture and parkland	67,768	183	4,372	5,226	4,343	6,433	100%

Biodiversity Action Plan (BAP) habitats and condition of Sites of Special Scientific Interest
7% of the region is designated as Sites of Special Scientific Interest (SSSIs), which are nationally important for their wildlife or geology. The Government has a Public Service Agreement (PSA) target to bring 95% of SSSI land into favourable or recovering condition by December 2010. In the South East the area of SSSI land in PSA target condition increased from 85.5% in April 2008 to 90.3% in April 2009. Success in securing appropriate management for lowland heathland and woodland have made a significant contribution to the overall improvement in SSSI condition.

There are many opportunities in the South Downs proposed National Park for children to explore and enjoy this wonderful landscape

Enjoyment of the natural environment

People enjoy the natural environment in a variety of ways. It may offer a place for outdoor activities such as walking, cycling and climbing, or simply somewhere to relax and enjoy the view. Access to a healthy natural environment can make an important contribution to our health and wellbeing and form an enriching part of our everyday lives.

In the South East we are privileged to have some of the country's finest landscapes on our doorstep. A wealth of opportunities to explore and enjoy the natural environment can be found across the region.

National Nature Reserves

Our 37 National Nature Reserves draw nearly 3 million visitors a year. These are areas that are among the very best examples of a particular habitat and therefore of national or international importance. They include the fine yew forest at Kingley Vale in West Sussex, the wood pasture of Ashtead Common in Surrey and the shingle beach of Dungeness in Kent.

Local Nature Reserves

The South East has 249 Local Nature Reserves, with a combined area of approximately 10,000 ha. This is 28% of the national total and more than double the area of any other region in England. These provide high quality natural green space for everyone, offering local opportunities for both urban and rural communities to experience nature.

Country Parks

The South East has 58 Country Parks, the largest number of any English region.

The coast

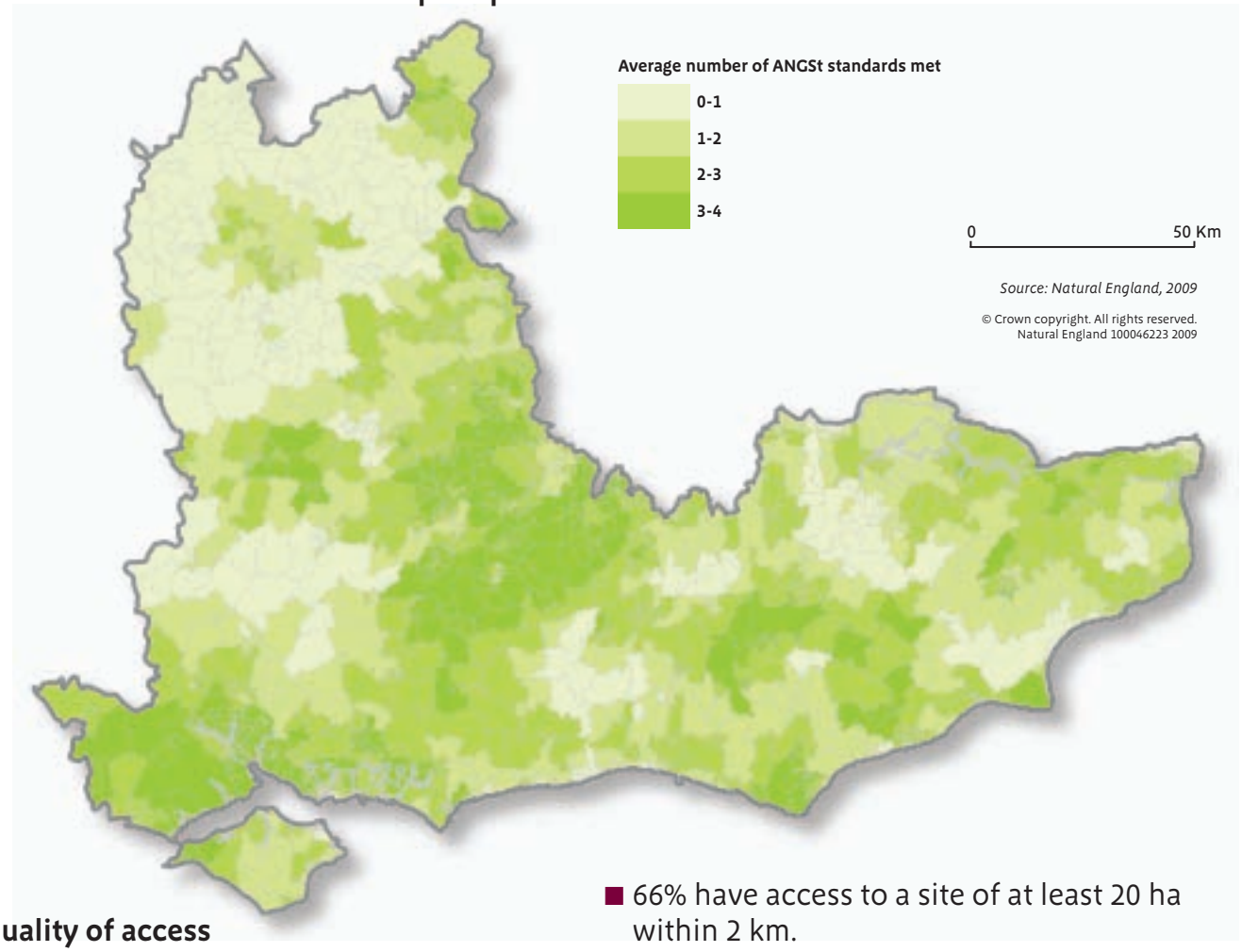
We can enjoy access to three quarters of our region's coastline. There are four designated Heritage Coasts, 125 km in total, providing opportunities to enjoy some of our finest coastal landscapes. Access rights will improve with enactment of the Marine and Coastal Access Bill.

National Trails and Public Rights of Way

The South East is crossed by four National Trails – the South Downs Way, the North Downs Way, the Thames Path and the Ridgeway. With a total length of 1,277 km, these long distance paths offer opportunities to explore some of our finest landscapes, and were used by an estimated 3.7 million people in 2004.

More locally, the region is served by a network of nearly 33,000 km of footpaths, byways and bridleways. These are complemented by over 500 km of new permissive paths on farmland provided through agri-environment agreements with farmers.

Figure 4 Accessible Natural Greenspace provision



Inequality of access

While the opportunities illustrated above are many and varied, some communities enjoy far easier access to the natural environment than others. There are variations in the quantity and the quality of available natural green space and public rights of way, and some of our urban communities experience a number of social and economic barriers to using them.

A report published in 2007 by Natural England and the Forestry Commission[6] identified and mapped natural areas open to the public and tested levels of provision against the four parts of the Accessible Natural Greenspace Standard (ANGSt). It revealed that the South East has nearly 140,000 ha of accessible natural green space of which half is woodland, but this is unevenly distributed in relation to where people live. This groundbreaking study assessed all households in the South East and found that:

- 20% have access to a site of at least 2 ha within 300 m (ie walking distance).
- 66% have access to a site of at least 20 ha within 2 km.
- 77% have access to a site of at least 100 ha within 5 km.
- 46% have access to a site of at least 500ha within 10 km.
- 10% meet none of the above standards for access to natural green space[6].

The distribution of Accessible Natural Greenspace across the region is very uneven. In some districts (e.g. Runneymede and Thanet) fewer than 10% of households have an ANG within walking distance while in others (e.g. Hart, Guildford and Ashford) the figure is greater than 30%.

On average, approximately two out of four ANG standards are met for households across the whole region, however, the distribution is very uneven with some districts meeting nearly all ANGSt standards (e.g. Guildford and the New Forest) while in others almost no natural greenspace is accessible (e.g. West Oxfordshire and Aylesbury Vale).

Challenges and opportunities in the South East

The following section focuses on some of the significant and topical issues affecting the natural environment in the South East and illustrates how Natural England is working with our regional partners to address them.

Climate change

Sustainable land management

Sustainable management of coast and seas

A Natural Health Service

Growth and environmental capacity

Open heathland landscape at Thursley National Nature Reserve in Surrey

Climate change

There is now overwhelming scientific consensus that our climate is changing driven by human activities such as the burning of fossil fuels.[7] Modelling undertaken by the United Kingdom Climate Impacts Programme (UK Climate Projections 2009[69]) produced climate change scenarios for differing levels of greenhouse gas emissions. For the South East it predicted that by 2080:

- It will be warmer all year round. Mean temperatures for summer are likely to rise by between 3 and 4.9°C and for winter between 2.6°C and 3.7°C, while the temperature on the hottest day of the year could increase by up to 10°C.
- Winters will be wetter and summers will be drier. Precipitation are likely to decrease by 14 to 28% in summer and increase by 18 to 30% in winter, while rainfall on the wettest day of the year could increase by up to 45%.
- Cloud cover will reduce. Summer-mean cloud amount is likely to decrease by up to -18% in parts of southern England. The number of hot days and dry spells will increase significantly in the South East.
- Sea level in London is likely to be between 30.5 and 43.3 cm higher than present.

The scale of changes that we experience will depend on our success in reducing greenhouse gases emissions. But even if we achieve significant reductions, greenhouse gases already in the atmosphere will continue to affect the climate for decades to come. Such 'locked in' climate change represents the most serious long-term threat to our ecosystems, landscapes and the biodiversity they support. The consequences for the natural environment will be complex and it is possible to foresee only some of the likely changes for the South East. These include:

Sea level rise and increased storm events: Coastal defences will come under greater threat and the significant losses of intertidal habitat already recorded in the South East[8] will continue as sea levels rise unless provision is made for habitats to migrate landward.

Changes in phenology: We are already seeing changes in the timing of seasonal events in the South East.[9] For example, there is clear evidence that the time that first leaves emerge on oak trees in Surrey is becoming earlier each year.[22] Where species are inter-dependent, for example flowers and their insect pollinators, this may lead to the relationships they depend on breaking down.

Changing species ranges and habitat requirements: The conditions for some species currently found in the South East may become less favourable, while others may extend their range northwards, including species arriving from the continent. However, fragmentation of habitats will make it difficult for some species to move. The silver-spotted skipper butterfly is currently expanding its range across the South East, probably in response to favourable management and perhaps climatic factors.[20] It has also been shifting its preference from short turf toward taller and, therefore, cooler areas of grassland.[21]

Ground water and rivers: Hotter drier summers with increased water demand may cause falling groundwater levels and extremely low river-flows in summer, which could be particularly serious for the health of our chalk rivers.

The following sections consider potential strategies for the use and management of land and seas to allow the natural environment to adapt to the changing climate.

A British white grazing amongst bell heather at The Flashes Local Nature Reserve in Surrey

Sustainable land management

Our recent successes in putting in place the management required to bring Sites of Special Scientific Interest into favourable condition will deliver significant gains for biodiversity in the South East. However, the challenges we face in securing sustainable land management that protects and enhances our region's biodiversity in the wider environment remain considerable. An important factor in shaping our response to these challenges is the need to enable species to adapt to the changing climate.

The issues

Habitat quality and species diversity are continuing to decline

More than 89% of the SSSIs in the South East are now in favourable or recovering condition. However, outside the designated sites, habitats and species have not fared so well. The 2005 reporting round for the UK Biodiversity Action Plan (BAP) found that only 35% of the BAP habitats in England are stable or increasing in area, while 39% are decreasing.[10] Evidence shows that even where BAP habitats are increasing in area, their condition can be poor[11] and the species associated with them are in many cases continuing to decline.[12]

Defra's most recent published figures for farmland birds show dramatic declines in the South East, greater here than in any other region.[13] For the period 1994 to 2006, our population index for farmland birds shows a decrease of 21%, with 12 of the 19 species showing declines of over 10%.

Fragmented landscapes reduce biodiversity and present challenges to management

Agricultural improvement, development and other changes in land use have left many habitats in the South East highly fragmented. This limits some species' ability to disperse and colonise[14] and can have a negative effect on the diversity of species supported by these the habitats.

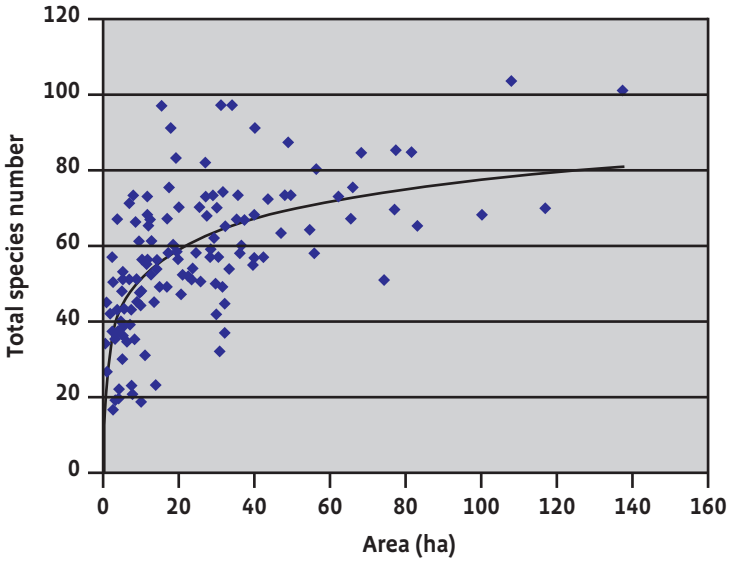
The biodiversity of some of the richest habitats is dependent on grazing. These include calcareous (chalk) grassland, lowland meadow, coastal and flood plain grazing marsh, acid grassland and some areas of lowland heathland, wood pasture and parkland.

Securing appropriate and sustainable grazing regimes that support the biodiversity of these habitats is a significant challenge in the South East. These habitats tend to be agriculturally unproductive and marginal to farming systems. They frequently survive in small, fragmented patches[15] and the economic returns from grazing are often too low to make them viable.

Chalk grassland fragmentation and species diversity on the South Downs

Chalk grassland, once widespread on the South Downs, now survives in scattered fragments, mostly concentrated along the steep, scarp slopes. Analysis of the distribution of chalk grassland within the proposed South Downs National Park boundary has shown that the total area of approximately 4,300 ha is divided into more than 650 patches with an average size of 6.5 ha. A third of all remaining chalk grassland is in patches of less than 10 ha.[15]

Research conducted on the South Downs by Brighton University has shown that, below a threshold of around 100 ha, the number of species likely to be found in a patch of chalk grassland decreases increasingly rapidly as patch size falls.[16] This means that much of the chalk grassland on the South Downs is likely to have relatively poor species diversity, well below the potential for the habitat.

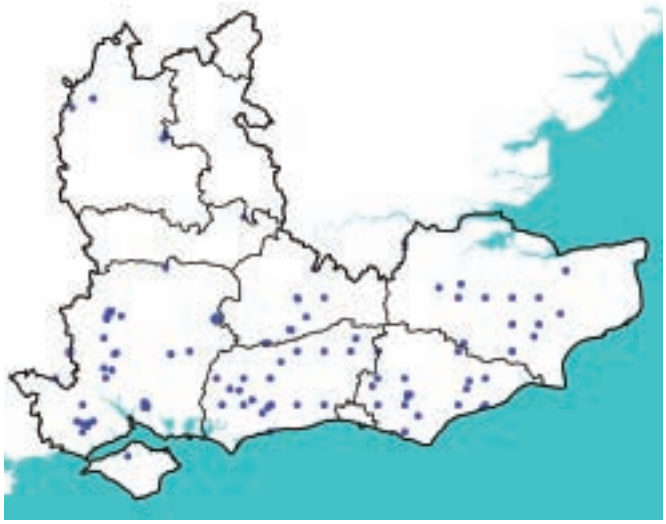


Lack of management is leading to a loss of biodiversity

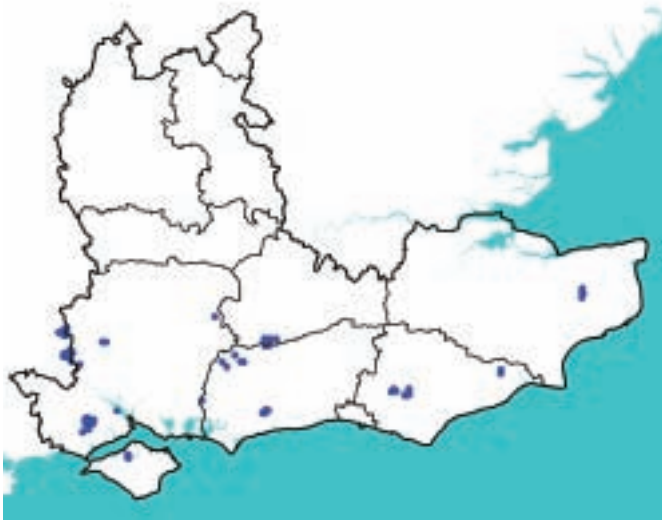
Many of the woodlands in the South East were formerly coppiced. This helped to sustain populations of species that require warm, open conditions. However, woodlands no longer have the same importance to the rural economy and many are now left unmanaged,[17] leading to a considerable decline in woodland biodiversity. Formerly widespread species such as the pearl-bordered fritillary butterfly have declined in range and numbers, as the maps below illustrate.

Figure 5 Distribution of pearl-bordered fritillary records

1970-1982



2000-2003



This decline has been replicated across England. Butterfly Conservation estimates that in 1997 there were 250 English pearl-bordered fritillary colonies. These had declined by a third to 170 colonies in 2004. In the South East, this butterfly was restricted to just seven sites in 2008.[18]


© Patrick McKernan

Small pearl-bordered fritillary

The populations of many characteristic woodland birds in the South East have also declined heavily in recent years.[19] For the period 1994 to 2006 the regional population index for woodland birds shows an overall decrease of 19%, with 16 of the 29 species showing declines of over 10%. Of particular concern are spotted flycatcher, willow tit and willow warbler, which have declined by over 50%.

Climate change will compound pressures on biodiversity

The impacts on species of habitat fragmentation and insufficient or inappropriate management are likely to be compounded by our changing climate. The relationship between species and their environment is complex, making it extremely difficult to predict exactly how they will respond to likely changes in climate. However, modelling such as that undertaken by BRANCH[23] can give some indication of the nature and scale of changes we are likely to see.

The BRANCH Project took a suite of characteristic species of lowland heathland and calcareous grasslands in Hampshire and mapped their distribution against the present climate. Climate models were used to predict how their distributions were likely to change under different climate change scenarios.

Under the high emissions scenarios for the 2080s some of these distribution changes were dramatic. For heathland the majority of the plant species studied would no longer be able to find suitable climate conditions in the county, while the area in which most of the calcareous grassland species could survive was reduced.

These results suggest that it is highly likely that the species composition of calcareous grassland and heathland in Hampshire will shift dramatically before the end of the century.

Achieving long-term sustainable land use will be a challenge

Natural England's long-term vision is for viable wider land management practices and systems that deliver the ecosystem services necessary to protect and enhance the natural environment whilst also producing sufficient high quality food and woodland products that meet robust environmental, social and animal welfare standards. However, current economic circumstances within the farming and forestry sectors, including volatility in global food markets, generally higher arable prices, a recessionary threat to premium value food, and the drive for more renewable energy products will present considerable challenges to achieving this vision.[42]

Our response

The relationships between species, habitats, landscapes and the natural processes that shape them, are complex and function at a range of scales. If we are to reverse declines in species and maintain a rich and healthy natural environment into the future, we will need to manage whole landscapes in a way that both meets the immediate ecological needs of the species they support and provides maximum opportunity for them to adapt to the changing climate. This will mean maintaining a diversity of semi-natural habitats, increasing their area and improving the connections between them, guided by an understanding of how ecosystems function within the landscape.[24]

South East Biodiversity Strategy

Natural England and our partners in the South East England Biodiversity Forum (SEEBF) have recently launched the South East Biodiversity Strategy. This provides a framework for the delivery of biodiversity targets, embedding a landscape-scale approach to restoring whole ecosystems in the working practices and policies of all partners.

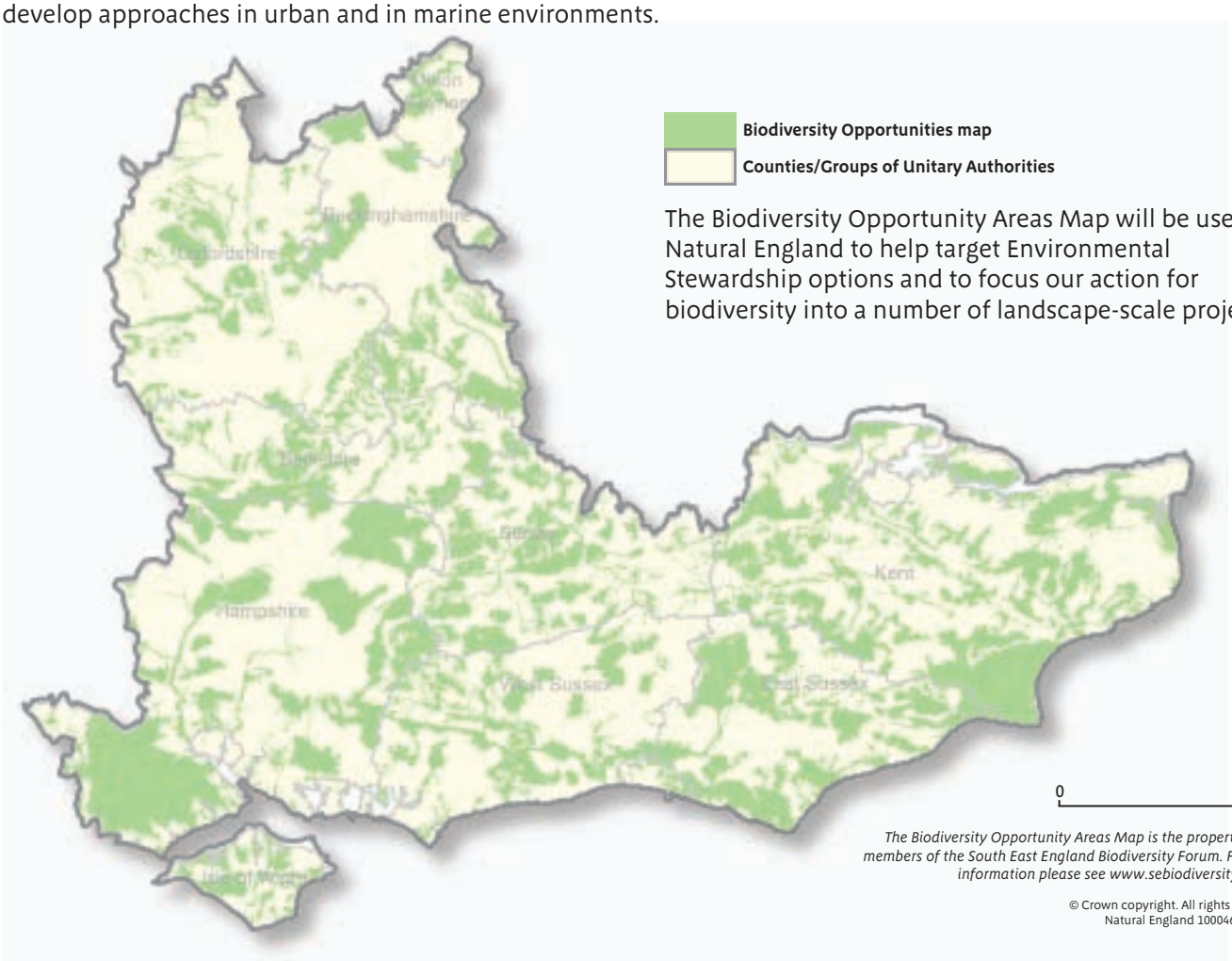
The Biodiversity Opportunity Areas map is central to the strategy and provides a spatial representation of the Biodiversity Action Plan (BAP) targets. It is designed to focus effort into discrete areas which offer our region the best opportunities for landscape-scale biodiversity restoration and management.

Natural England will work with partners in the South East England Biodiversity Forum to implement the strategy by:

- specifying the contribution that lead agencies for each habitat will make towards BAP targets and, where appropriate, in which Biodiversity Opportunity Areas this will be focused;
- ensuring that, where appropriate, the South East Biodiversity Strategy and its delivery framework is incorporated into the strategic documents and plans of Natural England and our partners; and
- increasing the number of organisations positively contributing to the BAP targets and working to secure long-term financial support for the wildlife of the South East.

Figure 6 Biodiversity opportunity areas

The Biodiversity Opportunity Areas (BOAs) map depicts the regional priority areas of opportunity for restoration and creation of Biodiversity Action Plan (BAP) habitats. This is a spatial representation of the BAP targets and the BOAs are areas of opportunity, not constraint. The BOAs shown in the map do not include all the BAP habitat in the region, nor do they include all the areas where BAP habitat could exist. In particular, more work is needed to develop approaches in urban and in marine environments.



The Biodiversity Opportunity Areas Map will be used by Natural England to help target Environmental Stewardship options and to focus our action for biodiversity into a number of landscape-scale projects.

The Biodiversity Opportunity Areas Map is the property of the members of the South East England Biodiversity Forum. For more information please see www.sebiodiversity.org.uk

Strategic planning for climate change
Changes to the physical environment together with the impacts of society's response to climate change will have adverse effects on the natural environment unless anticipated and managed. Strategic priorities for action are increasingly well understood on the coast. We now need to start developing a strategic approach to climate change adaptation inland. To complement the Biodiversity Opportunity Areas we will invite regional environmental partners to work with us to better understand and agree which areas of our terrestrial natural environment in the South East are most vulnerable to locked-in climate change. This will require us to:

- improve our understanding of the intrinsic sensitivity to climate change of our key habitats and landscapes and the public enjoyment of both,
- determine existing degrees of resilience of our most sensitive features, including but not solely degrees of spatial fragmentation, and
- use this information to determine the likely impact of climate change set out in the refreshed UKCIP scenarios.

In addition, we will start trialling approaches to building environmental resilience in pilot landscapes starting where we already have projects targeted on landscape-scale action like the South Downs. Over time, we will work with partners to disseminate lessons learned about best approaches to building local resilience and target our actions on those other landscapes or areas of greatest vulnerability.

The Regional Forestry Framework represents a wide partnership of organisations involved in the forestry and woodland sector in the South East. It provides a framework through which we will work together to deliver our shared objectives to ensure there is a thriving woodland resource in the region.

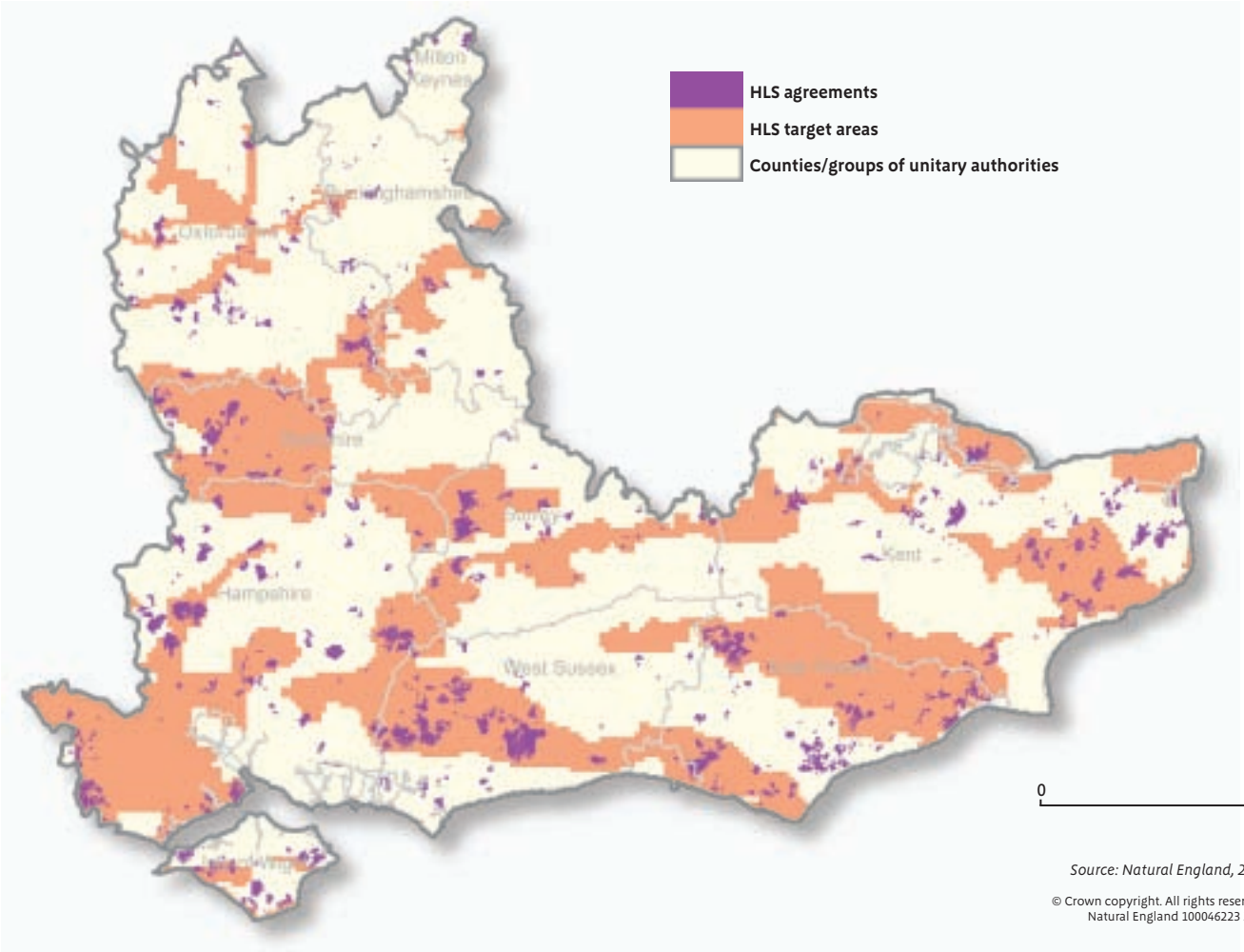
Through the framework Natural England will:

- work with the Forestry Commission and other partners to target support for woodland management into areas that will deliver the biggest gains for biodiversity and contribute to management of whole wooded landscapes that support species diversity and are resilient in the face of climate change; and
- seek to support, as appropriate, the Forestry Commission and the South East England Development Agency in finding new ways of bringing woodland into management, particularly through wood fuel initiatives, focusing on where this will have priority benefits for the natural environment.

South Downs firewood accreditation scheme
Natural England and the South Downs Joint Committee, in partnership with the Forestry Commission and the private woodland sector, are exploring the feasibility of a firewood accreditation scheme whereby consumers would have confidence in buying a quality product, sourced locally from woodlands managed to an agreed environmental protocol. The aim is to support the woodland sector through infrastructure grants and training, generating a market for bringing woodlands into sustainable management, thereby benefiting biodiversity, particularly threatened species in key areas.

Targeting key areas for woodland butterflies
Natural England is working with the Forestry Commission and Butterfly Conservation to reverse the decline of threatened butterfly and moth species in the South East. The Forestry Commission-led project has three priority areas for management, with a particular focus on Biodiversity Action Plan species. Natural England is helping the project officers on the ground by targeting Environmental Stewardship in areas that will bring the greatest benefit to these species.

Figure 7 Higher Level Stewardship (HLS) agreements



Area of agreements = 93, 311 ha (4.8% of the region)
Annual spend currently approx £11 million
HLS Target Areas 750,800 ha (39% of the region)

Targeted support for land management

Higher Level Stewardship (HLS) has an important role to play in delivering land management that will benefit our most valuable habitats and species. It can also help support a wider range of priority economic and societal benefits (see discussion of 'ecosystem services' in the section on growth).

Natural England is working with partners to target HLS, together with other advice and support, into areas that offer the best opportunities to expand and link existing semi-natural habitats, and to create and sustain landscapes and ecosystems that are resilient in the face of the changing climate.

Barbastelle bats in the West Weald landscape

Since 2003, a partnership of organisations including the Sussex Wildlife Trust, Natural England and the Forestry Commission has been working at the landscape scale in the West Weald to identify and understand the key requirements of the area's rare species and to enhance the quality of their habitats.

A key site in this heavily wooded area is Ebernoe Common, an ancient wood pasture that is one of the country's most significant sites for bats. It supports 14 of the UK's 17 species, notably the rare barbastelle and Bechstein's bats. Earlier surveys in this area showed that female barbastelle bats had to forage over an increasingly wide area of countryside because of the lack of suitable habitat near their maternity roosts. The evidence indicated that improving the habitat quality of their flightlines and enhancing the connectivity between existing high quality habitats were essential to enable barbastelles to move freely across the landscape.

Targeted land management, advice and grants, including Higher Level Stewardship (HLS), are providing clear results. Barbastelles now use improved flightlines and foraging habitats close to Ebernoe Common and recent results show that the breeding barbastelle population is double its size ten years ago.

Barbastelle bat

Long term sustainability of land management

In addition to shorter-term targeted support for environmental land management, Natural England needs to work with partners through the recently established South East Rural Board, (including the Sustainable Food and Farming Board), to understand and address long-term challenges facing the establishment of sustainable agriculture and forestry. This needs to combine a secure economic future with a responsible approach to management of the natural environment.

Integrating delivery at a landscape scale

The South Downs Spatial Project is one of four spatial projects that Natural England is establishing in the region designed to develop landscape-scale approaches to integration of our work with that of partners. Through this project we are working closely with partners in the South Downs Environmental Stewardship Delivery Group to target HLS options for downland restoration and management. This will form part of an overarching strategy that should ultimately deliver an ecologically functioning and robust chalk grassland network across the proposed National Park, as well as delivering a range of ecosystem services and improved public access.

Achieving this will require targeted support for the livestock sector to produce landscape and biodiversity benefits where these are most needed as well as measures to address issues of long term sustainability. This will include:

- using HLS payments to support enhanced chalk grassland habitat management, targeting key landowners for new agreements or the transfer of existing ESA agreements into HLS;
- influencing Rural Development Plan Axis 1 funding for livestock support through established approval processes such as the South Downs LEADER Local Area Group; and
- encouraging local lamb and beef branding initiatives that support local grazing capacity.

Control of non-native plants at Pevensey Levels

Pevensey Levels is both a Site of Special Scientific Interest and a Ramsar (protected wetland) site. This large area of low-lying grazing meadows is intersected by a complex system of ditches that support internationally important communities of wetland plants and invertebrates. The survival of a number of endangered ditch species is threatened by the spread of non-native plants - particularly pennywort and New Zealand pigmy weed. Natural England and the Environment Agency are working together with local landowners to control non-native plants across the 3,600 ha site. The project:

Fen raft spider. One of Britain's largest and rarest spiders, the fen raft spider *Dolomides plantarius* has its stronghold at Pevensey

- assesses the current extent and spread of non-native plants on the site;
- communicates clearly what the issues are to landowners and how they can help;
- delivers effective control of non-natives partly by support from the Higher Level Stewardship scheme; and
- monitors the effectiveness of measures used to control the non-native plants.

Sustainable management of coast and seas

The South East region has one of the most important coastlines and marine environments in the country for both wildlife and people. The challenges are many - a need for growth and a vibrant economy, a demand for recreation and enjoyment, and at the same time a desire to maintain and improve the large areas of high quality natural environment for which our coast and seas are renowned. Added to this are the inevitable consequences of climate change with sea level rise and the need for adaptation. Achieving long-term environmental sustainability is therefore a significant challenge for our region.

The issues

Coastal squeeze threatens intertidal habitats
Change to our coast is inevitable. The action of wind, waves and tides shapes our coast through the combined processes of erosion and accretion. Cliffs continue to erode; sand, gravel and fine sediments move from one place to another; and beaches build or disappear. In addition, our sea levels continue to rise because of the combined effects of 'locked-in' climate change and the continuing slow sink of land in south east England following the end of the last Ice Age.

The survival of intertidal habitats is dependent upon both sufficient new coastal sediment to feed the creation of mudflats, saltmarshes and shingle beaches; and sufficient space to allow landward movement in response to sea level rise. Both present long-term challenges. The availability of sediment is declining because of past human interventions and because much of it was originally from glacial material that is now effectively exhausted. Further, landward movement of habitats is constrained by hard sea defences built to protect land and property from inundation.

The South Wight Maritime SAC includes vegetated sea cliffs, submerged sea caves and some of the most important subtidal British chalk reefs, including the extensive tide-swept reef off the Needles

In the South East saltmarsh habitats are being rapidly lost because sediment accretion cannot keep pace with the impacts of sea level rise. Studies have shown that saltmarsh in nine estuaries on the south coast had declined from 1,700 ha in the 1970s to 1,080 ha by 2001. The estimated rate of saltmarsh loss is over 1% annually from 1994 in parts of southern and eastern England and 1.5% annually from 1946 for areas around the Solent.[25] This not only means a loss of valuable wildlife and landscape areas, but also puts at risk seawalls that benefit from the wave-absorbing power of saltmarshes.

Saltmarsh loss at Hurst to Lymington in the western Solent

This area of open coast fringed by saltmarsh and mudflats is protected from the prevailing wind and waves by a 2 km long, artificially maintained, partially vegetated shingle barrier. On the landward side of the saltmarsh, behind the sea walls, are coastal grazing marshes and saline lagoons in areas previously reclaimed from the sea. All of these habitats are highly important for wildlife and are afforded a number of local, national and international conservation designations.

Historically, the saltmarsh in this area has been receding at a rate of three to six metres a year. Recent modelling and mapping[26] have shown that by the 2080s (under all the climate change scenarios), if current sea defences are maintained, saltmarsh will be almost completely lost between Hurst and Lymington.

Opportunities for local 'managed realignment' are limited so there is a need for a strategic approach to offset saltmarsh losses by replacement in other locations. This is recognised in the shoreline management plan and regional habitat creation programme currently being developed.

Visualisations of saltmarsh loss between Hurst and Lymington in the western Solent produced by the Branch Project[22]

Present

Medium low emissions scenario (UKCIP 2002)

High emissions scenario (UKCIP 2002)

Chichester Harbour looking towards East Head – one of the few remaining undeveloped coastal areas in Southern England, the harbour provides a major wildlife haven and some of Britain's most popular boating waters

Diffuse pollution is affecting our estuaries

Excessive algal growth, caused by elevated nitrate levels in water and estuarine sediments, particularly affects the semi-enclosed harbours of the eastern Solent. This has resulted in extremely high levels of green weed cover, adversely affecting marine animals living within the mudflat sediments and the birds that rely on them as a source of food. Consequently, large areas of coastal SSSI and European Sites in the eastern Solent are currently in unfavourable and declining condition.

The Environment Agency's programme for reviewing consents has identified diffuse sources from the catchments as a major contributor of nitrates to these coastal waters. A significant proportion of the catchments are characterised by intensive agriculture.[27]

Climate change and human activities are combining to put pressure on the marine environment

The UK's marine environment is facing significant pressures from a range of human activities that have led to the degradation of seafloor habitats and loss of irreplaceable features. This has resulted in decreases in the diversity and abundance of marine species. There is also evidence that climate change is altering the marine environment in ways that pose a threat to the balance and integrity of the marine ecosystem.[28]

Potential challenges for the marine environment in the eastern English Channel include tackling the negative impacts of: marine pollution (see above); marine development such as offshore wind farms, ports and harbours; and extractive industries such as fisheries, oil and aggregate dredging. If recently discovered resources were fully exploited, aggregate extraction in the eastern English Channel would account for more than 50% of the UK total.[29]

Our response

Planning for a more sustainable coastline
With sea levels predicted to rise up to half a metre over the next 90 years, coastal communities, the Government and its agencies will face crucial decisions and challenges. Natural England is committed to finding solutions that work with rather than against nature to secure long-term policies that assist adaptation for the environment as well as people. We are working closely with the Environment Agency and local authorities on their coastal strategies and shoreline management plans (SMPs) in order to secure policies that provide for long-term sustainable coastal management. This requires a critical look at the need to maintain sea defences. Combating the adverse effects of sea level rise and coastal squeeze will require us to find locations where we can move sea defences landward to allow for evolution of intertidal habitats ('managed realignment'). A successful example in this area is the recently agreed Medway Swale SMP, which secures some of the most extensive stretches of coastal managed realignment ever agreed in the South East.

Creating a more sustainable coastline
Natural England recently endorsed the Environment Agency's Regional Habitat Creation Programme for the South East. This sets out a plan of coastal managed realignments for the next 100 years to support the requirements of the policies within SMPs. Reaching agreement on this programme is a significant milestone on the path towards combating coastal squeeze in the South East. We will now work closely with the Environment Agency, local authorities and landowners to implement the programme, advising on specific habitat creation opportunities and using Higher Level Stewardship to support land management change where appropriate.

Tackling diffuse pollution
Natural England staff have been working with the Environment Agency and key partners such as local water companies to develop a new project to tackle diffuse pollution affecting the eastern Solent. This project will set out a long-term strategy to tackle diffuse sources through a programme of catchment appraisal and dissemination of farm advice based upon Catchment Sensitive Farming principles.[30]

Marine Protected Areas
In order to adequately conserve rare, threatened, and representative habitats and species and ecological processes required to maintain and improve marine biodiversity and ecosystems, the UK Government is committed to establishing a network of Marine Protected Areas (MPAs) by 2012. MPA is an umbrella term that encompasses both European marine sites (existing and new marine Special Areas of Conservation and Special Protected Areas under European legislation) and national marine sites (Marine Conservation Zones (MCZs) under the Marine & Coastal Access Bill).

In the South East, Natural England will work with key marine partners from the public and private sectors to establish a new network of Marine Conservation Zones within the eastern English Channel. This represents a great opportunity to further the protection of our region's marine ecosystems.

A Natural Health Service

The natural environment has huge potential to contribute to our wellbeing in the South East. By acting as a 'Natural Health Service' for our region, it can reduce health inequalities and help offer a preventative solution to rising health costs. However, there are significant challenges in providing adequate natural green space close to where people live and in giving people the opportunity to enjoy the benefits it can bring.

The issue

The South East has significant health inequalities

The population of the South East is becoming more sedentary in nature. People make fewer trips on foot than in any other region in England,[27] and Sport England's *Active People Survey* (2007)[32] indicates that only 22.3% of adults in the region undertake the three thirty-minute bouts of sport or active recreation recommended for each week.

Mental wellbeing issues are also significant, with one in six people having a mental health problem.[33] Nationally, poor mental health and stress-related illnesses affect economic productivity, costing the economy £77 billion a year. In the South East, 16% of women and 12% of men are affected by depression or anxiety,[34] and our region has the highest rates of sickness absence in the country.

Looking across the Chilterns from Aston Rowant NNR. *"... It is these early years of inspiration that set in motion a life time passion; today's young expolorers are tomorrow's naturalists and biologists."* Naturalist and television presenter Chris Packham at the launch of the *One Millon Children Outdoors* programme (see Natural England website for details).

Life expectancy at birth is a useful measure of the health of a population, and there is a significant variation across the South East. Girls born in Epsom & Ewell can expect to live 4.1 years longer than those born in Hastings. Boys born in Hastings are likely to live 5.2 years fewer than those born in Hart.[37]

The natural environment can benefit health and wellbeing

There is a growing body of evidence showing the benefits to our health and wellbeing of access to a natural environment. A recent study of over 350,000 people published in The Lancet found that people who lived near green space lived longer and had significantly reduced health inequalities, even when all other factors were accounted for.[38] Walking, running, volunteering on conservation projects, learning and playing outdoors are all good for us. Using the natural environment in these ways increases and, importantly, sustains physical activity, thereby contributing to the prevention and management of over 20 conditions and diseases including coronary heart disease, diabetes, cancer and obesity. Increasing evidence also shows that access to the outdoors helps reduce stress and symptoms of depression and enhances concentration, mood and self esteem.[35] It plays a role in increasing a community's social capital through reducing anti-social behaviour, benefiting children's cognitive development and reducing isolation through stimulating contact with other people.[36]

The greatest opportunity for the natural environment to deliver health benefits lies in those areas suffering the poorest health and the poorest health prospects. The natural environment has huge potential to become a 'Natural Health Service' addressing inequalities and offering a preventative solution to rising health costs. The Regional Health Strategy and initiatives such as Get Active South East are beginning to reflect this opportunity

Our response

Natural England is promoting the role that the natural environment plays in health through regional health fora and strategies and illustrating through pilots how the outdoors can be utilised for the health benefits it can bring. Steps to provide people with the opportunity for regular contact with the natural environment involve all sectors, particularly local authorities, Local Strategic Partnerships and the NHS. They include planning easily accessible natural green space into growth and development, resolving the physical and socio-economic barriers that stop communities from enjoying the outdoors and local green spaces, and commissioning 'green exercise' opportunities as part of a wider package of health care provision.

Understanding the barriers to improving access to the natural environment

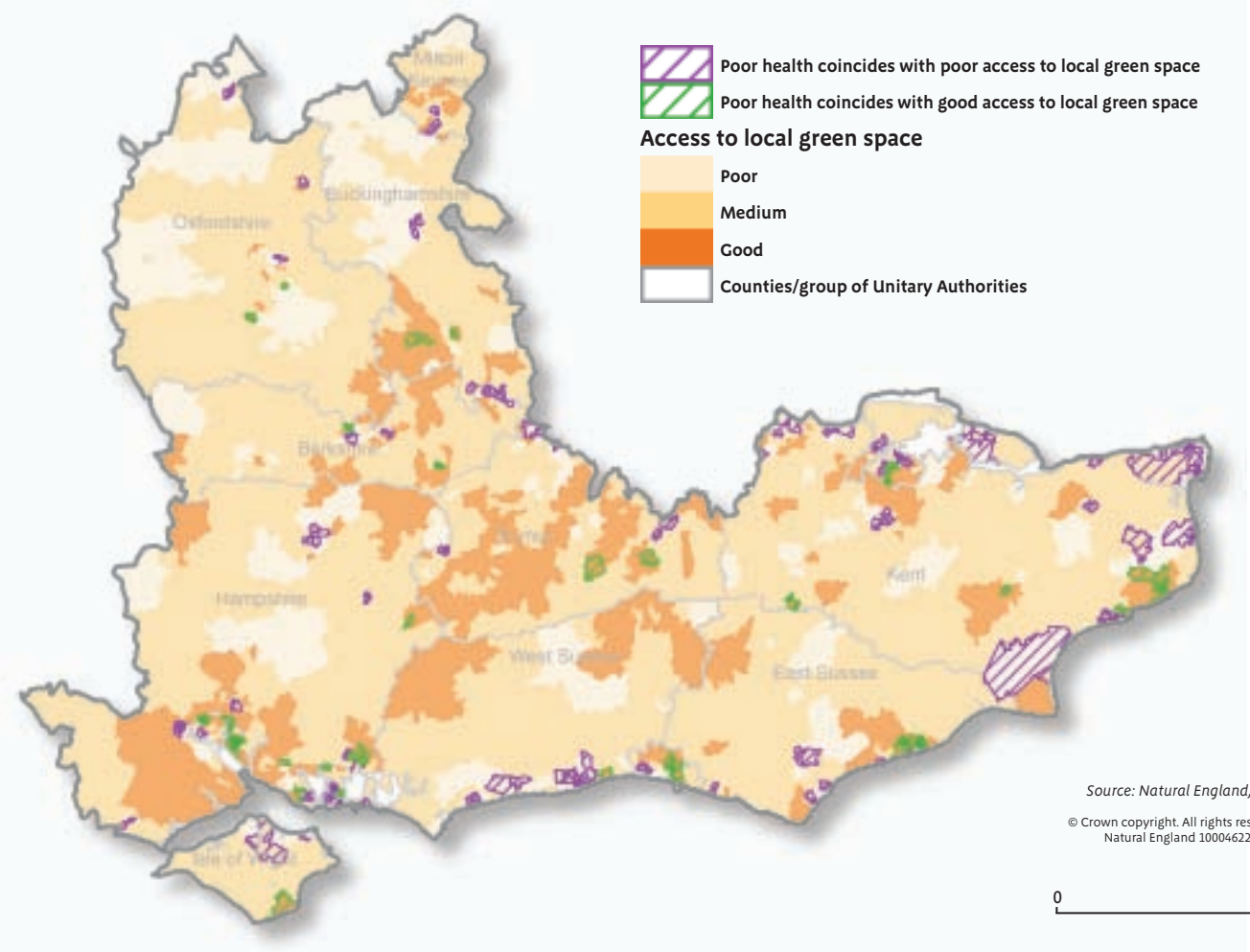
To assess how best to support local authorities in increasing the provision of accessible natural green space, Natural England commissioned a survey of the 31 authorities with the poorest provision in the South East. The study[39] reviewed the barriers that authorities face in providing access to natural green space, and how access standards are integrated into policy. 81% of respondents wish to work with Natural England and other partners to improve access to natural green space by sharing best practice and working through Community Strategies, Local Area Agreements and strategic planning. We will consider the barriers faced by local authorities and focus our work on areas where communities will feel the greatest benefit and where authorities have indicated their intentions to work towards better access provision.

An example of good practice is the Hastings Community Strategy, which includes among its targets: 'Give Households access to open space such as parks, Local Nature Reserves, public gardens and play areas or the beach, within 300 m of their homes by 2013. Target 90%.'

Identifying where the natural environment can help reduce health inequalities

The provision of local, easily accessible and welcoming natural green spaces is an essential part of developing a 'Natural Health Service'. In order to understand where this would have maximum health benefit in the South East we have mapped health, wellbeing and physical activity indicators across the region and compared these to the distribution of households with two or more hectares of accessible natural green space within walking distance. This has highlighted those areas of the South East (Thanet, Medway, Portsmouth and Worthing) suffering the worst health prospects that would benefit from better provision of local accessible natural green space and those areas (such as Southampton and Hastings) where better use could be made of existing locally accessible natural green space to help reduce health inequalities.

Figure 8 Health and access to the natural environment



Poor health has been mapped using a basket of indicators that reflect the potential benefits of activity outdoors. Indicators used: Obesity (adult), physical activity, hip fracture, heart disease & stroke, life expectancy and mental health (mapped to Middle Super Output Areas).

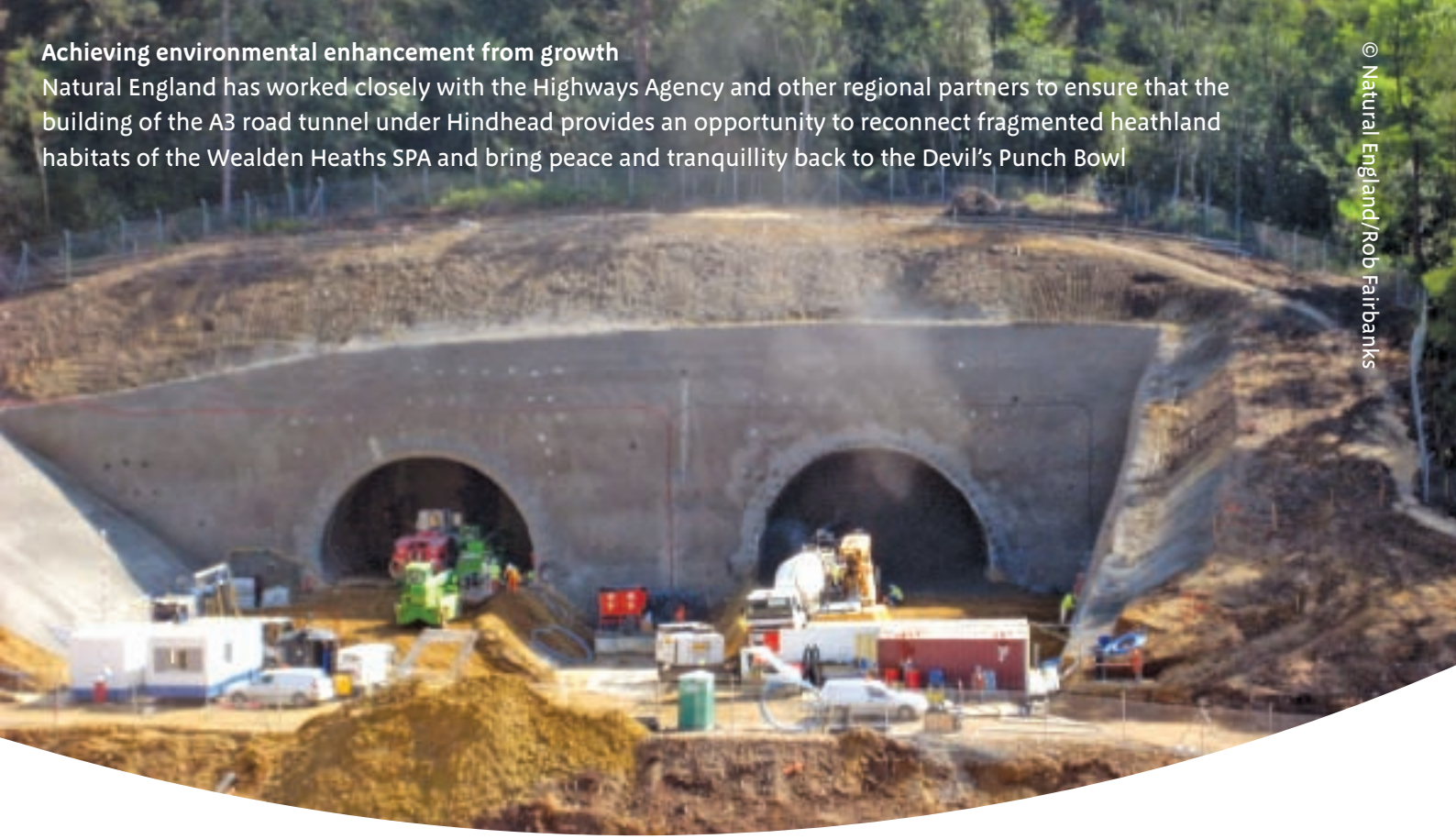
Walking our way to health
Natural England, with the British Heart Foundation, sponsors and facilitates the *Walking the way to health Initiative* (WHI) across England which aims to encourage people, particularly those who take little exercise, to do regular short walks in their communities to benefit their health. Approximately 4,500 people regularly join the 400 volunteer-led Health Walks across the South East.

Feedback from participants illustrates the benefit these walks have on health and wellbeing. Christine Long from Sonning Common says,
"My husband, David, and I discovered the Health Walks on the internet. I suffer from Marfan syndrome, which affects many parts of the body and I do have a lot of pain. We started walking with the Sonning Common and Prospect Park Health Walks groups and the benefits have been enormous. It is very uplifting, there is good company and we have great leaders."

Trialling *Health Care Pathway* to physical activity in the natural environment
A pilot project launched in November 2008 in Crawley, West Sussex is illustrating how the health sector can use local green space to improve physical activity. Crawley has good levels of natural green space, with 41% of households having two or more hectares within 300 m,[40] providing an underused opportunity for residents to use it as part of everyday activities. But with 91% of the population of Crawley not active enough to benefit their health,[41] Natural England is working with West Sussex Primary Care Trust, local GP surgeries, Crawley Borough Council's Wellbeing Programme and the local Health Walks provider on a 'Care Pathway' to promote outdoor activity amongst GPs' most sedentary patients.

Southgate and Leacroft surgeries lie within the most deprived wards of Crawley Borough, where the communities have very poor participation in sport and recreation. Through the pilot, GPs are recommending patients to the Crawley Wellbeing Unit, which coordinates both indoor and outdoor activities across the borough. The scheme provides one-to-one guidance and ongoing support and motivation for patients on how they can build activity into their lives, particularly through using the natural environment around them. The pilot will assess changing physical activity levels and how GPs have responded to using this new programme.

Guinness world record attempt for simultaneous cartwheels: 30th anniversary of The North Downs Way National Trail: Withersdane Hall near Wye in Kent



Achieving environmental enhancement from growth
Natural England has worked closely with the Highways Agency and other regional partners to ensure that the building of the A3 road tunnel under Hindhead provides an opportunity to reconnect fragmented heathland habitats of the Wealden Heaths SPA and bring peace and tranquillity back to the Devil's Punch Bowl

Growth and environmental capacity

The Government has defined Sustainable Economic Growth as growth that is sustained within environmental limits, enhances the environment and social welfare whilst avoiding extremes in future economic cycles.[42] Recognising the importance of conserving and enhancing the natural environment for its intrinsic value – which this report shows is itself a significant challenge for the South East – is an important first step. But this definition of sustainable growth falls short by not recognising a healthy natural environment also offers significant benefits to our society.

The issues

The environment provides direct economic benefit

A high quality natural environment is increasingly recognised as essential for a successful economy[43]. It can directly support employment, attract businesses and support tourism. In 2003, economic activities that were directly dependent upon the environment for their economic outputs or directly contributed to the maintenance of high quality environments (the 'Environmental Economy'), contributed nearly £8 billion to the South East economy and employed 236,000 people, representing 5.5% of the South East's workforce (a higher figure than for any other English region)[44]. However, the full economic value of the environment in making the South East an attractive place in which to live and do business is not well understood or measured[45].

The social and economic benefits of a Natural Health Service

The preceding chapter showed the natural environment has huge potential to contribute to our wellbeing in the South East. This has significant economic implications. The cost of physical inactivity in England is £8.2bn per year[1]. This figure does not include the contribution to obesity – a further £2.5bn cost to the economy. Bird (2004)[1] estimated the value to the economy of existing urban parks of 8-20 ha in Portsmouth could be up to £4.4m.

A healthy natural environment provides more than just economic benefits

In addition to measurable contributions to Gross Value Added and jobs, our natural environment has a 'hidden' role as a provider of essential 'ecosystem services'[46]. A healthy natural environment provides us with:

- the essentials for life, such as clean air and water;
- those things we need, such as food, fuel and raw materials;
- opportunities for recreational and spiritual refreshment that improve our quality of life, mental and physical wellbeing, and social cohesion; and
- essential natural processes, such as climate and flood regulation, water storage and purification – that we often take for granted[47].

There is no published consensus on the best way to analyse and evaluate such services. In some cases benefits to society may be identified in monetary terms (see case study on page 31), but it will not always be sufficient as economic valuation will underestimate the actual benefits to society[48].

However, unless explicitly valued in decision-making, the pressures from growth compounded by climate change could lead to losses of 'ecosystem services' with associated social and economic costs[49]. We therefore need to work at explaining in more accessible terms to both regional policy makers and the wider public the 'benefits that are derived from nature'[50].

The potential impacts of growth remain unclear

The South East Plan proposes 654,000 new dwellings within the next 20 years. These high levels of growth, combined with extensive designated landscapes and high demand on natural resources present an obvious challenge to achieving sustainable development. Minimising environmental losses whilst maximising potential benefits will require ever increasingly smart spatial planning.

Government policy emphasises protection and enhancement of the natural environment as a key role for the planning system[51]. Determining the most environmentally sustainable locations for future development is clearly important but, in so doing, we will need to refine our understanding of in-combination effects (the interaction between proposed developments) and cumulative impacts. National research identified a range of ways in which the cumulative impact of land development could potentially adversely affect biodiversity in England[52]. Set alongside evidence for loss of the distinctive character of our landscapes in the South East through increased urbanisation and the uncertainty of the full effect of climate change, this raises questions about the true capacity of our environment to absorb growth and still provide the natural resources for an appropriate quality of life required by our current and future generations.

The economic benefits of geodiversity

Webber *et al* (2006) estimated the impact of geodiversity on the Isle of Wight's local economy. 39% of tourists surveyed specifically visited the area for this reason, and geology based tourism accounted for approximately £11 million of the estimated £352 million value of tourism in 2004/2005, generating between £2.6 – 4.9 million in local income and supporting between 324 – 441 full time jobs.

Dinosaur footprint

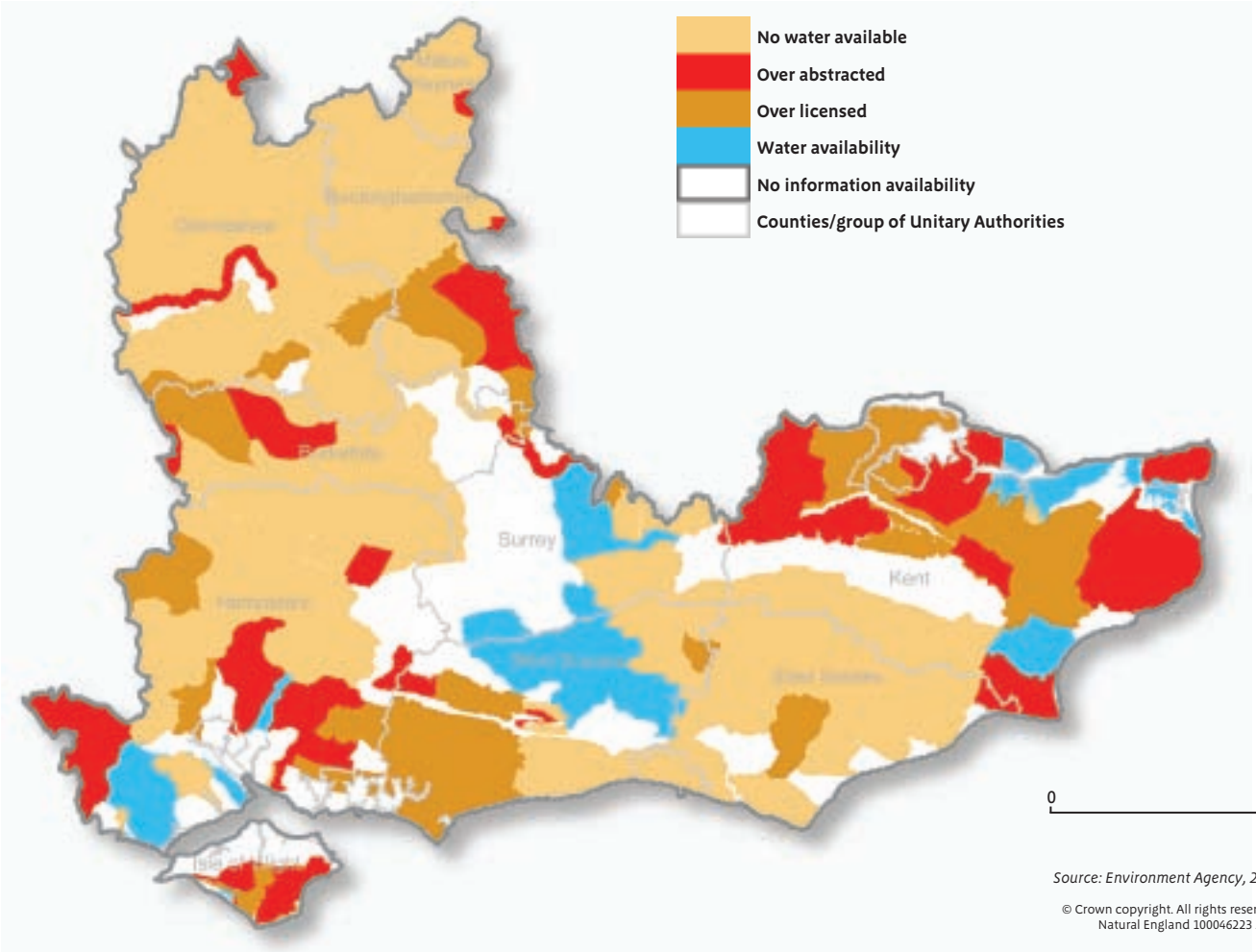
This uncertainty is reflected in the high-level assessment of the South East Plan, where the initial Sustainability Appraisal acknowledged that many aspects of our environment are already under stress. It concluded that the proposed level of housing growth could place a considerable strain on the region's environment, including potential negative impacts on landscapes, biodiversity, air quality, access, water quality and resources, and increased carbon emissions[53]. This leaves open the question whether environmental limits will be breached unless off-set by appropriate 'environmental and green infrastructure'. The risks and challenges are illustrated by the examples that follow.

Maintaining the benefits derived from nature – supplying water without environmental damage

The South East is the most water stressed English region[54]. Yet current water consumption per person is above the national average and predicted to rise[55]. The majority of our catchments are 'over-abstracted', 'over-licensed' (ie at risk of over-abstraction) or have no capacity for further abstraction[56] (Figure 9).

At the same time, predicted increase in winter rainfall and storms could result in greater run-off and less effective aquifer recharge, reducing water available in the following summer. Also, predicted warmer and drier summers could increase public demand in addition to having a direct impact on the natural environment.

Figure 9 Water availability



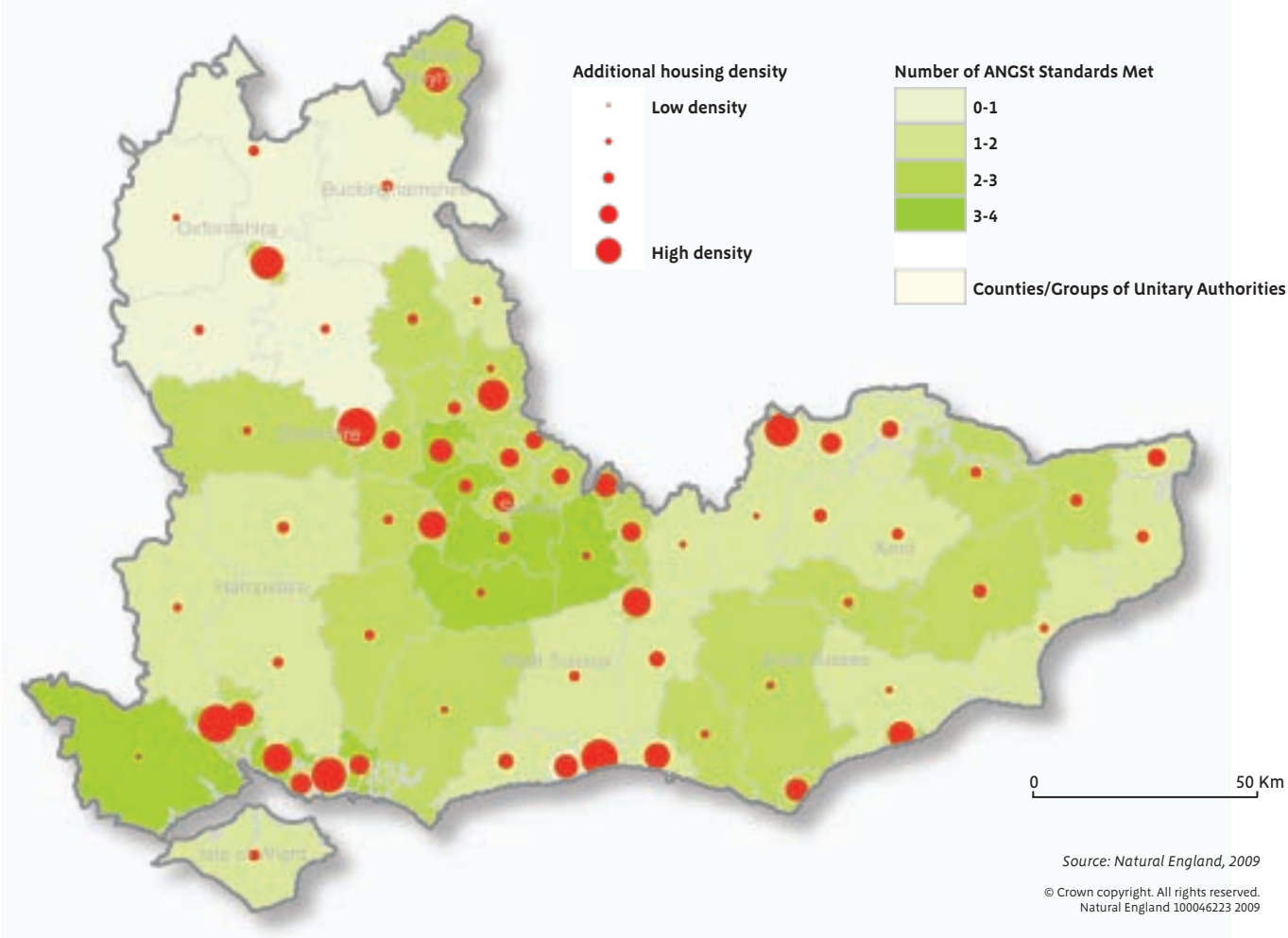
Source: Environment Agency, 2009

Unless carefully planned, levels of housing growth will increase demand from our rivers and groundwater with risk of damage to aquatic and wetland wildlife. Abstraction is already affecting our chalk rivers – an internationally rare wildlife habitat dependent on healthy flows fed by groundwater. In certain reaches of the River Kennet flows are reduced by up to 40% during droughts[57] and over-abstraction has already required artificial recharge of some Chiltern chalk streams to sustain flows during dry periods[58]. Low flows lead to siltation, decline in mayfly, poor salmonid recruitment and loss of water crowfoot[59].

Increased consumption also generates higher volumes of wastewater, which must be treated before discharge back to the environment. Recent significant improvements in the quality of such discharges are at risk of being offset by the increasing volume of wastewater that will be produced. Already there is a widespread problem of nutrient enrichment across the South East[60], resulting principally from discharges from sewage treatment works, though compounded by agricultural sources.

To live within our environmental limits will require a significant reduction in water consumption. Not all water companies are planning to meet Defra's[61] target level of 130 litres per person per day, which should be achievable by promoting simple economies that do not impinge on our quality of life. Natural England believes that greater water savings will be needed to both safeguard our rivers and wetlands and secure a sustainable future for water resources in the region.

Figure 10 Housing and Accessible Natural Greenspace



Source: Natural England, 2009

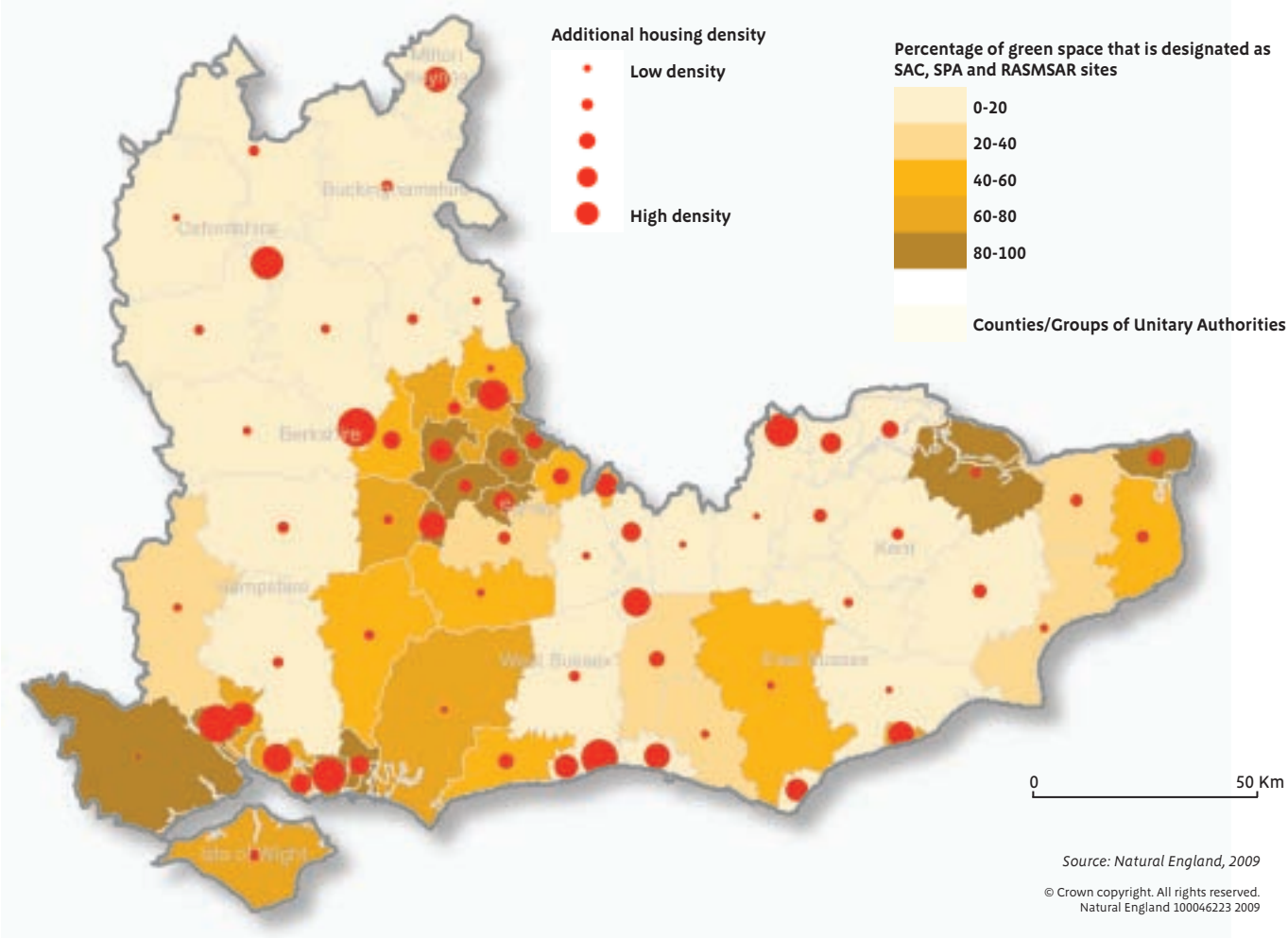
Maintaining the benefits derived from nature – ensuring sufficient natural green space to maintain our quality of life

Earlier sections set out the variations in the quantity of Accessible Natural Greenspace (ANG) across the region, showing this to be unevenly distributed in relation to existing households. The housing allocations in the South East Plan will, in some instances, significantly increase the number of households in districts where existing levels of ANG provision are poor (Figure 10). In other cases, allocations will significantly increase housing in districts where ANG is already subject to a potentially high existing pressure of use.

In addition, significant housing allocations have been made to districts whose Accessible Natural Greenspace is largely designated as internationally important wildlife sites (Figure 11), some of which, like the Thames Basin Heaths SPA example below, we know are highly sensitive to recreational pressure. The addition of significant numbers of households to the areas surrounding these sites presents the risk of increasing recreational pressure to levels which could adversely affect their conservation status.

Unless sufficient new natural green space is provided alongside new housing development in these districts, many new homes are likely to have very poor access to nature – with loss of the associated benefits set out in other sections of this report – and pressure on existing Accessible Natural Greenspace will be significantly increased, or important wildlife sites put at significant risk.

Figure 11 Housing and internationally important wildlife sites



Source: Natural England, 2009

Thames Basin Heaths
Incremental housing development around the internationally important Thames Basin Heaths has the potential, in-combination, to increase recreational disturbance of breeding heathland birds. We have worked with local authority and regional partners to better understand these potential impacts and to develop avoidance and mitigation measures. This has resulted in planning for development proceeding within an agreed framework, where improved or additional recreational access is being provided to meet the needs of a growing residential population, thereby reducing the likelihood of any further recreational impact on these sites.

Nightjar

Green Infrastructure provides for more sustainable development
Increasingly, 'Green Infrastructure' is seen as the most effective means of providing a wider range of 'ecosystem services', a more sustainable lifestyle and improved quality of life[62] helping to meet Government's emphasis on improving the quality[63] of what has hitherto been mediocre housing development[64].

The South East Plan requires local authorities to plan for Green Infrastructure in their local development frameworks. Green Infrastructure refers to a strategically planned and managed network of green spaces that provides a range of functions, embedding wildlife rich and varied habitats in urban and rural areas, providing recreational green spaces with associated health benefits, helping manage water resources and flood risk, and potentially providing climate change adaptation[65].

Our response

In meeting the Government's expectations for Natural England's engagement with the integration of regional economic and spatial planning, we will work to ensure that sustainable development and the environment are integral to decision making.

Our aim is to minimise the impact whilst maximizing the benefits of growth for the natural environment and people together. In doing this we will need to work with partners to develop methodologies that allow us to understand where the impacts and opportunities are highest, how these may change over time and where the need for certain environmental services or functions is greatest.

Building a picture of environmental capacity
We need to better understand the capacity of our environment to provide the services people need in the 21st century – and beyond. We will therefore work with regional partners to provide an assessment of long-term environmental capacity based on an improved and shared understanding of the issues, including:

- the impacts of existing population pressure on our most valued natural assets, including designated landscapes and wildlife areas;
- the cumulative impacts of future development;
- which areas of our natural environment are most vulnerable to 'locked-in' climate change, to inform implementation of existing plans and future spatial planning;
- our ability to reduce existing and mitigate future potential negative impacts of growth; and
- our capacity to restore environmental quality and build long-term environmental resilience through growth, such that we maintain and extend the beneficial services to society of a healthy natural environment.

Assessing and mitigating the potential negative impacts of growth
This document provides various examples of where we might need to better understand the distribution and scale of potential negative impacts of growth and how these work in combination, so that we might better anticipate where mitigation is a priority for taking forward development. As an immediate priority, we will work with GOSE to identify those areas where in-combination effects of proposed housing growth presents a high risk to European wildlife sites. This will inform the development of avoidance or mitigation strategies requiring collaboration across local authority boundaries.

Improving our understanding of ecosystem services
We will work with regional and local partners to build recognition and understanding of the true benefits of a healthy natural environment, building on emerging national thinking on how to develop the concept of 'ecosystem services'[66] and seeking better ways to value these beyond conventional economic measures. This will allow us to maintain, restore and extend those essential benefits that a healthy natural environment provides to society.

Taking forward the South East Green Infrastructure Framework
We will continue to work with key partners to understand the barriers to, and opportunities for, local delivery of the *South East Green Infrastructure Framework*[67] by:

- identifying regional priorities for delivery in order to align more confidently the work of delivery agencies with investment from regional agencies;
- helping ensure that the appropriate planning and delivery is coordinated across local authority boundaries and across different sectors; and
- working to develop best practice guidance, toolkits and other generic support to all areas.

Improving our ability to monitor achievement of sustainable growth
Most regional development agencies have adopted the Index of Sustainable Economic Wellbeing to provide a monetised indicator of economic wellbeing, quality of life and environmental costs to better measure the net benefits of economic activity[68]. We will offer to work with SEEDA and regional partners (including the regional observatory) to further develop the concept and the datasets to help ensure these adequately track the environmental implications of growth in the South East.

Conclusion

The natural environment of the South East is important and valued
This report clearly demonstrates the intrinsic importance of our natural environment and the benefits that it brings for our health and wellbeing as individuals and as a society. We are privileged to have some of the country's finest landscapes, with more than a third of the region protected by national designations. Many of the habitats and species they support are of international importance with particularly significant areas of lowland heathland, chalk grassland and ancient woodland inland, and vegetated shingle and sheltered estuaries along our coast.

Our designated landscapes, together with our many commons, are a significant and valued part of our cultural and natural heritage. They provide demonstrable direct economic benefit, in addition to a wider range of essential ecosystem services that we need to better understand and value. A significant proportion of our natural green space is open to public access, offering a wealth of opportunities to enjoy nature and the potential to deliver significant health benefits to the population of the South East, including communities suffering some of the poorest health prospects.

Our natural environment is under pressure
We have explored the condition of our key natural assets and some of the existing pressures and future threats they face, focussing on those which are particularly acute in the region. Historic losses of some of our most valued habitats have been compounded by more recent changes in land use and management practices. Competing demands on our land together with the discontinuation of traditional management practices mean the habitats of our landscapes have become fragmented. In addition, sea level rise on the coast presents a challenge to maintaining the extent of our important inter-tidal habitat and diffuse pollution adversely affects the water quality of our estuaries. Consequently, many of our distinctive landscapes are changing and less able to support healthy ecosystems that provide the services we require. It also makes them less resilient to future challenges such as those presented by climate change.

Targeted conservation action can be successful
Targeted action has been successful in addressing some of the pressures on our natural environment. Advice and support for land managers have delivered significant progress in securing the management required to bring Sites of Special Scientific Interest into favourable condition, while collaboration with the Environment Agency and others on Shoreline Management Plans is beginning to secure the coastal 'managed realignment' needed to address the issue of coastal squeeze. Increasingly, Natural England is working to target Higher Level Stewardship grants for environmental management into those areas which offer the best opportunities to expand and link existing semi-natural habitat in the wider countryside, and the promotion of Health Walks has seen an increasing number of people enjoying the benefits of exercise in the outdoors.

But more needs to be done
The actions that are underway and the successes we have highlighted show we are moving in the right direction, but more needs to be done if we are to halt declines in biodiversity in the wider countryside, address

undesirable change in our valued landscapes, recover past losses and ensure our natural environment is sufficiently healthy and resilient to withstand future pressures from development and climate change.

Finding ways to sustainably manage whole landscapes, identifying which areas are most vulnerable to climate change and taking account of natural processes on the coast will be critical. Addressing the current inequalities in people's access to nature as well as providing sufficient natural green space alongside new housing development will be important to maintaining and improving our quality of life. In addition, we will need to better understand the full range of benefits a healthy natural environment brings to our society so that we can plan for future growth accordingly.

The way forward

This report has presented evidence on the current state of our natural environment and many of the challenges to its long-term maintenance both for its intrinsic value and for the benefits it provides to people. However, it has also highlighted significant gaps in our knowledge that will need to be filled if we are to find effective responses to the challenges ahead. We have identified a number of key priorities that we believe will be required to build a coherent regional evidence base, but recognise that these will need to be taken forward through partnership working with key stakeholders.

The report also sets out key proposals for action by Natural England and our partners required to address the issues identified. Our intent is to develop landscape-scale approaches to integrate our delivery with that of partners, linking opportunities from growth, and changes in land use and land management in a way that provides benefits for both nature and people. We have identified the partners that we believe will have a significant contribution to make towards specific actions.

Our suggested evidence priorities and partners for action can be viewed on the web pages that accompany this report (see below). We are inviting comments on whether we have identified the correct organisations and individuals, and would welcome feedback on any current relevant work being undertaken.

Contacts and references

Further supporting material including a list of contacts in the region and all references indicated in the text can be found on our website at: http://www.naturalengland.org.uk/regions/south_east

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Email: enquiries.southeast@naturalengland.org.uk

The South East context

	Area (sq km)	Population 2007 (millions)	Population Density people/km²	Population 2011 (millions)	Population 2016 (millions)
South East	19,069	8.31	436	8.44	8.66
UK	242,495	60.98	251		

Gross Value Added (£ bn)	1994	1999	2001	2003	2004	2006
UK	596.55	786.41	862.12	965.85	1,024.09	1,128.79
South East	81.48	114.35	127.47	142.18	150.01	167.36
SE Agriculture (+hunting, forestry and fishing)	1.26	0.98	0.91	1.09	1.11	

Tourism (£ bn)	UK residents	Foreign
South East	2.35	1.58
UK	21.24	15.85

Urban South East	Total	Urban	Rural	% Urban
Local Authorities	67	34	33	51%
Coastal Districts (RES)	23	17	6	74%

Energy consumption per person 2007 (kWh)	Electricity		Gas	
	Domestic	Industrial	Domestic	Industrial
South East	4,741	71,499	17,799	443,648
Great Britain	4,392	79,077	17,614	633,779

CO^2 emissions 2004 million tonnes C	Total	Road Transport
South East	18.3	6.2
England	120.2	34.1

Further contextual data for the region is available from The South East England Intelligence Network SEE-iN **website:** www.see-in.co.uk **email:** info@see-in.co.uk

Climate change: trends and predictions

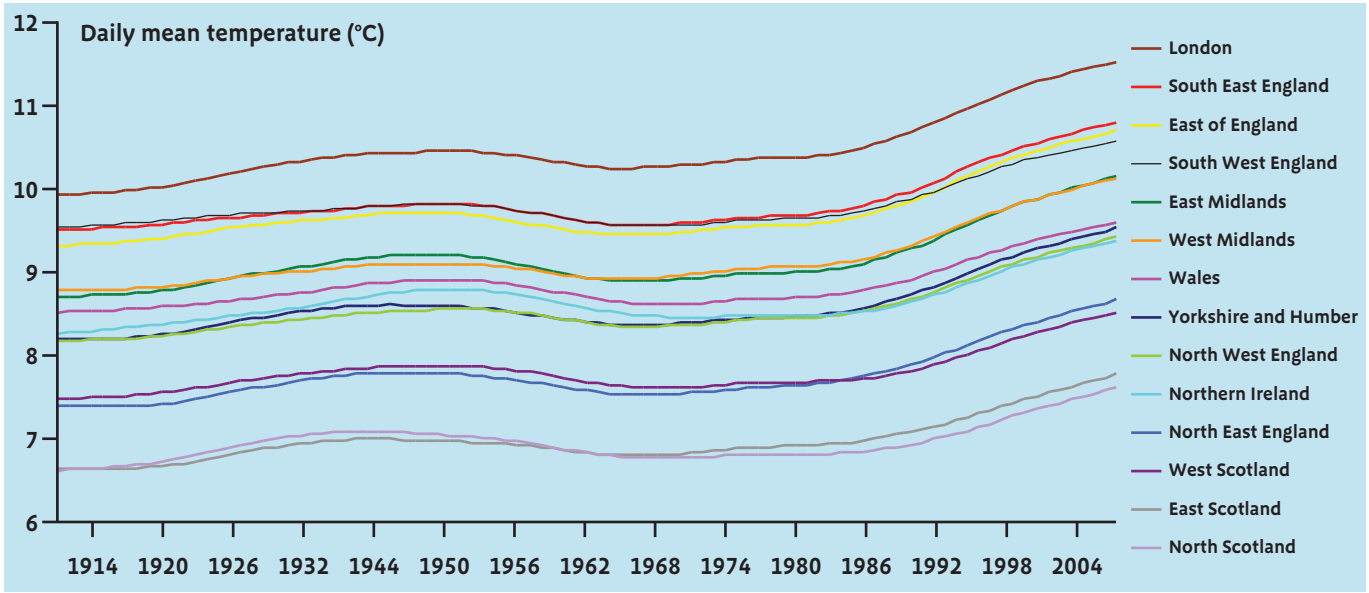
The figures presented in the following tables are the central estimates (50% probability level) from the United Kingdom Climate Predictions 2009 (UKCP09) Key Findings for the South East Administrative Region[69]. Within the Key Findings higher and lower estimates described as 'very unlikely to be less than' (10% probability) and 'very unlikely to be more than' (90% probability), along with a wider range of uncertainty are also provided.

Changes in Mean Temp	Summer			Winter		
	2020s	2050s	2080s	2020s	2050s	2080s
Low Emissions Scenario	1.6°C	2.5°C	3.0°C	1.3°C	2°C	2.6°C
Med Emissions Scenario	1.6°C	2.7°C	3.9°C	1.3°C	2.2°C	3.0°C
High Emissions Scenario	1.5°C	3.1°C	4.9°C	1.4°C	2.5°C	3.7°C

% Change in Mean Precipitation	Summer			Winter		
	2020s	2050s	2080s	2020s	2050s	2080s
Low Emissions Scenario	-6%	-13%	-14%	7%	13%	18%
Med Emissions Scenario	-7%	-18%	-22%	6%	16%	22%
High Emissions Scenario	-3%	-18%	-28%	7%	18%	30%

Sea Level Rise London	2010	2020	2030	2040	2050	2060	2070	2080	2090	2095
Low Emissions	5.3	8.2	11.4	14.8	18.4	22.2	26.3	30.5	35	37.3
Med Emissions	6.2	9.7	13.5	17.5	21.8	26.3	31.2	36.3	41.6	44.4
High Emissions	7.3	11.5	16	20.8	25.8	31.4	37.2	43.3	49.7	53.1

Central estimates for each decade of relative sea-level changes (cm) with respect to 1990 levels for the UKCP09 high, medium and low emissions scenarios.



Further data and guidance on the UKCP09 climate predictions can be found at: ukclimateprojections.defra.gov.uk

Front cover photograph
Hascombe Hill in the Surrey Hills

NATURAL ENGLAND

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