State of the natural environment in the East Midlands

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NATURAL ENGLAND

Contents

Trent Valley Greenway, Long Eaton, Derbyshire

Foreword

This report summarises the evidence we have about the current state of our regional natural environment. It shows that a healthy natural environment can make a real difference to people's lives and outlines the work we need to do to conserve our regional wildlife and landscapes for the future.

This year marks 60 years since the National Parks and Access to the Countryside Act was established; the landmark legislation which provided the framework for the conservation and enhancement of our landscapes and wildlife. We will continue to take this work forward, safeguarding our natural environment for the next 60 years.

The deadline to meet international targets to halt biodiversity loss is 2010. Our priority is to put in place a long-term system of protection for our wildlife; one which reverses declines, rather than simply halting them. Using Environmental Stewardship and our recently launched approach to targeting our schemes, we aim to ensure our natural wealth is spread equally across the region. We will invest around £180 million into our regional economy between now and 2013, making a real difference to our natural environment.

We will continue to lobby for increased investment in the natural environment near to where people live. Access to high-quality green space is integral to the wellbeing of the nation, in effect, our own natural health service. Reconciling conflicting demands of housing, energy, food production, water supplies and other pressures on the natural environment, while continuing to improve the life prospects and wellbeing of everyone across the East Midlands is a challenge, but we will continue to ensure that the natural environment is at the forefront of discussions shaping spatial and economic planning across the region.

We will work to ensure that the Marine and Coastal Access Bill delivers the first class system of protection which the marine environment so desperately needs and deserves, balanced with the important resources we derive from the seas, as well as creating access rights to the coast as part of our aspiration for a national coastal trail.

Re-building economic productivity and adapting to the impacts of climate change demand a far-reaching, sustainable response. We believe that the solution lies within our rural environment. By working closely with our partners and getting the land around us to do more, we believe we have the capacity to move towards a greener economic model; one which conserves the natural environment, provides new jobs, cleaner energy, sustainably-produced food, greener housing and climate security.

This report draws attention to those areas most in need of attention, and provides a baseline against which our progress can be measured. We believe that we can, and do, make a huge difference to the natural environment. We need you to help us make it work.

Maddy Jago
Regional Director

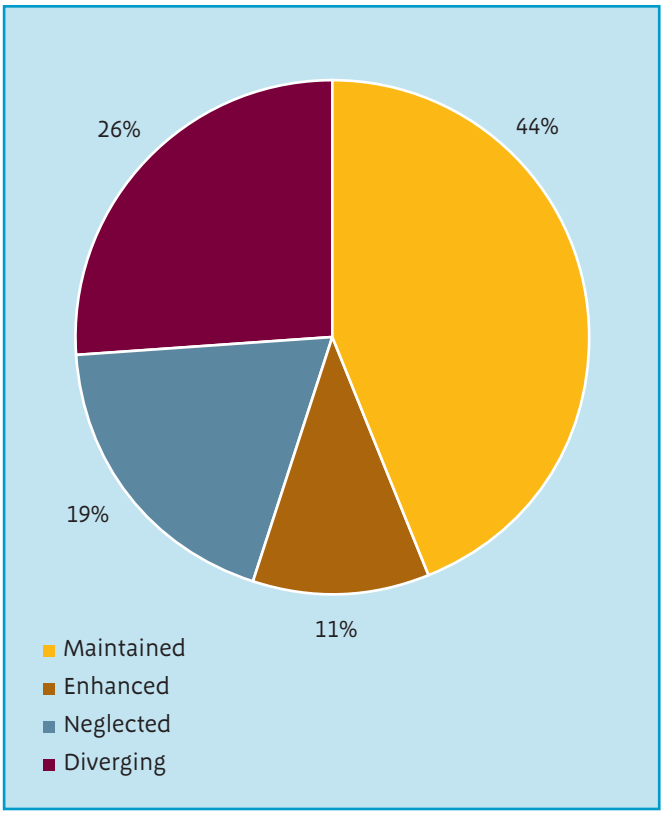
Our landscape

Landscape is a vital and diverse East Midland's resource. Noted for its agricultural productivity, recreational value, cultural associations, heritage and biodiversity assets, the region marks the transition between the low-lying agricultural land of eastern England, and the more complex, upland landscapes further west. Between extremes lie landscapes of limestone and chalk hills, ancient forests, rolling farmland interspersed with rural villages, remote lowland heaths and stretches of dramatic coastline. Remnants of ancient landscapes, such as Sherwood Forest, are still present. The region contains just 0.3% of England's common land – the lowest in England.

The region's two nationally designated landscapes, the Peak District National Park and the Lincolnshire Wolds Area of Outstanding Natural Beauty, together cover 9% of the region. This is the lowest percentage of designated landscape coverage in any region, comparing with a national average of 15%. However, the region does contain many other characteristically distinctive landscapes which need to be conserved and enhanced.

The national Countryside Character Initiative and National Landscape Typology provide a broad overview of key landscapes. Of the 159 National Character Areas (NCA), 27 relate entirely or mainly to the region. Figure 1 shows changes in the regional landscape character in the East Midlands. These changes are consistent with national changes between 1999-2003. Changes had mainly taken place in National Character Areas close to large urban areas and their associated major transport infrastructure. A complete description of changes in the region can be found at www.naturalengland.org.uk/regions/eastmidlands/ourwork/landscape, forming part of the 2008 scoping study which assessed the approaches to planning and managing the region's landscapes.

Figure 1 Assessment of landscape character change in the East Midlands, 1999-2003



The undulating landscape of the Lincolnshire Wolds AONB

Pressures on the landscape

The quality and diversity of the region's landscape is under pressure, largely from past and continued growth of our cities and towns, and their infrastructure, such as roads, and airports.

The changing patterns of agriculture, forestry, recreation and growth of the rural economy have fuelled equally dramatic changes in rural areas. Further changes will be produced by climate change and the mitigation and adaptation measures associated with it, such as renewable energy production.

Managing landscape pressures

The European Landscape Convention (ELC) encourages organisations to prepare landscape action plans to embed landscape into their work. Natural England has prepared guidance on the preparation and implementation of ELC Action Plans. More about the ELC and ELC Action Plan guidance can be found at www.landscapecharacter.org.uk.

We want to see our landscapes being maintained or enhanced for the benefit of all. However, there has not been a consistent approach to producing Landscape Character Assessments across the region. In 2008, we commissioned a regional tier landscape character assessment and companion strategy, to inform future landscape policy. These studies provide a current description of the region's landscape character, describing the forces acting on the landscape and present strategies to secure positive change for the region.

We need to plan carefully in order to manage these pressures. This requires the use of framing policies to ensure future landscape change is sensitive to landscape character, by producing guidance at both county and district levels.

Our geodiversity

Geodiversity is the ground beneath our feet, providing the basis for all our landscapes through underlying geology (structure, composition and history of the earth) and geomorphology (landforms and the processes that create them). It influences our biodiversity and land use through the composition of our soils, the exploitability of underlying minerals and its influence on hydrology, climate and topography.

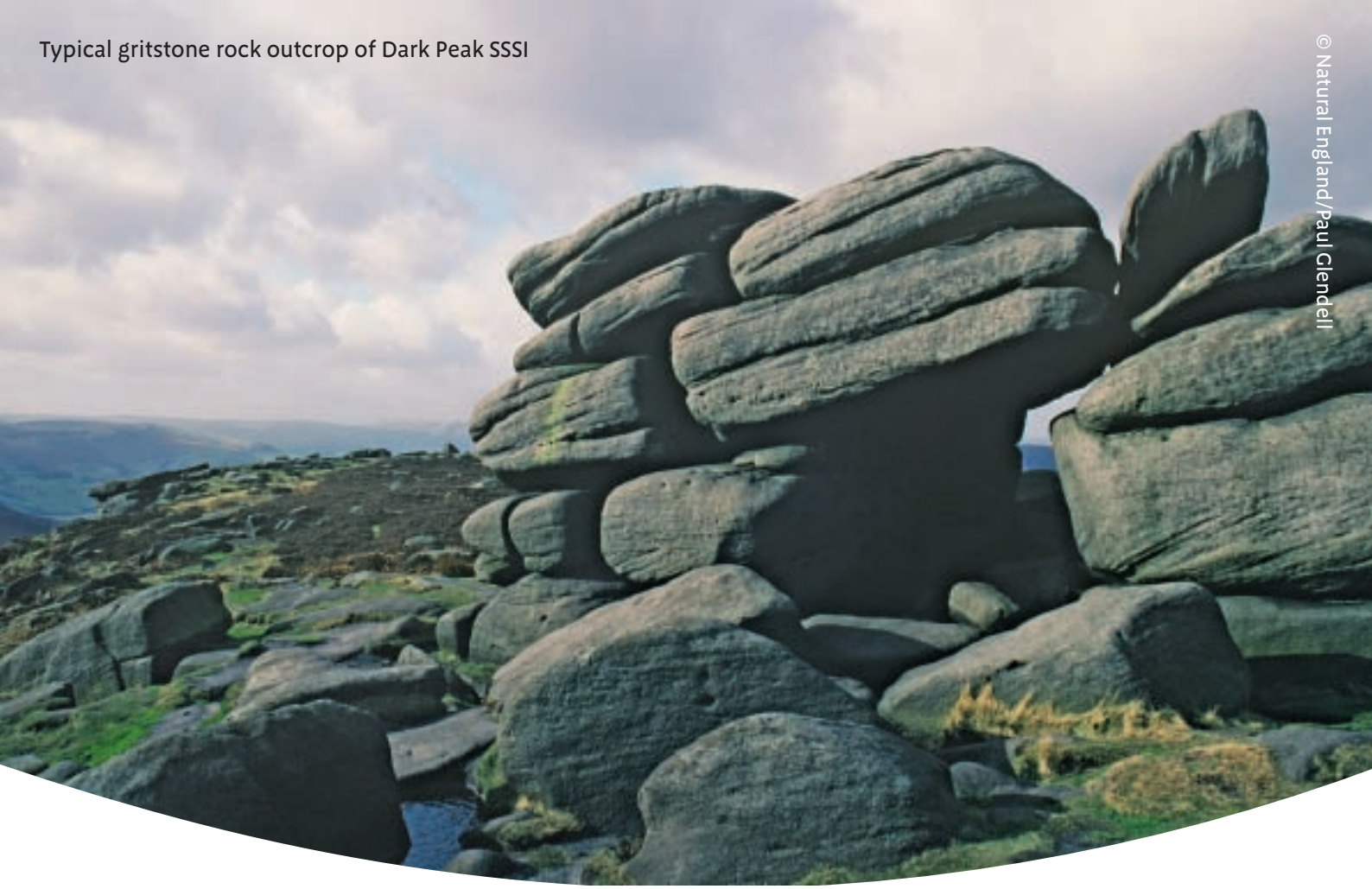
The rocks forming the solid geology of the East Midlands dip gently eastwards with the older rocks generally exposed in the north-west, and the youngest in the south and east. This pattern is reflected in the topography, with higher altitudes generally associated with exposures of older rocks. The only exception is an isolated block of Pre-Cambrian rock (600 million years old) which forms a unique and distinct area in Charnwood (see picture on page 6).

There are 94 Sites of Special Scientific Interest (SSSIs) within the East Midlands, which have been notified as the best examples of Britain's geological history and Earth Science stretching back over hundreds of millions of years. The geodiversity within each of the SSSIs is unique and of national, and in some cases, international significance.

Some SSSIs are notified for more than one geodiversity feature, and many, like Lathkill Dale National Nature Reserve, also include notified biological features. Most geodiversity is spectacular and readily visible, such as the quarries and rocky outcrops within Charnwood Forest and the coastal geomorphology at Gibraltar Point. Less readily visible sites include cave complexes, mines and even paleo-geomorphology under arable fields.

Table 1 Condition assessment (% area) as at January 2009

Sites with geological interest			Condition assessment (% area)				
Location	No.	Area (ha)	Favourable	Unfavourable recovering	Unfavourable no change	Unfavourable declining	Destroyed (Part)
Derbyshire	43	1,394	84.6%	14.6%	0.7%	0.0%	0.0%
Leicestershire & Rutland	22	413	90.5%	5.8%	0.4%	1.4%	1.9%
Lincolnshire	16	161	91.4%	0.0%	0.2%	8.4%	0.0%
Northamptonshire	9	46	52.4%	33.1%	11.5%	0.0%	3.0%
Nottinghamshire	4	11	52.4%	47.6%	0.0%	0.0%	0.0%
East Midlands	94	2,025	85.4%	12.2%	0.9%	1.0%	0.5%



Typical gritstone rock outcrop of Dark Peak SSSI

Derbyshire holds the largest geodiversity resource and number of SSSIs by area, while Nottinghamshire holds the least (Table 1). This reflects the relative complexity of the underlying geology and geomorphology and not the quality of the individual geodiversity resource.

The region's statutory geodiversity sites are in very good condition, with over 97% by area in either favourable or recovering condition. Eleven SSSIs are in unfavourable condition and two SSSIs (9.2 ha) have been permanently damaged. Negative condition mainly relates to the interest feature having been obscured, which in most cases can be re-exposed by clearing scrub or debris. Improving accessibility is a challenge at three disused mine SSSIs, as there is a danger of collapse or illicit collecting of minerals.

Managing geodiversity pressures

Over recent years, geodiversity has had a relatively low profile in the region, and we are now working to address this.

Each county has a suite of Regionally Important Geological/geomorphological Sites (RIGS), selected by local geological groups based on research, education, historical and aesthetic value. Local and regional planning policies take account of RIGS, meaning that local and regional geodiversity has some protection. However this information, along with the selection criteria for each county, is not currently readily accessible.

The Regional Geodiversity Partnership is working with the East Midlands Biodiversity Partnership to make regional geodiversity information accessible for all, via a website. Access to this information will improve geodiversity protection, increase public awareness and improve policy integration.

Case study: Silicone rubber rocks!
Some of the oldest rocks in England are in the East Midlands. These rocks contain fossil impressions of some of the earliest multi-celled creatures on earth, some 540-580 million years old. The sites are of huge scientific and educational importance but studying them has been constrained by their locations, coupled with fears of human interference and damage.

A joint project involving the British Geological Survey, GeoEd and Natural England has resolved these problems. A silicone rubber material (similar to that used in cake tins) was used to produce highly detailed moulds, which were then cast in plaster of Paris, creating exact archive records of the fossil-bearing surfaces for study away from the site.

This operation, the largest ever undertaken on a finite fossil resource, has extended opportunities for education and research. Laboratory work, using the archive, has already discovered new life forms and significantly higher fossil densities than previously known.

'Bomb Rocks' at Charnwood Lodge SSSI

Our biodiversity

Biodiversity has declined in the East Midlands for the past 200 years, to the lowest level for any English region (Regional Spatial Strategy for the East Midlands RSS8). The region still supports key areas of importance for biodiversity, including habitats and species of national importance, but these areas are often limited in extent, geographically isolated and separated by extensive areas with little natural or semi-natural habitat.

Designated sites

Our SSSIs are generally small in size, and SSSI coverage in the region is well below the national average. With the exception of the Peak District Dales, Lincolnshire Coast and South Pennine Moors, coverage is below 1% of the region's land area (similar to that of London). Some areas are particularly poor for SSSI coverage, such as the Lincolnshire Fens where coverage is ten times lower than the national average.

The region supports a nationally important population of water voles

Habitats

Other than for SSSIs, evidence of historical biodiversity trends is limited, but it is clear that declines in the region have been high. For example, the drainage of the coastal grazing marshes in the Lincolnshire Fens during the 17th century would have resulted in the loss of extensive wetlands. Leicestershire, Lincolnshire and Northamptonshire are among the worst ten counties in the UK for vascular plant extinctions.

Despite losses, areas of nationally important biodiversity do remain, in the shape of significant woodland sites (Rockingham Forest, Leighfield Forest, Bardney Limewoods); upland areas (South Pennines Moors, Charnwood); heathland (The Coversands and Sherwood); grassland (the White Peak Carboniferous Limestone grasslands, the coastal grazing marshes and the Lincolnshire and Rutland Limestone) as well as Lincolnshire's internationally important coastal habitats. These sites provide important tourism assets and other vital services, such as carbon storage and clean water from peat bogs, or wave energy dispersion from saltmarsh and mudflats.

Species and the effects of climate change
The region supports important populations of nationally rare plants and animals (ribbon-leaved water-plantain, Derbyshire feather-moss, black hairstreak butterfly, bittern), as well as nationally important populations of more common species (grey and common seals, water vole, barn owl). The region holds species at the northern and southern edges of their range, partly explaining the distribution of species such as twite, man orchid and mountain ringlet. The effects of climate change are already evident in the decline of these northerly species. Southern species such as little egret, bee-wolf and polecat are colonising or re-colonising the region as it warms.

To redress past losses, specific projects are re-introducing lost or endangered species (red kite, hazel pot beetle, dormouse). We are using Environmental Stewardship schemes to target habitat creation and improve land management and to focus on groups of declining species such as farmland birds. These initiatives mean the region is well positioned to meet the international challenge to stop biodiversity loss by 2010.

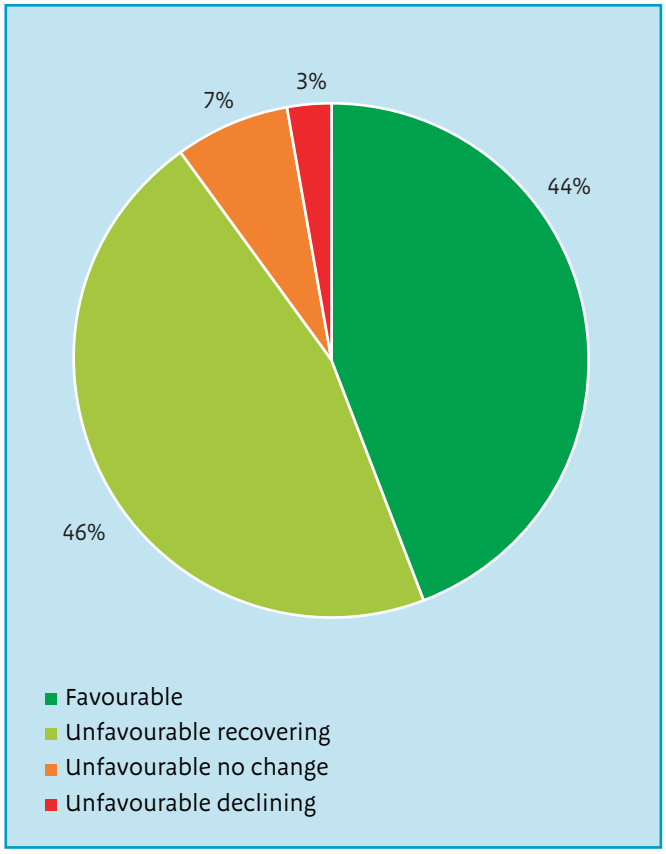
Climate change is affecting the distribution of species such as the green-winged orchid

Pressures on our biodiversity

SSSI condition has improved significantly and we now have the highest percentage area (94%) of land in favourable condition in England. Action is needed to ensure continued improvement, particularly in the face of climate change. Maintaining the viability of some of our SSSIs will be a challenge due to their small size and isolation, until they can be extended and links created through the countryside.

For many of our ancient woodlands, deer populations are the main threat to their condition, and so need to be managed. Natural England, the Forestry Commission and the regional Deer Management Group are providing comprehensive support for deer management groups to sustainably manage deer populations over wide areas, to reduce damage to woodland SSSIs and ancient woodland habitats.

Figure 2 SSSI condition in the East Midlands, 2008



Nationally, open water is the only habitat type where SSSI condition has declined in the past five years, yet the SSSI lakes and reservoirs in the East Midlands are currently in significantly better condition than most other regions. Continued supply of correct amounts of high quality water is critical in maintaining these sites in favourable condition.

Managing biodiversity pressures

Increasingly, there are strong biodiversity protection and enhancement policies at regional and local level along with active biodiversity partnerships committed to biodiversity delivery, but significant challenges do remain. The scale of past losses, together with the poor quality biodiversity of our countryside and the impacts of climate change will require continued, concerted action. This will need to happen at both local and landscape scales, to maintain and enhance our biodiversity.

Marine biodiversity
The Wash is of international and national importance for its wildlife and habitats, designated under national and European legislation, as well as international convention.

It is the second biggest bay in the UK containing the largest area of saltmarsh and second largest expanse of mud and sandflats. It holds the largest colony of common seals in the UK – about 90% of the English population.

The Wash is currently the only site in the UK which is designated for reefs built out of sediment by the ross worm *(Sabellaria spinulosa)*. The 15-30 cm high raised reefs are created when worms live at high densities and build their tubes around those of their neighbours (see picture on page 22). Reefs are important as they hold two or three times more species than areas without reefs, including commercial species such as shrimps and crabs. The offshore sandbanks and ross worm reefs have been identified as having the potential to become a marine Special Area of Conservation (SAC).

Managing the pressure on marine biodiversity
We will work to implement the Marine Bill, to improve conservation of Marine Protected Areas (MPAs), so enhancing species and biodiversity protection, as well as working with fishing communities to ensure sustainable management.

Enjoying our natural environment

The quality of the natural environment and the opportunity to access fresh air and open space is an important aspect of many people's lives. Experiencing and interacting with nature where we live and work has proven health and wellbeing benefits for communities and individuals of all ages.

Healthy living

Countryside visits are declining nationally, as sedentary lifestyles are increasingly adopted. Society is becoming more averse to perceived risks, particularly affecting children and young people, and a 'convenience culture' is growing, in which people are seeking fewer, high quality leisure experiences.

Public health profiles show that life expectancy and health experience in the region are consistent with national averages, but adult and childhood obesity levels are higher. The region has one of the lowest rates of physical activity amongst school age children, and many adults do not take enough exercise to benefit their health.

Our green space provides experiences and opportunities for physical and recreational activities, exploration, adventure and play. It also provides opportunities for people to become involved in voluntary activity. There are now 56 health walk groups in the region with fully trained volunteer leaders, who provide a valuable, natural health service to thousands of participants each year.

Regionally, Natural England has reported a 14% increase in volunteering on its National Nature Reserves in less than a year. Over half of the region's 121 Local Nature Reserves are managed in association with community groups. Volunteers make an invaluable contribution to all aspects of reserve management, while deriving pleasure and personal satisfaction for themselves.

Access

The East Midlands has a wide range of accessible green space, from parks, footpaths, woods and nature reserves, to major destinations such as the Peak District National Park, Sherwood Forest and Rutland Water.

The Peak District National Park attracts 22 million visitors per year, almost one third of all annual visits to English National Parks. 665,000 people visit the National Nature Reserves at Gibraltar Point, Saltfleetby and Donna Nook on the Lincolnshire coast each year.

The region's public rights of way network provides 18,000 km of local routes, around 10% of the national network. These routes serve the recreational needs of a wide range of users, providing sustainable travel options.

All nine access authorities in the region have produced Rights of Way Improvement Plans, prioritising improvements to local access networks, such as creating short, circular route connections close to where people live, and reconnecting routes for horse riding and cycles. The quality of our green spaces is increasingly recognised through the national Green Flag award. There are now 56 Green Flag award holders in the region (8% of the English total), including urban parks and gardens, woodland sites and arboreta, Local Nature Reserves and country parks. These annual awards are based on the quality of welcome, sustainability, heritage, nature conservation and community involvement.

Pressures on our green space

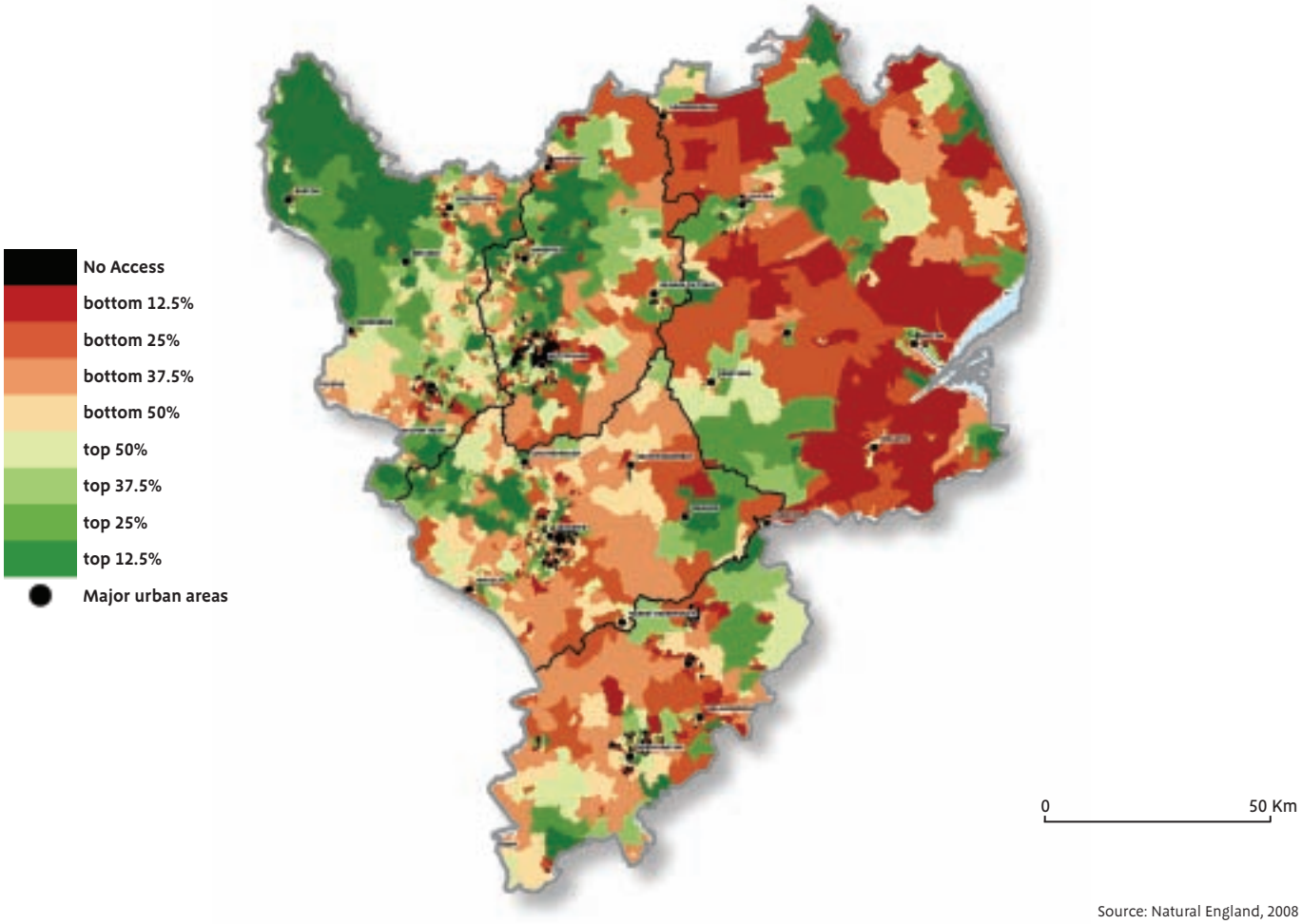
Accessible green space has been mapped at a regional and national scale to illustrate the relative provision levels. This map (Figure 3) can inform policy-making by showing broad trends and areas of search for green space provision and management.

The analysis only includes nationally consistent data sets, ie Local and National Nature Reserves, Open Access Land, Rights of Way, National Trails and cycle ways, Commons and Greens, Accessible Woodlands and Permissive Access Rights delivered by Environmental Stewardship. It excludes parks and gardens, sports or play facilities in urban areas. The map shows marked variation across our region.

We are working with partners to develop this analysis using further data, especially on urban green space, to create a more robust and complete understanding of the issues facing regional green space provision and management.

Figure 3 Accessible green space in the East Midlands

Based on standard units of population size, known as Lower Super Output Areas



Source: Natural England, 2008

River Dove, Dovedale

The major challenges for the region

Development and land use
The challenge

Housing growth
The East Midlands is undergoing more growth than any other English region, as part of Government's plans for housing expansion, posing a range of challenges for our natural environment. A minimum of 452,000 new houses are planned across the East Midlands by 2026. 113,600 of these are planned around the '3 Cities' growth point (Derby, Leicester, Nottingham), and around Newark, Lincoln, Grantham and Gainsborough growth points by 2016. There have also been consultations about new eco-towns in Nottinghamshire and Leicestershire.

The character of our landscapes has shown significant and increasing change since the 1990s. Urban growth, together with transport infrastructure such as motorways and airports, have all had a major influence on our landscapes and perceptions of their quality and tranquillity. Plans for additional housing and the transport infrastructure it will bring pose further risks to the character of our landscapes.

Meeting the access and recreation needs of our communities and reconnecting people, particularly the young, with nature present a major challenge. Opportunities to experience the natural environment close to where people live are already unequal. As housing expands around our urban centres, pressure on existing sites will increase and accessibility decline. This increased pressure of more people using their local wildlife sites could also have a detrimental effect on the region's already scarce and vulnerable biodiversity resource.

Housing growth must be delivered to achieve maximum benefits and minimum impacts. To achieve this, environmental capacity assessments should be central to decision-making and new housing should be in the most sustainable locations.

Volunteers in the Derbyshire Dales

Upton Sustainable Urban Drainage System, Northampton

Responding to the challenge

The planning system and environmental policies

The Regional Spatial Strategy has strong policy guidance on sustainable development to protect and enhance the region's landscapes and biodiversity, and deliver Green Infrastructure (GI) through preparing and delivering Green Infrastructure Strategies. These policies need to be translated by local authorities across the region into their Local Development Frameworks.

Proposed changes to integrate the regional tier of plans to create a single regional strategy must be based on sustainable development principles and maintain the regional continuity of purpose to enhance the natural environment.

Green Infrastructure

Green Infrastructure provision can make a real contribution not only towards creating green space but also to improving access, enhancing landscapes and delivering the region's biodiversity targets. It contributes to sustainable development and provides a high quality environment for new and existing communities. Green Infrastructure Strategies should be prepared by all local authorities as part of their LDFs and as an integral part of delivering housing 'growth points'.

We are currently working with the '3 Cities' and other growth points across the region to create GI Strategies, as well as with partners to include GI planning and delivery on regional park initiatives in Charnwood and Sherwood.

Creating new assets to deliver a GI Strategy remains a challenge. It is a long term project, requiring funding for ongoing delivery and management over many years. GI networks need to be created, with new assets within settlements and the surrounding countryside. Local authorities need to work closely with developers and local communities to move from the preparation phase to the delivery phase.

There is a greater challenge in the region to deliver GI to rural areas where access, biodiversity and landscape would be of most benefit, but where large scale development is not planned.

Concept Statements:
A tool for sustainable planning
We promote Concept Statements, to achieve high-quality sustainable development through the planning system. The statements are produced within practical stakeholder workshops and aim to create locally distinctive development, designed to ensure efficient use of natural resources and make the most of a site's existing assets, such as trees and hedges. They are sensitive to the landscape character and local built environment, and are used to help inform Local Development Frameworks. The speed and inspirational nature of the process has been praised by many participants.

We successfully piloted Concept Statements in Northamptonshire (Wellingborough and Irthlingborough) with workshops in 2006/7 resulting in quality statements outlining the development principles. We are currently involved in producing similar statements in the Newark growth area and advocate their wider use across the region.

Green Infrastructure on a working farm: The Grange, Cotham, Nottinghamshire
Situated on the outskirts of the Newark growth point, The Grange is a valuable Green Infrastructure resource which has been created on a working farm.

The farm, which has been worked by four generations of the Pykett family, abounds with interesting landscape features including the River Devon which runs through the farm and a lake created from reclaimed quarry land. Aside from enhancing the landscape, these features also provide pleasant access opportunities for local communities.

Some 64 ha of previously arable land has now been planted with poplars to provide flood storage capacity. There are also many hedgerows, copses and uncultivated field margins which have been established under the Countryside Stewardship Scheme.

Together, these features enhance the landscape character and biodiversity of the area, providing habitats and food sources for wildlife, including otters, water voles and over 130 bird species.

By filling gaps in the bridleway network and linking town with country, the site provides the local community with easy access to green space close to where they live. It is an excellent example of public funding delivering Green Infrastructure on private land.

Salcey Forest, Northamptonshire

Land management
The challenge

The East Midlands contains 34% of the total national resource of the best, most versatile grade 1 agricultural land in the country. This highly productive land, mainly in Lincolnshire, produces 24% of the nation's vegetables and contains 18% of the country's cereal holdings.

There are many competing interests for the use of land across the region. The changing global economic climate, population growth and the effects of climate change on food production are increasing the pressure to focus on food and biofuel production. Such pressure will pose a particular challenge to delivering landscape-scale habitat creation, which is essential to enhance the resilience of species and habitats in the face of climate change.

Promoting agricultural practices and systems that provide increased opportunities for our biodiversity, yet also enable the sustainable production of sufficient high quality food, is a challenge. We are working closely with farmers and land managers to help them to embrace environmental practices, but this is a challenging task in the changing economic climate. We are also encouraging farmers to build public engagement with, and value for, the natural environment through the provision of opportunities for recreation, access, enjoyment and education on farmland.

Access and education are encouraged under our agri-environment schemes

© Dick Makin Images

Manor Farm, Strixton –
Field margins around crops can
attract and enhance wildlife

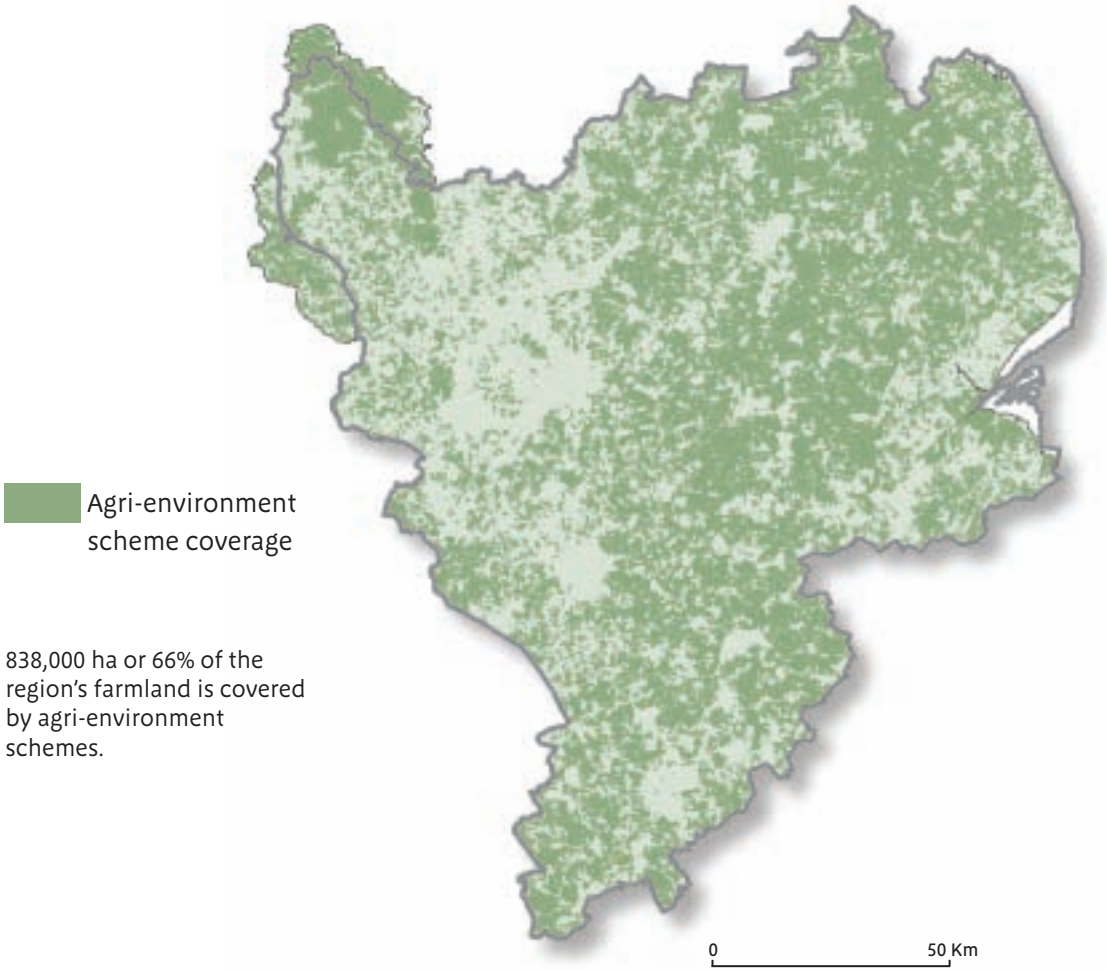
Responding to the challenge

Environmental Stewardship
We are working in partnership with the farming sector to help create a viable farming industry which combines a secure, economic future with a responsible, environmental approach. We are addressing the challenge through the promotion of agricultural practices that protect and enhance the natural environment, while enabling food production to continue. Through Environmental Stewardship we aim to conserve wildlife, maintain and enhance landscape quality and character, protect resources, the historic environment and promote public access and understanding of the countryside.

Agri-environment incentive schemes in the East Midlands

- 460 land managers (56,000 ha), currently hold Environmentally Sensitive Area (ESA) agreements.
- 1,400 land managers (35,000 ha) hold Countryside Stewardship agreements.
- Together, these agreements cover:
  - 3,500 ha of grass margin
  - 25,000 ha of permanent lowland and upland grassland under beneficial management
  - 5,900 ha of grassland reverted from arable cultivation
  - 120 km of hedgerow and 64 km of dry stone wall restored and maintained through capital works.
- 4,650 land managers (750,000 ha) hold Environmental Stewardship agreements.
- 330 of these land owners have opted for the Higher Level Stewardship options which deliver greater environmental benefits.
- We pay farmers around £45 million per year under these schemes.
- Environmental Stewardship has created:
  - 5,000 ha of grassland
  - 28,000 km of managed hedgerows
  - 1,360 km of restored, protected and maintained stone walls
  - 6,000 ha of buffer strips on arable and grassland fields.

Figure 4 Agri-environment schemes in the East Midlands



838,000 ha or 66% of the region's farmland is covered by agri-environment schemes.

Source: Natural England, 2008

Onshore energy generation
Energy from biomass production is in its infancy in the region, with only 5,500 ha (less than 1%) of our arable land being used to grow energy crops. However there is significant projected demand from major power generators based in or close to the region. Energy crops can help to mitigate climate change, but appropriate locations need to be found in order to avoid undesirable effects on landscape, biodiversity and archaeological sites.

Individual onshore wind farms are currently small in scale, but increasing numbers of proposals are leading to concern about their impact on landscapes, particularly surrounding the Peak District National Park and Lincolnshire Wolds AONB. Careful assessment of the impacts of siting onshore wind farms is needed to ensure they are away from designated areas, in order to minimise the impacts on local bat and protected bird populations and landscapes.

Sea management
The challenge

Offshore wind farm development
Offshore wind farms are being created in the Greater Wash Strategic Area, which stretches along the coastline from Hornsea to Great Yarmouth. This area already includes two offshore wind farms (27 turbines each at Lynn and Inner Dowsing) with more under construction. Another eight sites have been leased for the development of a second round, of which two (Sheringham Shoal and Lincs) have already received consent. The number of proposed turbines varies from 20-240 per site.

While these wind farms produce sustainable energy, many are situated close to the Wash and North Norfolk Coast Special Protection Area and Special Area of Conservation and are likely to impact on the nature conservation value of the area. Cables linking the wind farms to the national grid onshore have to pass through the sensitive marine communities which The Wash supports,

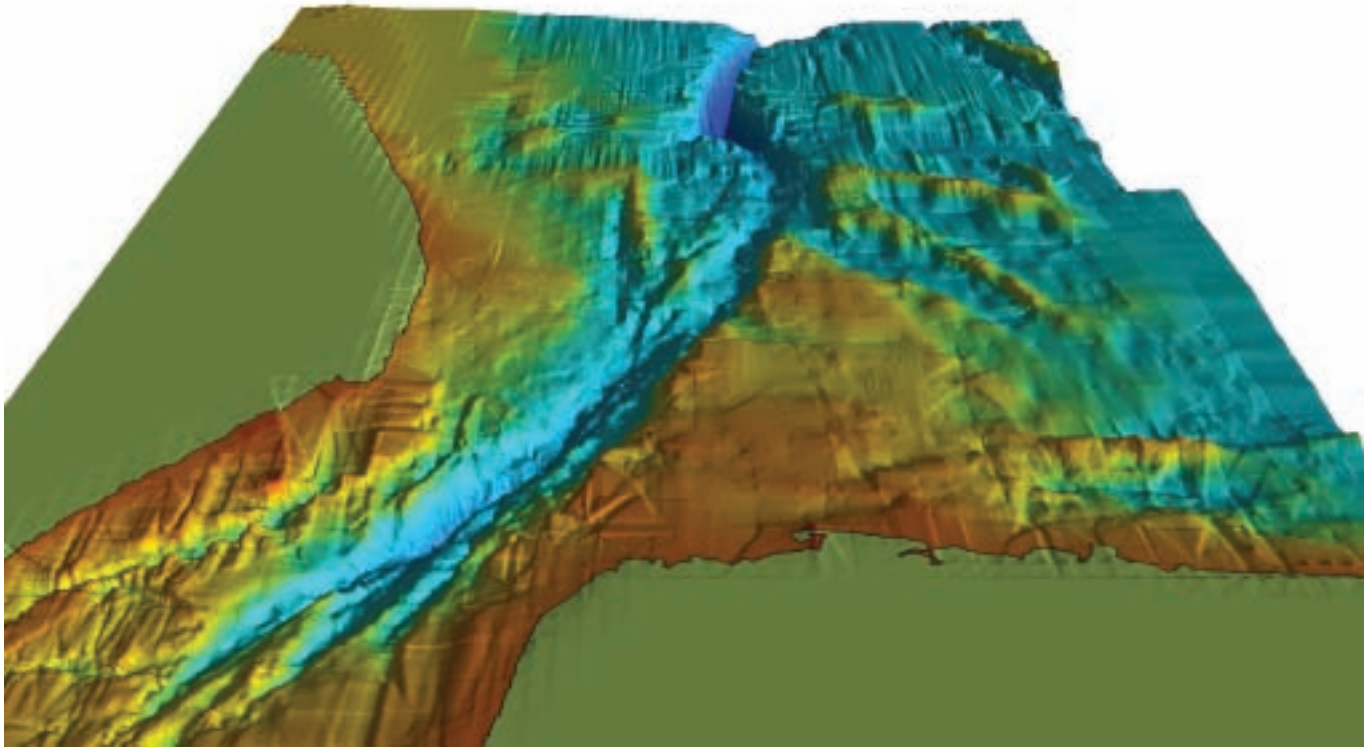


Figure 5 This Bathymetric model of The Wash, North Norfolk & Lincolnshire coast shows the deep water channels (darker blue), and the shallower sand banks off the region's coast (yellow).

Grey seal pup at Donna Nook National Nature Reserve, Lincolnshire

such as *Sabellaria spinulosa* reefs, which are likely to be damaged by cable laying. Wind turbines also pose a threat to the internationally important tern populations which fish along the North Norfolk coast, as well as being clearly visible from the land, so affecting the seascapes. Natural England is working closely with developers to minimise the impacts of wind farms.

The Wash

Muddy sediments dominate the inner Wash, with sandy sediments in the outer part of the estuary and along the Lincolnshire coast. Each sediment type supports different species. Shallow sandy areas are important breeding grounds for commercial fish such as plaice, cod, sole and thornback rays. Gravel and sands in the deeper areas of The Wash support rich invertebrate communities including *Sabellaria* reefs and subtidal mussel beds. Figure 5 shows the offshore sandbanks and deeper channels, important foraging areas for crabs, lobsters, porpoise and grey and common seals.

In the 1980s The Wash had the most productive mussel and cockle beds in the UK (70% of UK market). Overfishing caused stocks of cockles and mussels to collapse in the 1990s, with disastrous effects for both birds and the fishing industry. Thousands of oystercatchers died in three different winters and knot counts fell by tens of thousands. The cockle fishery was closed in 1997, and mussel harvesting from natural beds remained low between 1993 and 1998.

Consequently Natural England classified nearly 15,000 ha of The Wash SSSI as in unfavourable declining condition. New research was commissioned investigating factors inhibiting the site's recovery.

Responding to the challenge

We have been working with Eastern Sea Fisheries Joint Committee and fishermen's groups around The Wash for ten years, to improve mussel and cockle management and achieve a sustainable future for both the natural environment and the local economy.

Together with our partners, we have created new shellfish management policies, resulting in the 15,000 ha of SSSI being brought into recovering condition, as well as populations of mussels and cockles recovering. We are now working together to ensure important areas of *Sabellaria* reef in The Wash are similarly protected.

The implementation of the Marine Bill will create a Marine Protected Area (MPA) network to help deliver sustainable management of the marine areas off our coast. In particular stakeholders will need to be involved throughout the process of MPA selection and management. Their involvement is key to securing effective ownership, integrating socio-economic interests and facilitating subsequent management and enforcement.

Flood management

The challenge

Of all the regions, the East Midlands has the greatest area at risk of flooding, with large areas along the coast and within river valleys at or below sea-level. The internationally designated sand dune coast of Lincolnshire is especially vulnerable.

To prevent flooding the region's water courses and coast have been massively modified by hard defences over time. These defences will come under increasing pressure from climate change as sea levels start to rise. A real challenge will be maintaining sea defences which can sustain the internationally important habitats and species in the face of predicted sea level rise and climate change.

Saballeria reefs exposed at low tide

Sea lavender thrives in saltmarsh

Responding to the challenge

The Government has recognised that we cannot meet the challenge of flooding by building ever higher, stronger engineered defences. The solution lies in working with natural processes for sustainable solutions such as floodplain restoration and managed realignment. Natural systems such as the coastal sand dunes and saltmarshes of the Lincolnshire coast can make a robust contribution to coastal defences, given sufficient time to respond to sea level rise.

We will work with others, for example through Shoreline Management Plans, the Lincolnshire coastal strategy and Catchment Flood Risk Management plans, to create sustainable defences which manage flood risks while achieving biodiversity gains.

Water resources

The challenge

The region receives less than the national average rainfall, particularly in the south and east. Despite this, the region exports water from the Peak District to the north, and from Rutland and Pitsford Reservoirs and the River Nene to the south and east. It is predicted that overall rainfall is likely to decline, but that it will fall in more extreme events, similar to the widespread summer flooding of 2007.

The region has one of the highest areas of open water, because of its large number of gravel pits and reservoirs, but has the second lowest area of wetland habitat, over 50% of which is found in the uplands of the Peak District. Several of our most important freshwater sites are water supply reservoirs, such as the internationally designated Rutland Water, and many SSSIs across the region are dependent on a regular supply of high quality water. In the lowlands, wetlands are small, isolated remnants of once larger landscapes.

Changing rainfall patterns as a result of climate change may result in growing competition for water, sufficient for future housing growth, to sustain the few remaining wetlands and to recreate new large scale wetlands.

Responding to the challenge

Well designed and managed wetlands can provide biodiversity-rich areas which also provide services such as flood risk management, water storage, water quality improvement and ground water recharge, so helping manage the very water resources they depend on. They are also highly valued tourism and recreation assets.

Historical attempts by the region to avoid flooding, by engineering its rivers and streams to remove water quickly from low-lying areas, has served to exacerbate the shortage of water. We are working closely with our partners to develop more sustainable solutions to managing our water resources, which include more natural wetland systems that can provide society with the services and rich biodiversity it needs.

Climate change
The challenge

Climate change brings many challenges to the region. The natural environment will be put under increasing stress as droughts increase and available habitat for species changes significantly. We need to develop robust landscapes to allow species to adapt as the climate dictates.

Responding to the challenge

The importance and urgency of landscape-scale delivery is made more urgent in our region because our wildlife-rich, high quality landscapes currently exist in small, isolated areas.

Natural systems can significantly help in adapting to and mitigating climate change, providing services which will increasingly replace traditional unsustainable engineered solutions. These range from street trees reducing summer temperatures and providing shade in urban locations, to large scale saltmarsh and mudflats contributing significantly to coastal flood protection.

Climate change not only presents new challenges but also increases the urgency of tackling the landscape and biodiversity challenges we face already.

Case study: *Moors for the Future*

Moors for the Future is a partnership to conserve and restore large parts of the Peak District's internationally important moorland. Moorland plays an important part in carbon storage, holding between 16 and 20 million tons of carbon. Damage or mismanagement of the moorland may release this into the atmosphere.

Moors for the Future is developing expertise on the protection and sustainable management of the moors. It has established a public awareness programme to encourage responsible use and enjoyment of the landscape and has restored some of the areas worst damaged by wildfire and moorland paths eroded by recreation pressures.

The partnership is exploring how moorland can be used as an environmental, economic and social resource. The Peak District is not just a landscape providing habitat for wildlife, but a landscape which could provide environmental goods and services for society's wider benefit, such as water quality improvements, flood risk reduction and carbon storage and access opportunities, all of which generate money for the local and regional economy.

Management of damaged peat on Bleaklow Moor

Conclusion

At Natural England, we recognise the pressures faced in the East Midlands, as laid out within this report. We cannot address them alone. We will continue to build on our work with stakeholders and partners across the region to address these challenges and work to conserve our natural environment for the benefit of all.

How to find out more

For more information about the state of our natural environment in the East Midlands, please see
www.naturalengland.org.uk/regions/eastmidlands/sone

Contact details

Natural England's General Enquiry Service:
Tel: 0845 600 3078 (local rate)
eastmidlands@naturalengland.org.uk

Front cover photograph
Lathkill Dale, Derbyshire Dales
National Nature Reserve

NATURAL ENGLAND

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