National Character Area profile:

# 85. The Brecks



NATURAL ENGLAND

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## Introduction

As part of Natural England's responsibilities as set out in the Natural Environment White Paper[1], Biodiversity 2020[2] and the European Landscape Convention[3], we are revising profiles for England's 159 National Character Areas (NCAs). These are areas that share similar landscape characteristics, and which follow natural lines in the landscape rather than administrative boundaries, making them a good decision-making framework for the natural environment.

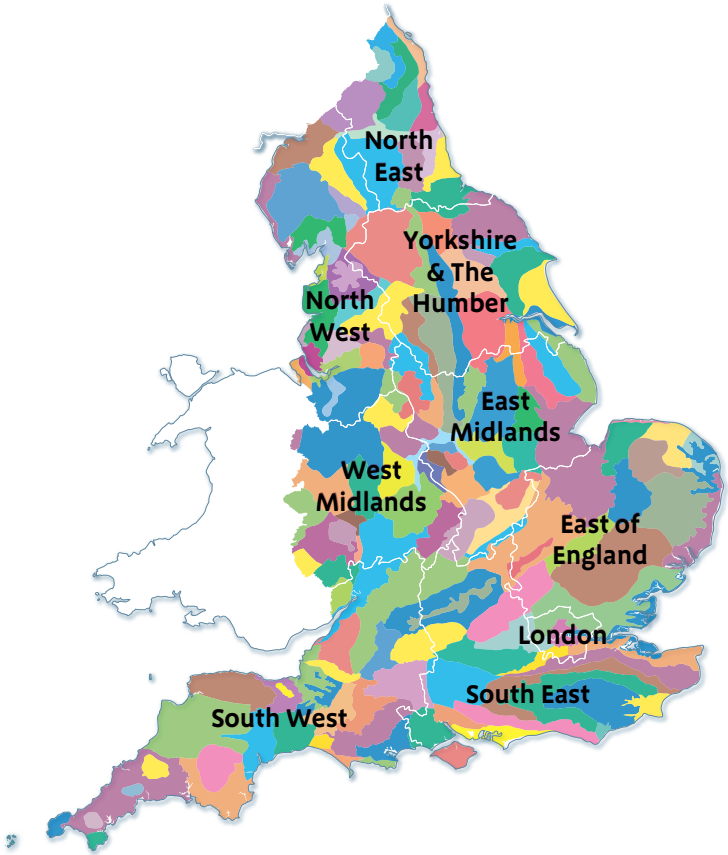
NCA profiles are guidance documents which can help communities to inform their decision-making about the places that they live in and care for. The information they contain will support the planning of conservation initiatives at a landscape scale, inform the delivery of Nature Improvement Areas and encourage broader partnership working through Local Nature Partnerships. The profiles will also help to inform choices about how land is managed and can change.

Each profile includes a description of the natural and cultural features that shape our landscapes, how the landscape has changed over time, the current key drivers for ongoing change, and a broad analysis of each area's characteristics and ecosystem services. Statements of Environmental Opportunity (SEOs) are suggested, which draw on this integrated information. The SEOs offer guidance on the critical issues, which could help to achieve sustainable growth and a more secure environmental future.

NCA profiles are working documents which draw on current evidence and knowledge. We will aim to refresh and update them periodically as new information becomes available to us.

We would like to hear how useful the NCA profiles are to you. You can contact the NCA team by emailing **ncaprofiles@naturalengland.org.uk**

## National Character Areas map




[1] The Natural Choice: Securing the Value of Nature, Defra (2011; URL: www.official-documents.gov.uk/document/cm80/8082/8082.pdf)

[2] Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services, Defra (2011; URL: www.defra.gov.uk/publications/files/pb13583-biodiversity-strategy-2020-111111.pdf)

[3] European Landscape Convention, Council of Europe (2000; URL: http://conventions.coe.int/Treaty/en/Treaties/Html/176.htm)

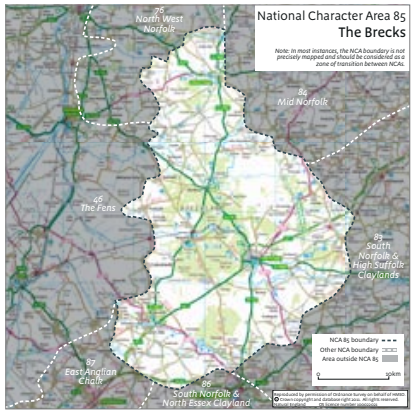
# Summary

The Brecks National Character Area (NCA), also known as Breckland, lies at the heart of East Anglia, occupying much of south-western Norfolk and north-western Suffolk, together with a small part of north-eastern Cambridgeshire. The area has an ages-old identity, a very particular land use history and a richly distinctive wildlife, which sets it apart from all surrounding landscapes. Its underlying chalk geology has produced a low, gently undulating plateau, largely covered with sandy soils of glacial origin. The Brecks is sandwiched between the more fertile, and more wooded, clayland plateau to the north, east and south, and the level drained peat and silt fens to the west, which the main rivers, the Little Ouse, Wissey and Lark, drain into.

The Brecks is among the warmest and driest parts of the United Kingdom, with a markedly less maritime climate than other parts of England. This aspect, combined with its free-draining soils, has greatly influenced the landscape character and led to the development of dry heath and grassland communities. In the 19th century the area was termed a sandy waste, with small patches of arable cultivation that were soon abandoned. However, 20th-century agricultural advances have enabled the dry, low-fertility soils to be farmed and the area is now a major producer of vegetables and cereals, with over two-thirds of the land under cultivation.

The Brecks' rich and distinctive wildlife heritage has experienced extraordinary change and loss of species and habitats in just the last 60 years. The surviving remnants of dry heath and grassland support a great diversity of plants, invertebrates and breeding birds, which have also adapted to live in forestry and arable habitats. Woodlark and nightjar breed on the open heaths and recently felled areas within the vast conifer plantations of Thetford Forest (the largest area of lowland conifer forest in England), while 60 per cent of the United Kingdom's nesting stone curlew population establish nests on open ground provided by arable cultivation. A unique characteristic feature of these remnant heaths is that they often comprise complex mosaics of acid and calcareous grassland together with, in places, heather-dominated heath. Combined with the conifer plantations they contribute strongly to the sense of place. The rich biodiversity of the Brecks is recognised by the many statutory conservation designations which include the Breckland Special Protection Area, four Special Areas of Conservation, four National Nature Reserves and numerous Sites of Special Scientific Interest; together, these cover 40 per cent of the NCA's land area.

A wealth of archaeological heritage, including the Neolithic flint mines of Grime's Graves near Brandon and estate parklands such as Euston Park and Culford, also characterise the area. There are few settlements with Thetford being the main town, located on the A11 in the centre of the NCA, and Brandon, Mildenhall and Swaffham the only other settlements of any size. The larger town of Bury St Edmunds lies just outside the area to the south.




**Click map to enlarge; click again to reduce.**

Recent change has led to some increase in the heathland and grassland resource, through conservation efforts and changes in forestry management, which has also increased the proportion of deciduous tree species within the forested area. Uptake of the current agri-environment incentives supports the nationally and internationally important biological diversity found within the Brecks, helping to secure and increase numbers of rare farmland birds such as stone curlew, and scarce plants such as bur and sickle medick, and Spanish and sand catchfly. Increased recreational use of the forest and heathland areas, new housing around Thetford and infrastructure developments such as the dualling of the A11 continue to provide challenges and opportunities in this distinctive land of flint, sand and water. A key challenge will be to increase the establishment of sustainable land management practices that help to reduce the abstraction of water from the underground aquifer and safeguard and strengthen soils and habitats, while also providing sustainable income for land managers.


**Conservation grazing by Exmoor ponies on Knettishall Heath.**

## Statements of Environmental Opportunity

- **SEO 1**: Conserve, enhance and increase public awareness of the distinctive historic landscape of the Brecks, which is of national and international significance, through securing and expanding its unique and varied habitat mosaic, protecting and managing its sensitive periglacial landscape and rich historic environment.

- **SEO 2**: Manage the Brecks' distinctive agricultural landscape to benefit biodiversity and soil and water quality, by promoting sustainable but productive farming practices that are able to adapt to changing agricultural economics, the considerable challenge of climate change and the increasing water stress within the NCA.

- **SEO 3**: Manage the Brecks' forest plantations and woodlands to combine commercial forestry and fuel production with a mix of habitats for rare and endangered plants and animals, enhancing both their capacity and capability as a national recreational resource and their role in climate change adaptation and regulation.

- **SEO 4**: Encourage measures which lead to the enhancement of landscape character and the historic environment, the sense of place and tranquillity, and the conservation of historic features when considering the design and location of new development and infrastructure and land management options, securing multiple benefits through the provision and management of high-quality green infrastructure networks.

# Description

## Physical and functional links to other National Character Areas

Spanning areas of Norfolk and Suffolk and a small part of Cambridgeshire at the centre of East Anglia, the Brecks shares with the surrounding National Character Areas (NCAs) an underlying geology of Middle and Upper Chalk, with overlying superficial deposits, originating from glacial drift deposited by the Anglian ice sheet. One of the most intriguing and uniting features of East Anglian scenery is its general flatness, forming landscapes well known for their wooded horizons and spectacular big skies. However, the Brecks' gently undulating plateau is very different from the areas that surround it, despite their similar topography.

The chalk aquifer which underlies the Brecks and adjoining NCAs provides functional links between these areas and the population of the East Anglian region whose water the aquifer supplies. In dry years the NCA's Norfolk rivers supply the Great Ouse Groundwater Scheme, which transfers groundwater to reservoirs in the Northern Thames Basin to meet public water demands in Essex and Cambridge.

The rivers Little Ouse, Lark and Wissey and their major tributaries arise to the east in the adjoining elevated South Norfolk and High Suffolk Claylands. They flow westwards, cutting through the Brecks' dry chalk plateau before flowing out of the NCA into the neighbouring flat expanse of the rich peaty Fens and ultimately into the Wash. The edge of the Fens and the Brecks wetland habitats rich with wildlife, connect these two distinct landscapes.

Arable farming is the predominant land use that links East Anglia's NCAs as major food producers. To the north, the arable landscape of the Brecks flows seamlessly into the managed, well-cultivated character of the 'Good Sands' of north-west Norfolk while, to the north-east, the gradual transition is to the ordered arable estate landscape of central Norfolk, which shares a similar topography to the Brecks.

To the east the landscape character of the South Norfolk and High Suffolk Claylands differs considerably, although there is a transitional zone within which elements of discrete landscape areas mingle. This is even more apparent to the south, where the Brecks merges with the East Anglian Chalk NCA with which it shares some landscape continuity. Here the distinction between the chalklands around Newmarket and the blown sand over chalk of the Brecks is blurred.

Views between the NCA and neighbouring NCAs are often framed by areas of conifer plantation. From within the NCA the gently rolling, low landform means that there are views of varying distance, frequently shaped by pine shelterbelts and plantation blocks of Thetford Forest.

Radial road and rail routes fan out from Thetford, creating transport links to all surrounding areas, while connection to surrounding areas for the movement of animals and plants is provided through the Brecks' forest and woodlands, river valleys and wetlands and farmland networks, with their hedgerows and shelterbelts.

## Distinct areas

- Thetford Forest

## Key characteristics

- A largely open, gently undulating landscape with a low-lying, dry plateau that rises to the north. Subtle long slopes lead to alluvial flats containing shallow, meandering wooded river valleys.
- The chalk solid geology lies close to the surface and is covered by thin deposits of sand and flint. The effects of repeated freeze and thaw in the tundra-like climate of the last ice age have produced intricate ground patterns, with patches of calcium-rich soils interspersed with acidic conditions.
- Remnants of collapsed pingos and other ground-ice depressions which formed in periglacial conditions are typically found in the valleys, and are characteristic features at Sites of Special Scientific Interest (SSSI) such as Thompson Common, East Walton Common and Foulden Common.
- Vast commercial conifer plantations form a forest landscape, unique in lowland England. The regular geometric shape and form and the repeated occurrence of plantations and shelterbelts unify the land cover pattern, forming wooded horizons and framing views into adjacent landscapes.
- Predominantly agricultural land use focused on arable production, with planned courtyard farmsteads and large, regular 18th- and 19th-century enclosure fields often clearly defined by Scots pine and beech shelterbelts or neat hawthorn hedges, indicative of large estate enclosure. The regular field layouts combine with long, straight, undulating roads to create a geometric landscape character.
- Outdoor pigs and intensive indoor and outdoor poultry-rearing units are also characteristic.
- Free-draining geology and soils with naturally low fertility support internationally important lowland heathland and mosaics of lowland acid and calcareous grassland that bring colour and textural variation to the landscape and provide a biodiversity-rich resource.
- Narrow and meandering lush shallow river valleys (some of which contain unusually fast-flowing streams) form a marked but limited contrast to the dry, extensively arable upland catchment which they drain. All flow westward and are fed by nutrient-poor calcareous groundwater and support important wetland habitats.
- A high concentration of important archaeological features, resulting from a long continuity of human settlement, include Neolithic flint mines, medieval churches, priories and rabbit warrens, 18th- and 19th-century designed parklands and estate villages, Second World War defence features and 20th-century abandoned settlements in the military training area known as the Stanford Training Area (STANTA).
- The main population centre is Thetford with road and rail links radiating out from the town. The settlement pattern is sparse with nucleated villages scattered along the river valleys. Farm buildings and churches have considerable impact, but elsewhere the landscape is very empty. Large military air bases are a feature.

The blue Viper's Bugloss on farmland in high summer.

## Key characteristics continued...

- Traditional knapped flint, clunch (a form of impure chalk) and 'white' brick are characteristic building materials.
- Away from the main A-road transport corridors where traffic is consistently busy including the A11, A1065 and A134, the area remains still and peaceful. On the approach roads to Swaffham, Watton and Thetford, vertical structures, including communications masts and the Swaffham and North Pickenham wind turbines, dominate the landscape.

## The Brecks today

The Brecks straddles the county boundary of western Suffolk and Norfolk, and includes a very small part of Cambridgeshire. The NCA is formed on a low part of the chalk escarpment between Newmarket to the south and Swaffham to the north, resulting in a low, rolling landform. The Cretaceous Chalk is overlain by Pleistocene deposits of chalk-sand and, in some places, chalky 'boulder clay' (also known as the Lowestoft Till). The deposits vary in depth, creating local landscape variation. In the north and west the chalky boulder clay is thickest, creating an elevated flat plateau. In the south-west the chalk is barely covered by sands and gravels. The soils of the Brecks are mainly sands and sandy loams that are low in natural fertility (with considerable variation in the content of chalk, flint, stone, silt and clay), and have varying pH levels that exert a profound influence on the area's natural vegetation. Elsewhere in the landscape, where drainage is impeded, gleys and peats have formed.

The climate of the Brecks is markedly less maritime than other parts of England, with relatively hot summers, cold winters and low rainfall. The unique combination of underlying geology, low-fertility soils, soil disturbance, a dry, frost-prone climate and grazing by sheep together with the presence of rabbits has strongly influenced the natural and cultural evolution of the landscape. It has given rise to one of the most extensive areas of lowland heathland and lowland acid and calcareous grassland remaining in the United Kingdom today. Lowland heath is one of Europe's rarest and most threatened habitats and it is for this reason that the Brecks' heaths are now recognised as internationally important. They support a diversity of flora and fauna reliant on open and disturbed ground including ground-nesting birds such as stone curlew, woodlark and nightjar. On hot summer days, the heaths, which have a primeval, steppe-like quality, teem with ants, spiders, beetles and solitary bees, with characteristic butterflies including the brown argus and dingy skipper on the chalk while small copper, grayling and green hairstreak are typical of the acid heaths. The greatest extent of the Brecks' heaths is today centred on the Elveden Estate in Suffolk and the Stanford Training Area to Brettenham Heath area in Norfolk, which is in poor condition. Several other important sites are found near the main town of Thetford. The remainder are relatively small, scattered survivors of formerly extensive areas.

**Internationally important lowland heathland mosaics of acid and calcarious grassland bring colour and textual varition to the area.**

**Traditional building vernacular on display at Euston village.**

Unusually for East Anglia, arable cultivation is matched if not dominated by forest and heath. Apart from within the river valleys the Brecks' soils have historically been poorly suited to arable farming owing to their low-nutrient and free-draining nature. However, advances in farming methods have overcome these limitations. Current farming in the area is predominantly large scale with many farmers committed to high-value production including vegetable and salad crops, while outdoor pigs and novel crops such as herbs and even tulips are also grown. The exception is the narrow linear patterns of irregular enclosure river valley meadow pastures, which have a less intensive character. Grazing land also characterises some of the late 18th- and 19th-century estate parklands such as Euston, Culford, Shadwell and Elveden.

The central plateau is characterised by intensively cropped arable land, interspersed with the fragmented network of heathlands and plantation forest. Fields are medium to large in size and enclosure is by distinctive twisted and gnarled lines and belts of pine trees (known as 'pine lines' or 'deal rows'), together with thick beech shelterbelts and hawthorn hedges, while the large-scale Forestry Commission conifer plantations dominate the background. Towards the eastern margins mixed cropping is common and open heathland and pine lines are rare. In the west, the rich, organic black soil and the lower-lying, flat landform create fenland landscapes, which are typically in arable production.

In the early 20th century, because of the infertility of the soils, many areas of heathland were converted to plantation woodland, and now Thetford Forest covers nearly 20 per cent of the NCA. In this central area, plantation woodlands and heaths give a different character. Views are often bounded on all sides by woodland blocks and shelterbelts, giving a sense of uniformity, enclosure and tranquillity. The plantations are often on a large scale and mainly consist of commercial pine with some broadleaf. They support wildlife including bats and birds such as goshawk and hobby. The forest resource also provides a popular recreational resource for the public with walking, mountain-biking and horse-riding routes together with tree-top adventure courses, camp sites and the High Lodge visitor centre.

Water is also a key feature for the NCA with a wide variety of waterbodies found within it. The plateau is dissected by shallow rivers, the Black Bourn, Lark, Little Ouse, Thet and Wissey. In contrast to the dry heathlands the river valleys are relatively lush, containing rich soils with a naturally high groundwater that support floristically rich spring-fed wetlands, commonly used for grazing and home to many rare insects. The rivers themselves flow through the area from east to west. They have mostly been modified for drainage and flood defence reasons and support rich aquatic habitats containing the native white-clawed crayfish (in the Little Ouse) together with otters and water voles.

The importance of water in this predominantly dry landscape is illustrated by the high concentration of villages and archaeological features that are located in the river valleys and on the edge of the Fens to the west, as well as close to the post-glacial meres and pingo ponds. Throughout the NCA, a long history of settlement has left a wealth of historical features that range from prehistoric earthworks, flint mines and pits dating from the Neolithic period to the remains of extensive medieval and post-medieval rabbit warrens. All are strong visible reminders of the history of the Brecks and the ways in which human activity has helped to shape this distinctive landscape.

It is a sparsely populated NCA with limited modern development, although the character of the towns of Thetford, Mildenhall and Brandon has been affected by 20th-century London overspill development policies. The architecture of the 18th- and 19th-century estates provides unity to the villages, particularly to the east, while flint and brick are common building materials, with clunch used along the western edge and 'white' brick near Thetford and Culford. The Swaffham and North Pickenham wind turbines that dominate the landscape in the north of the NCA are among the 21st-century developments.

**Grassland habitats linked within the forest plantations.**

## The landscape through time

The Brecks' bedrock is Cretaceous Middle and Upper Chalk, deposited as a pure limestone in tropical seas between 100 and 65 million years ago. This is covered by often thin, sandy glacial drift left behind when the Anglian ice sheet covered the area around 400,000 years ago. Much later this Anglian drift material was re-worked under the prevailing tundra-like conditions of the last glacial period 100,000 to 12,000 years ago. This left a cover of wind-blown sediments which, through freeze and thaw processes on the chalk which was close to the surface, led to characteristic patterned ground and striped soils of alternating acid sands and alkaline chalk, as at Brettenham Heath. During this period shallow depressions termed pingo ponds and palsas as well as the so-called karstic depressions or swallow holes, such as the Devil's Punchbowl at Croxton, were formed. The famous fluctuating Brecks meres, such as Ringmere and Fowlmere, may be connected to this karstic drainage.

**The Brecks pingos form important and characteristic wetland habitats.**

The rapid arrival of warm, dry conditions after the last ice age allowed raw chalk and sandy soils to be colonised by Mediterranean and steppe species. Although forest cover then developed, the combination of immature mineral soils, drought and large numbers of red deer along the fen margin (as indicated by archaeological remains) suggests that forest cover in the Brecks may have been fairly open.

The Brecks' diverse soils together with its hot and cold extremes of seasonal dry climate have, from the earliest periods of occupation, imposed constraints on the population and had a significant influence on settlement and land use patterns. The numerous relics of early cultures indicate that for most of the prehistoric period the Brecks was an important cultural centre in the British Isles. Visible evidence includes Neolithic flint mines, primitive trackways, bronze-age barrows and iron-age and Romano-British settlements. Neolithic settlers around 6,000 years ago were the first to colonise the area which, because of the light, workable soil and the ease with which woodland could be removed, was easier to cultivate than the surrounding heavier soils but once the trees were removed, the light soil had a tendency to blow away. In general, cereal cultivation was more prevalent in river valleys, with grazed commons and heaths on the drier plateau and interfluves. However, all aspects of the land use were dynamic, and there have been changes and upheavals through time. The land required 'high-input/ high-output' agriculture systems. In part this was a formal open-field system and fold-course rotation of crops with uncropped fallows, sometimes of several years in length. Large sheep flocks that grazed the heathlands were folded onto arable land

to allow their dung to fertilise the poorer soils, thereby increasing crop yields. By the Middle Ages the fold-course system had become highly regulated and much of it was managed by estates and subject to manorial control in order to maintain sufficient fertility for arable cropping. During the 18th and 19th centuries the 'brecks', originally described as 'breakes', 'breches' or 'brakes', became part of this system and are the origin of the NCA's name. Brecks were intakes of heathland converted to arable and cultivated for a few years before being left fallow for a long period, and remained in use into the 18th century.

The area became a major centre of the Celtic Iceni tribe during the late Iron Age, until the suppression of Boudicca's revolt by the Romans 20 years after the invasion of 43 AD. The southern Scandinavian Angles then settled as early as around 450 AD, earlier than in many other regions. They established the present-day towns and villages including Thetford. In the 10th century Thetford became the Saxon capital of East Anglia and even had its own mint, from which coins have been found as far afield as Scandinavia. The Domesday Book records that by the 11th century it had become one of the largest and most important industrial, military and religious towns in England, ranking alongside York, Norwich and Oxford, which it remained until the 12th century. The importance of water in this arid landscape led to medieval and later settlement being primarily nucleated, with villages clustered along the river valleys and fen-edge wetlands to the west of the central dry plateau.

The Normans introduced rabbits to the Brecks, managing them intensively for food and fur. A tradition of warrening (essentially enclosed rabbit farms) was established across increasingly large parts of the sandy uplands from the medieval period, and continued well into the late 19th century. The high densities of warrens, in particular from Mildenhall to Brandon and Thetford and in the area now designated as the Stanford Training Area, and subsequent overgrazing on the fragile soils, led to dust storms (sand blow-outs) becoming a common feature of the area, which in turn made a significant contribution to maintaining the characteristic open heathland landscape.

**Views across the farmed estate landscape near Euston.**

More than 70 per cent of the area of the Brecks was enclosed after 1750, reaching a peak during the Napoleonic Wars when regular field systems were imposed both on former common arable land around settlements and across wide areas of the open heaths to allow for improved crop rotation and closer stock management. Much land was amalgamated into large model shooting estates, the epitome of 18th-century 'improvement' (such as Elveden) with their architecturally distinct mansions, elaborate gardens and parks, adding a sense of uniformity to wooded boundaries and local village architecture. The resulting products of Georgian and early Victorian planned enclosure – large, geometric fields and long, straight roads, together with enclosure hedges, pine lines and belts – had a profound influence on the landscape character. A few earlier farmsteads and enclosures survive in the pockets of better soil, mainly along the river valleys where arable land had traditionally been viable.

Until the mid-20th century the more marginal farmland on the low nutrient sandy soils fell in and out of cultivation, with cropping often dependent on grain prices. This resulted in the relative proportion of heath and fallow to arable land varying considerably. The late 19th- and early 20th-century agricultural depressions caused heathland areas to expand, although by the middle of the 20th century heathland had declined by 75 per cent. This was largely through the land take of intensified farming practices, afforestation and conversion to arable land and urban development. Since the 1920s the Forestry Commission has bought and planted some 20,500 ha, creating the predominantly coniferous plantations of Thetford Forest. The plantations were primarily created to provide a strategic reserve of timber since the country had lost so much woodland in meeting the demands of the First World War.

Land was also acquired for defence, with the Stanford Training Area and large (mostly bomber) air bases being established before and during the Second World War. Some of the larger and most substantial bases such as Mildenhall and Lakenheath were considerably expanded during the Cold War and continue to serve the US Air Force, stimulating the development of large settlements such as Mildenhall.

Farming practices continued to expand in the late 20th century with irrigation introduced for grain and vegetables leading to the expansion of fields on heathland sites. Those sites that remained suffered long-term neglect through the decline of the rabbit population, loss of domestic livestock grazing and the cessation of practices which maintained open bare ground. Today, for the majority of the large Brecks heaths, much of the 20th-century neglect has been halted with sites now protected by conservation designations. Management is targeted at maintaining the rare, scarce and characteristic species associated with low-intensity, highly disturbed habitats. The introduction of Environmental Stewardship schemes for farmland and changes to modern agricultural practice have led to beneficial land management. Tighter legislation and increased enforcement measures have resulted in a reduction in the negative impact of nitrates entering the rivers and wetlands, and controls of chemicals used in farming are much stricter. Improved forest management has increased the proportion of broadleaf woodland within the coniferous blocks and helped to maintain and increase the open mosaic of forest and heath. Areas of energy crops including miscanthus are also beginning to appear in the landscape, providing renewable energy sources. Recent trends of urban expansion, especially around Thetford, provide both challenges and opportunities for the area.

## Ecosystem services

The Brecks NCA provides a wide range of benefits to society. Each is derived from the attributes and processes (both natural and cultural features) within the area. These benefits are known collectively as 'ecosystem services'. The predominant services are summarised below. Further information on ecosystem services provided in the Brecks NCA is contained in the 'Analysis' section of this document.

### Provisioning services (food, fibre and water supply)

- **Food provision**: In spite of low natural soil fertility, the Brecks is a major producer of vegetables and cereals with over two-thirds of the area cultivated in 2009. Outdoor pigs and poultry are also increasingly part of the farmed landscape. Extensive grazing of generally acid grasslands continues with suckler herds and sheep flocks.

**Drought sensitive salad and vegetable crops which grow well in the light sandy soils, although require high levels of irrigation, are a common site in Breckland.**

- **Timber provision**: Over a quarter of the NCA (28,998 ha, 28 per cent) is woodland, predominantly large-scale commercial conifer plantations. About 32 per cent (9,281 ha) of the NCA's woodland stock is broadleaved, and of this 2.6 per cent (247 ha) is recorded as ancient semi-natural woodland. The woodlands are major producers of softwood products and these are commonly used for construction and fencing materials.

- **Water availability**: Groundwater from the chalk aquifer beneath the Brecks can contribute up to 70 per cent of the total annual flow in the NCA's rivers. Abstracted water provides benefits to public water supply, agriculture (dominated by spray irrigation) and river support, and supplies key habitats (for example, the Norfolk Valley Fens Special Area of Conservation (SAC)). Groundwater is pumped into the rivers from a selection of river support boreholes to help to supply the Ely Ouse to the Essex Transfer Scheme, developed to meet the demands of public water supply in Essex. In addition to natural flows, the river flows are also regulated by effluents from sewage treatment works and the discharge of industrial cooling water. Previously taken as abstracted water, this 'return' of water can be valuable during the summer months.

### Regulating services (water purification, air quality maintenance and climate regulation)

- **Climate regulation**: Across most of the NCA a low proportion of carbon is stored within the soil, although there are pockets of higher soil carbon content which coincide with the heaths, river valleys and wetlands. Carbon is stored in the trees of the forest plantations, shelterbelts and hedgerows.

- **Regulating soil erosion**: Shallow, unstable soils are prone to wind and water erosion, especially where organic matter is low, on sloping cultivated ground or where dry, bare soil is exposed or compacted. Extensive outdoor pig rearing can expose soils. Sand blows occur when there is insufficient protective vegetation crop cover and where protective field boundary hedgerows and shelterbelts have been removed. Freely draining, slightly acid but base-rich soils may be susceptible to capping and slaking, again increasing the risk of erosion. Two Priority Catchments have been identified in the England catchment sensitive farming delivery initiative: the Little Ouse (Thetford Ouse) and the River Nar. Soil erosion is identified as an issue in both catchments. The re-establishment of hedges and provision of uncropped wildlife strips, conservation headlands, targeted arable reversion to grassland, and winter stubble through agri-environment schemes has limited soil erosion.

- **Regulating soil quality**: The Brecks' diverse soils include some of the least fertile in England. They are typically sands and sandy loams (with considerable variation in the content of chalk, flint, stone, silt and clay) that freely leach nutrient inputs. However, the addition of chemical fertilisers combined with the irrigation of these easily worked soils has enabled highly productive agriculture to prevail across the NCA.

- **Regulating water quality**: Low-intensity management of Thetford Forest helps to maintain water quality within the underlying aquifer. In spite of the forest, the groundwater chemical status in the NCA is poor. This is predominantly owing to the NCA's 43 sewage treatment works, effluent from industrial processes (food processing, sugar refining and poultry plants) and oil from surface water drains being discharged. In catchment sensitive farming identified priority catchments, watercourses suffer from high nitrate and phosphate levels. Between 18 and 28 per cent of phosphate pollution is due to agriculture and can come from excess farmyard manure and slurry applications, nutrient leaching and inefficient crop nutrient management. There is also some localised diffuse pollution from pesticides. Environmental and Countryside Stewardship and catchment sensitive farming measures help to reduce polluting factors and to improve water quality.

- **Pollination**: The extensive semi-natural habitat mosaic of heathland, forest-edge and acid grassland habitats of the central plateau and in the river valley pastures and wetlands across the area provide important nectar sources for pollinating insects. Where arable cropping dominates, interstitial habitats such as the edges of farm tracks become the key sources of both pollen and nectar. These habitats are particularly important as they support the insects that pollinate commercial arable crops including rape as well as high-value vegetables, herbs and even tulips.

- **Pest regulation**: Networks of interstitial habitats such as forest-edge, shelterbelts and the uncut edges of farm tracks provide important over-wintering habitats for beneficial predatory invertebrates such as ground and rove beetles which feed on pests. Careful management of agro-chemicals (through integrated pest management approaches) may in some cases remove the requirement for chemical intervention, although evidence of efficacy is required. Financial support for farmers channelled through Environmental and Countryside Stewardship can fund these habitats in arable areas.

### Cultural services (inspiration, education and wellbeing)

- **Sense of place/inspiration**: Sense of place and cultural heritage services are dominated by the mosaic of arable land and conifer forest. Semi-natural features include remnant heathlands, grasslands and wetlands interspersed with distinctive periglacial landforms including pingos and karst features. The Scots pine lines or 'deal rows' define a strong geometric field pattern

and give the Brecks its strongest visual identity. Localised contrast is provided by lush, shallow river valleys. There are historic features such as large estate parklands and associated model villages, isolated farmsteads and churches (in Norfolk), sparse settlement and vernacular buildings of traditional knapped flint, clunch and 'white' brick. The physical austerity, marginal profits and ethereal beauty all frame the historic narrative of authors and poets. Thomas Wright Esquire in 1668 vividly describes the Great Sand Floods resulting from soil erosion that encroached, swamped and destroyed settlements such as Santon Downham. Mary Mann's novels such as *The Fields of Dulditch* (1902) portray the grim lives of agricultural workers of that time, yet W G Clarke (*Breckland Wilds*, 1925) was inspired by the fragile beauty of the heathland wilderness.

- **Sense of history**: There is a great sense of history throughout the NCA and the landscape is littered with historical evidence of the past. Significant sites include Neolithic flint mines, bronze-age burial monuments, iron-age and Roman settlements, Saxon earthworks, medieval churches, monastic remains and abandoned villages. Extensive medieval and post-medieval rabbit warrens remain as earthen banks and occasional warren lodges. Traditional buildings in town centres are often cheek-by-jowl with unsympathetic 1950s and 1960s development. Conversely, most rural buildings date from the late 18th and early 19th centuries. Distinctive structures include Cluniac priories, such as Castle Acre and Thetford, and Thetford's Norman castle, built on an iron-age fort. More recent military history dates from the Second World War and artefacts include pill boxes, anti-glider ditches and old airfields.

**Scots pine lines or 'deal rows' give the Brecks its strongest visual identity.**

- **Tranquillity**: Around 60 per cent of the Brecks is classified as undisturbed. This represents a fall from 86 per cent since the 1960s (Campaign to Protect Rural England Intrusion Map 2007). Areas suffering from intrusion are primarily associated with Thetford, the A11 corridor and development in the west of the area. There is also regular intermittent low flying from military aircraft which can feel intrusive. Nevertheless, the Brecks remains among the most tranquil areas in the East of England. There are very large areas of forest and private farmland where it is rare to see other people. Expansive silences are broken only by the calls of unfamiliar birds reaching across empty heathland. Threats to tranquillity come from new development (especially around Thetford) and increased car travel including in relation to recreational trips.

- **Recreation**: Thetford Forest and Kings Forest are a positive focus for access with thousands of hectares providing formal and informal countryside recreation. Part of the Peddars Way and Norfolk Coast Path National Trail also provide recreation opportunities. In general the NCA has a sparse public rights of way network which results from private land ownership (particularly large estates), land use and dispersed settlement patterns.

- **Biodiversity:** Recent studies[4] have revealed the Brecks to be a unique biodiversity hotspot in the UK, vitally important for rare and threatened species. Over 12,500 species were documented in 2010, 2,000 of which were endangered. The Brecks contains 28 per cent of all rare species in the UK and is particularly important for invertebrate species. As a consequence of the value and fragility of the natural environment, 40 per cent of the Brecks NCA is covered by national nature conservation designations. The national and international importance of the Brecks heathland is recognised by the many designations, including four National Nature Reserves and 42 SSSI. In addition, European legislation has designated one Special Protection Area and four SAC. Some 13 per cent of the area supports Biodiversity Action Plan priority habitats, including lowland heathland and lowland meadows.

- **Geodiversity:** The Brecks' geodiversity underpins the character of the NCA, most notably the Pleistocene sand, clay and flint-derived sediments and associated periglacial landforms. The area is particularly important for our understanding of Pleistocene geology and the evolution of this landscape in response to the extreme tundra environment of the last ice age. Its geodiversity has arguably supported one of the longest surviving histories of mineral extraction in England with flint mining dating to Neolithic times. Grime's Graves, which has over 400 mine shafts surrounded by an open 'lunar' landscape of shafts, pits, quarries and spoil dumps, is the only Neolithic flint mine open to visitors in Britain. More recent mineral extraction has focused on sands and gravels deposited during and after glaciation.

[4] *Securing Biodiversity in Breckland: Guidance for Conservation and Research. First Report of the Breckland Biodiversity Audit*, Paul Dolman, Christopher Panter and Hannah Mossman (2010) http://www.uea.ac.uk/~e313602/Breckland.pdf

# Statements of Environmental Opportunity

**SEO 1: Conserve, enhance and increase public awareness of the distinctive historic landscape of the Brecks, which is of national and international significance, through securing and expanding its unique and varied habitat mosaic, protecting and managing its sensitive periglacial landscape and rich historic environment.**

**For example, by:**

- Working with landowners, partners and communities to restore the connectivity of key habitats across the landscape, expanding and creating new habitats and ecological networks for species, including those identified in the Breckland Biodiversity Audit.
- Facilitating the ability of viable agricultural businesses to undertake more tailored agricultural and conservation management to achieve a range of successional stages from disturbed bare ground, through to cultivated margins and established habitat, in order to support rare and declining species such as stone curlew, grey carpet moth and sand catchfly.
- Enhancing the management of wetland habitats and river corridors (including meres, pingos and river valley habitats), carefully managing water availability and quality to achieve favourable ecological condition and securing their natural and cultural value and the associated benefits that they provide.
- Maintaining, extending and linking dry habitats, especially acid and chalk grass heaths and heather heaths, together with enhancing the management of afforested land, to provide better opportunities for the range of rare, scarce and characteristic species typical of the NCA and to help to strengthen the ecological and visual value of these areas.
- Maintaining and where necessary improving the condition of the Sites of Special Scientific Interest and continuing to conserve and protect the valuable habitats and species in the Breckland Special Protection Area together with the Brecks' four National Nature Reserves.
- Encouraging the replanting of late enclosure windbreak hedgerows and Scots pine lines where they have been lost and positively managing and maintaining those that have become neglected to bring about ecological and landscape benefits.
- Maintaining and enhancing the area's characteristic geology, geomorphology and soils and associated sites, to protect their interest and provide opportunity for study, appreciation and enjoyment by the public.
- Promoting the links between geological sites, boundaries, archaeological evidence of human activity and the biological interest of these areas to achieve a wider understanding of the importance of the Brecks.
- Managing visitor pressures at popular and sensitive sites by investing in high-quality infrastructure and interpretation that is designed to provide equality of opportunity, meeting the different needs and levels of use of a range of visitors, including local communities, recreational day visitors and tourists, and enhancing the experience without being the cause of damage or degradation of the Brecks' unique natural assets.
- Conserving historic parklands together with their important veteran trees and deadwood fauna and flora, in particular focussing on the continuity of the mature and veteran tree resource in the parkland and in the surrounding landscape.

**SEO 2: Manage the Brecks' distinctive agricultural landscape to benefit biodiversity and soil and water quality, by promoting sustainable but productive farming practices that are able to adapt to changing agricultural economics, the considerable challenge of climate change and the increasing water stress within the NCA.**

**For example, by:**

- Encouraging sustainable farming practices and the diversification of cropping and livestock to assist adaptation to climate change, while expanding and connecting ecological networks and supporting the continued production of food supplied to local and national markets.
- Working in partnership with farmers, understanding motivations for and barriers to achieving sustainable agricultural and environmental objectives.
- Encouraging increased uptake of agri-environment schemes and options that are targeted at supporting and increasing populations of farmland birds as well as rare arable weeds associated with arable farming. Uptake of Environmental Stewardship in the area remains consistently below the national average.
- Working in partnership with farmers to encourage the uptake of agri-environment options that harvest and conserve water, protect watercourses and prevent water quality deterioration by reducing diffuse pollution, ensuring compliance with regulations on nitrate vulnerable zones to manage fertiliser inputs.
- Working in partnership with farmers to encourage soil management improvements in order to prevent deterioration of water quality caused by soil erosion and nutrient leaching.
- Reconnecting rivers and their flood plains where appropriate to provide ecological and accessible green infrastructure networks at a landscape scale, linking towns and the forest; and increasing the use of river valleys for the storage of flood waters, aquifer recharge, and restoring and creating new wetland habitats.
- Securing and enhancing spring-fed and groundwater-fed habitats including pingos and meres as well as river flows and potable and irrigation water supply, through appropriate water resource management.

**SEO 3: Manage the Brecks' forest plantations and woodlands to combine commercial forestry and fuel production with a mix of habitats for rare and endangered plants and animals, enhancing both their capacity and capability as a national recreational resource and their role in climate change adaptation and regulation.**

**For example, by:**

- Increasing the recreational benefits afforded by Thetford Forest, optimising the value of this currently under-utilised and extensive recreational asset, as outlined in the Thetford Forest Plan.
- Conserving and enhancing wet woodland in valley bottoms, veteran trees in remaining areas of wood pasture and parkland and characteristic Scots pine lines through appropriate management.
- Exploring the potential for new woodland types, including species more resilient to potential challenges of climate change and new tree diseases.
- Ensuring continued careful planning of felling and woodland management to retain the variety of different woodland structures and transitions to heath and woodland-edge habitats for internationally important populations of woodlark and nightjar and for rare and declining plants and invertebrates.
- Ensuring careful management of the Thetford Forest plantations, including rides and tracks that link the forest blocks and areas of open habitat, helping to secure and enhance ecological networks and improving the recreational experience for visitors.
- Encouraging local farm businesses to increase appropriate-scale generation of heat, utilising woody biomass for woodchip boilers where it is sustainable to do so. This will in turn bring further opportunities for improved woodland management, while being mindful of locally valued landscape characteristics and sensitive landscapes, habitats and associated species.

**SEO 4: Encourage measures which lead to the enhancement of landscape character and the historic environment, the sense of place and tranquillity, and the conservation of historic features when considering the design and location of new development and infrastructure and land management options, securing multiple benefits through the provision and management of high-quality green infrastructure networks.**

**For example, by:**

- Conserving and appropriately managing the area's rich architectural legacy and sense of place, and using this understanding, and the area's distinct patterns of settlement, to plan for and inspire any new development.
- Ensuring that high-quality green infrastructure is considered in all new building projects, encouraging developers and planners to consider this aspect at the outset of all scheme design with the aim of promoting space for wildlife, outdoor recreation and play in urban settings.
- Working in partnership with farmers to encourage the appropriate and sensitive siting of new farming-related developments (for example, irrigation reservoirs), recognising that farming is a business and that appropriate and sensitive development is required to maintain viable farm businesses.
- Conserving and maintaining the high levels of tranquillity associated with much of the area, especially where there is little settlement or infrastructure intrusion.
- Conserving the farmsteads, churches and the traditional and estate buildings (and views to them) that often have a strong visual impact in the landscape.
- Promoting the use of traditional building materials such as flint and white brick (and clunch in the west of the area) in building restoration or new development where this would be appropriate, to enhance the character of the local area.
- Supporting the use of historic and landscape characterisations to inform change, and encouraging their use in community-based planning to help to identify locally valued townscapes, rural landscapes and heritage assets.
- Investigating ways of securing better management of heritage assets which contribute to the character of the area, particularly those which have been identified as 'heritage at risk'.
- Conserving the distinctive archaeological evidence (banks, related buildings, gorse belts) and associated biodiversity of historic rabbit warrening sites and their contribution to the distinctive cultural and physical landscape.

## Additional opportunity

**1. Manage, develop and promote opportunities for access and outdoor recreation for both local people and visitors that improve health, wellbeing and enjoyment of the environment, also raising awareness of the important habitats and the wildlife that they support as well as their contribution to the local economy.**

**For example, by:**

- Working in partnership with farmers to achieve mutually satisfactory objectives, managing access on land adjacent to heathland, forest and arable land through clear signposting and interpretation, to improve the quality of understanding and enjoyment of sensitive environments and bird species (such as stone curlew, woodlark and nightjar).
- Managing and promoting the Peddars Way and Norfolk Coast Path National Trail and other routes to national standards in order to enhance tourism and recreational opportunities for local people and visitors alike and ensure a high-quality experience for all users, as identified in existing plans.
- Working with landowners and farmers to develop multi-user routes and improve route connectivity, characterised by good-quality surfacing, gradients, signage and solutions to route severance, such as a new A11 National Trail crossing, which improve opportunities for more people on foot, cycle and horse and with wheelchairs and pushchairs.
- Supporting local partnerships to develop new investment in access and recreational provision and implement the Thetford Green Infrastructure Strategy and Norfolk and Suffolk Rights of Way Improvement Plans, which provide the framework for where people want to go and where access is most needed.
- Continuing to develop the area as a responsible tourism destination with the potential for appropriate use of the forestry estate and adjoining farmland linked to the access network, especially for family-based holidays.
- Seeking opportunities to interpret the link between the area's defining geodiversity and interests such as archaeology and early settlement pattern, the influence of geodiversity on the landscape of the NCA, and the relationship between geodiversity and provisioning services such as water supply.
- Maintaining and improving access to the important geological exposures, rivers and the Neolithic flint mine at Grime's Graves, and providing resources for the management of geodiversity (for example, through conservation and enhancement schemes, or agri-environment schemes).

# Supporting document 1: Key facts and data

Total area: 101,926 ha

## 1. Landscape and nature conservation designations

There are no designated landscapes in this NCA.

**Source: Natural England (2011)**

### 1.1 Designated nature conservation sites

The NCA includes the following statutory nature conservation designations:

| Tier | Designation | Name | Area (ha) | Percentage of NCA |
|---|---|---|---|---|
| International | n/a | n/a | 0 | 0 |
| European | Special Protection Area (SPA) | Breckland SPA | 39,141 | 38 |
| | Special Area of Conservation (SAC) | Breckland SAC; Norfolk Valley SAC; Fens SAC; Waveney & Little SAC; Ouse Valley Fens SAC; Rex Graham Reserve SAC | 7,905 | 39 |

| Tier | Designation | Name | Area (ha) | Percentage of NCA |
|---|---|---|---|---|
| National | National Nature Reserve (NNR) | Brettenham Heath NNR; Cavenham Heath NNR; Weeting Heath NNR; Thetford Heath NNR | 676 | 1 |
| | Site of Special Scientific Interest (SSSI) | A total of 55 sites wholly or partly within the NCA | 40,372 | 40 |

**Source: Natural England (2011)**

*Please note: (i) Designated areas may overlap (ii) all figures are cut to Mean High Water Line, designations that span coastal areas/views below this line will not be included.*

Land covered by international nature conservation designations (SPAs SAC) totals 39,622 ha (39 per cent of the total land area). Land covered by national nature conservation designations (NNRs and SSSI) totals 41,372 ha, 40 per cent of the total land area.

There are 245 local sites in the Brecks NCA covering 9,252 ha which is 9 per cent of the NCA.

**Source: Natural England (2011)**

- Details of individual Sites of Special Scientific Interest can be searched at: http://www.sssi.naturalengland.org.uk/Special/sssi/search.cfm
- Details of Local Nature Reserves (LNR) can be searched at: http://www.lnr.naturalengland.org.uk/Special/lnr/lnr_search.asp
- Maps showing locations of Statutory sites can be found at: http://magic.defra.gov.uk – select 'Designations/Land-Based Designations/ Statutory'

### 1.2 Condition of designated sites

| SSSI condition category | Area (ha) | Percentage of SSSI in category condition |
|---|---|---|
| Unfavourable declining | 310 | 1 |
| Favourable | 34,855 | 87 |
| Unfavourable no change | 673 | 2 |
| Unfavourable recovering | 4,453 | 11 |

**Source: Natural England (March 2011)**

- Details of SSSI condition can be searched at: http://www.sssi.naturalengland.org.uk/Special/sssi/reportIndex.cfm

## 2. Landform, geology and soils

### 2.1 Elevation

Elevation in the NCA ranges from -0.02 m below sea level to a maximum of 85 m above sea level in the north of the NCA north-west of Swaffham. The average elevation of the landscape is 30 m.

**Source: Natural England 2010**

### 2.2 Landform and process

A gently undulating dry plateau that rises to the north, with subtle long slopes, leading to alluvial flats, with shallow meandering river valleys. The river valleys cut through the middle and upper chalk strata and plateau. The conditions during the last glaciation have given rise to the patterned ground features and ice depressions (pingos) that we see today and that are of high geological and biological importance.

**Source: Breckland Countryside Character Area Description**

### 2.3 Bedrock geology

The area has an underlying geology of Middle and Upper Chalk deposited as a pure limestone in tropical seas during the Cretaceous Period between 144 and 65 million years ago.

**Source: Breckland Countryside Character Area Description**

### 2.4 Superficial deposits

The overlying drift geology of the area originates from the glacial drift that was left behind when the Anglian ice sheet covered the area around 400,000 years ago.

During the last glacial period (known as the Devensian, 100,000 to 12,000 years ago) the Anglian drift material was re-worked in the tundra periglacial environment. Extensive areas of windblown sand accumulated and, through freeze/thaw processes, the characteristic Brecks striped soils of alternating acidic sand and alkaline chalk were formed.

The drift geology is a thin though variable deposit of sand and flint gravels with drifts of chalky boulder clay (also known as Lowestoft Till) between the sands and the chalk which create local variation within the landscape.

The geological deposit of chalky boulder clay varies considerably in depth and presents a flat surface. Where the deposits are thickest (mainly in the north and west of the NCA) they create the elevated, flat chalk plateau which is carved through by streams.

In the south west of the NCA, drift deposits are either completely absent or only very thinly scattered. Here there is only a thin capping of sand and gravel covering the chalk giving rise to the barren, sandy soils.

The river valleys have loamy and sandy soils with naturally high groundwater and a peaty surface.

**Source: Breckland Countryside Character Area Description**

## 2.5 Designated geological sites

| Tier | Designation | Number |
|---|---|---|
| National | Geological Site of Special Scientific Interest (SSSI) | 1 |
| National | Mixed Interest SSSI | 5 |
| Local | Local Geological Sites | 1 |

**Source: Natural England (2011)**

- Details of individual Sites of Special Scientific Interest can be searched at: http://www.sssi.naturalengland.org.uk/Special/sssi/search.cfm

## 2.6 Soils and Agricultural Land Classification

The Brecks NCA contains one of the most extensive areas of lowland heathland in England, with complex but typically poor, free draining sands and sandy loam soils with scattered flints over chalk, which are low in organic matter. Distinctive striped or polygon-shaped soil patterns of periglacial origin show marked pH variation within short distances. This has a profound influence on the natural vegetation and on arable practices in the NCA. The interior of the NCA is characterised by particularly acidic soils, formed in deep sands, which are especially notable in the areas around Thetford. This has lead to the interior being always more sparsely populated than the peripheries of the area. In the west, along the Fen edge the rich, organic, black soil and the lower lying, flat landform creates a transition zone between the Brecks and Fenland landscapes, which are typically in arable production. In the east where the sands give way and merge with the heavier boulder clays, soils are often more fertile and calcareous. The soils of the NCA are among the least inherently fertile soils in the country. Despite this, heavy irrigation and chemical fertilisers have allowed the Brecks soils to support one of the most productive agricultural systems in the country. Non-agricultural land consists mainly of the forestry plantation areas which make up almost a third of the NCA.

**Source: Breckland Countryside Character Area Description, Breckland Natural Area Profile**

The main grades of agricultural land in the NCA are broken down as follows (as a proportion of total land area):

| Agricultural Land Classification | Area (ha) | Percentage of NCA |
|---|---|---|
| Grade 1 | 88 | <1 |
| Grade 2 | 3,426 | 3 |
| Grade 3 | 25,070 | 25 |
| Grade 4 | 37,162 | 36 |
| Grade 5 | 1,297 | 1 |
| Non-agricultural | 33,619 | 33 |
| Urban | 1,265 | 1 |

**Source: Natural England (2010)**

- Maps showing locations of sites can be found at: http://magic.defra.gov.uk – select 'Landscape' (shows ALC and 27 types of soils).

## 3. Key waterbodies and catchments

### 3.1 Major rivers/canals

The following major rivers/canals (by length) have been identified in this NCA.

| Name | Length in NCA (km) |
|---|---|
| Wissey | 57 |
| Little Ouse River | 39 |
| Black Bourn | 32 |
| River Lark | 21 |
| River Thet | 21 |
| Watton Brook | 20 |
| River Nar | 8 |
| River Kennett | 7 |
| Sapiston Black Bourn | 7 |

**Source: Natural England (2010)**

**Please note: Other significant rivers (by volume) may also occur. These are not listed where the length within the NCA is short.**

Three westward flowing rivers and their tributaries incise the low plateau of the Brecks. Their valleys are small and tucked into the landform cutting through the Middle and Upper Chalk strata, and plateau rising to the north, creating a gently undulating landform with subtle slopes.

### 3.2 Water quality

The total area of Nitrate Vulnerable Zone is 101,926 ha, 100 per cent of the NCA.

**Source: Natural England (2010)**

### 3.3 Water Framework Directive

Maps are available from the Environment Agency showing current and projected future status of water bodies at:

http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=_e

## 4. Trees and woodlands

### 4.1 Total woodland cover

The NCA contains 28,998 ha of woodland (28 per cent of the total area), of which 247 ha is ancient woodland. The majority of the woodland is Forestry Commission plantation.

**Source: Natural England (2010), Forestry Commission (2011)**

### 4.2 Distribution and size of woodland and trees in the landscape

Thetford Forest is the largest area of lowland woodland in England.

The pine and broadleaved woodlands of Thetford Forest cover nearly 20 per cent of the NCA. The main forest blocks stretch from West Stow in the south to Swaffham in the north and from Mildenhall in the west to Harling in the east. They were established from 1922 onwards on land that was formerly heathland, old rabbit warrens and on poor agricultural ground to become the major lowland pine forest in Britain. The principal trees are Corsican pine, Scots pine together with larch and fir. Around 12 per cent of Thetford Forest is broadleaved.

Along the river valleys wet woodland, mostly containing willows and sallows, and alder has become established on many former fen sites. A range of mixed ash and alder, willow and alder and pure alder areas exist depending on land use history and water regime with some poplar plantations established in places.

The cover of ancient semi-natural woodland (woodland present since at least 1600 AD) is amongst the lowest of any NCA in England (0.2 per cent). There is just 247 ha of ancient woodland, of which just under 198 ha is considered truly semi-natural. The majority of ancient woodlands occur in a scatter along the south-east border of the Brecks, where the light soils grade into the Suffolk claylands. Fakenham Wood/Sapiston Great Grove complex near Euston is the largest covering 108 ha. Other woods, never more than a few hectares each, are widely spaced elsewhere.

Veteran trees are occasionally found in wood pasture or parkland landscapes such as at Aspall Park, Oak Pin, Risby and at Shadwell.

The variation in soil type is reflected in the tree species found with oak, birch and hazel dominating on acidic sandy Brecks soils and ash, field maple, wild cherry and hornbeam found on wetter or clay soils.

**Source: Breckland Countryside Character Area Profile**

### 4.3 Woodland types

A statistical breakdown of the area and type of woodland found across the NCA is detailed below.

Area and proportion of different woodland types in the NCA (over 2 ha) is 28,998 ha, covering 28.4 per cent

| Woodland type | Area (ha) | Percentage of NCA |
|---|---|---|
| Broadleaved | 9,281 | 9 |
| Coniferous | 16,586 | 16 |
| Mixed | 329 | <1 |
| Other | 2,802 | 3 |

**Source: Forestry Commission (2011)**

Area and proportion of ancient woodland and planted ancient woodland sites (PAWS) within the NCA:

| Woodland type | Area (ha) | Percentage of NCA |
|---|---|---|
| Ancient semi-natural woodland | 198 | <1 |
| Planted ancient woodland sites (PAWS) | 49 | <1 |

**Source: Natural England (2004)**

## 5. Boundary features and patterns

### 5.1 Boundary features

The older arable fields are often bounded by pine shelter belts and the former Scots pine hedgerows or 'Deal Rows' that were originally planted and managed as wind break hedgerows to reduce windblow on the light soils predominantly in the early 19th Century. Some were set on earthwork banks. This traditional hedgerow management has long been abandoned but has left behind distinctive, short well spaced lines of pine trees.

Elsewhere, field boundaries are predominantly formed by hedges which are often species-poor, predominantly hawthorn, as they are relatively recent elements of the landscape resulting from late 18th and early 19th century enclosure, rather than pre-enclosure hedges of the ancient countryside found in the neighbouring Clayland NCAs. This distinction is less clear along the eastern edge of the Brecks as the light soils merge into the heavier soils of these NCAs. Beech hedges and belts are also characteristic of the area.

The main coniferous plantation blocks and numerous smaller coniferous plantations and shelter belts vary in size and shape and often follow old farm/ estate boundaries. They form a strong pattern of enclosure and create strong points of focus, channelling views and greatly influencing the character of the skyline.

These woodland blocks become less geometric, more organic in form and increasingly deciduous, most notably influenced by birch, as they give way to the areas of lowland heathland.

**Source: Breckland Countryside Character Area description; Countryside Quality Counts (2003)**

### 5.2 Field patterns

Arable areas are characterised by a regular, geometric patterning of medium to large field units. The river valleys contain narrow linear patterns of irregular enclosed meadow pastures.

**Source: Breckland Countryside Character Area description; Countryside Quality Counts (2003)**

## 6. Agriculture

The following data has been taken from the Agricultural Census linked to this NCA.

### 6.1 Farm type

This area is a major producer of vegetables and cereals together with livestock rearing, especially pigs and poultry together with lowland grazing, mainly sheep. There has been a 163 per cent increase in specialist pig farms (31 holdings). Trends also show an increase in the number of specialist poultry farms (15 to 21 or 40 per cent) as well as a significant increase in the number of grazing livestock farms (32 to 46 or 44 per cent). Cereal farms have also increased (40 to 52 or 30 per cent) although there has been a decrease in the area of land used for cereals. General cropping farms have reduced (149 to 100 or 49 per cent) and horticultural holdings have also decreased (17 to 11 or 34 per cent), while mixed holdings have remained relatively static decreasing slightly from 26 to 24.

**Source: Agricultural Census, Defra (2010)**

### 6.2 Farm size

Farms in the largest size bracket more than 100 ha are the most numerous accounting for 119 holdings, or 32 per cent. Farms/small holdings in the smallest size bracket (under 5 hectares) account for 68 holdings (18 per cent) - the second most common size in the NCA. Overall, holdings over 100 ha make up 90 per cent of the

total farmed area compared to those under 5 ha which cover less than 0.08 per cent of the farmed area. The trend under 'farm type' has shown a general increase in the number of smaller sized holdings. Between 2000 and 2009 there was a 33 per cent increase in the number of holdings of less than 5 ha (51 to 68). The number of holdings of between 5 and 20 ha increased by 3 per cent and the number of holdings between 20 and 50 ha increased by 15 per cent. The largest size bracket (over 100 ha) saw a decrease from 133 to 119 (11 per cent).

**Source: Agricultural Census, Defra (2010)**

### 6.3 Farm ownership

2009: Total farm area = 62,561 ha; owned land = 39,529 ha
2000: Total farm area = 65,540 ha; owned land = 41,241 ha
Sixty-three per cent of the total farmed area is owner occupied. There has been a general decrease in both owned and tenanted farmland over the 2000 to 2009 period. Owned land has decreased by 4 per cent and tenanted land by 2 per cent which has resulted in the total farmed area being reduced by 2,979 ha over this period of time.

**Source: Agricultural Census, Defra (2010)**

### 6.4 Land use

The dominant land use is cereal crops accounting for 18,636 ha (30 per cent of the total farmed area). Grassland including land uncropped accounts for 16,610 ha (27 per cent) followed by cash root crops (9,146 ha or 15 per cent) and vegetables (4,233 ha or 7 per cent of the total farmed area). Between 2000 and 2009 there was a decrease in the area of land used for cereals (by 2,840 ha or 13 per cent) and a decrease in the area of grassland and uncropped land (by 565 ha or 3 per cent). There have also been decreases in the area of land used for growing cash roots (7 per cent), vegetables (11 per cent) and oil seed (16 per cent). Hardy Nursery Stock, although an infrequent land use, has seen a dramatic 70 per cent reduction (110 ha to 33). Land used for stock feed has massively increased from 92 to 391 ha (325 per cent) while more modest increases have been seen in other arable crops (37 per cent) and fruit up 30 per cent.

**Source: Agricultural Census, Defra (2010)**

### 6.5 Livestock numbers

Pigs are the most numerous livestock by far within this landscape. There were a total of 209,900 pigs. Sheep are the next most numerous with 34,200 animals. Total cattle numbers have remained static for the period 2000 to 2009. There has been a significant increase in the total number of pigs during the same period (total increase of 87,600 animals, or 72 per cent). Sheep numbers also increased by 1,100 animals, or 3 per cent.

**Source: Agricultural Census, Defra (2010)**

### 6.6 Farm labour

The figures suggest that the majority of holdings are run by dedicated principal farmers (including their spouses and business partners) compared to salaried managers (441 principle farmers, 109 salaried managers) with a higher number of employed full time and part time workers (470 FT and 155 PT). Trends from 2000 to 2009 show a decrease in the number of principal farmers (down by 46) and a small increase in salaried manages (up by 19). Full time farm workers have decreased considerably by 200 while part time and casual workers have remained stable during this period.

**Source: Agricultural Census, Defra (2010)**

**Please note: (i) Some of the Census data are estimated by Defra so may not present a precise assessment of agriculture within this area (ii) Data refers to commercial holdings only (iii) Data includes land outside of the NCA where it belongs to holdings whose centre point is recorded as being within the NCA.**

## 7. Key habitats and species

### 7.1 Habitat distribution/coverage

The national and international importance of the Brecks is recognised by the many statutory designations covering the area. These include one Special Protection Area (SPA) and two Special Areas of Conservation (SAC) wholly within the NCA, with parts of a further two SACs. There are four National Nature Reserves and a total of 55 Sites of Special Scientific Interest (SSSI) wholly or partly within the NCA.

**Lowland calcareous grassland, lowland acid grassland, lowland heath:**
The greatest extent of Brecks heaths are centred on the Elveden Estate in Suffolk and the Stanford Training Area (STANTA) to Brettenham Heath area in Norfolk. Several other important sites are found near Thetford, such as Barnham Cross Common. The remainder are relatively small scattered survivors of formerly extensive areas. A feature which is characteristic of the Brecks is that these heaths often comprise complex mosaics of acid and calcareous grassland, or "grass heath", together with, in places, heather-dominated heath. These differences reflect the underlying soil types, seen at the surface as "patterned ground", together with the prevailing management conditions.

The grass heaths are typified by an open turf of grasses such as sheep's fescue and low-growing plants. Calcareous soils support up to 80 species of plant including chalk grassland species such as purple milk-vetch, fairy flax, squinancywort and hairy rock-cress. The yellow flowering spikes of lady's bedstraw are common in summer across the grass heaths, but on more acid soils heath bedstraw and shepherd's cress are found. Especially where rabbits are abundant there is more bare ground, and cushion-like mosses and Cladonia lichens can dominate, together with many spring flowering annual plants.

**Grassland and woodland at Knettishall Heath.**

In a few instances on highly calcareous soils, often where these have been brought to the surface by human activity, the broken turf supports an unusual group of rare lichens such as scaly-breck lichen. The rarest of the Brecks plants are found on the heaths, as well as in the rides and other open space in Thetford Forest, including Spanish catchfly, Breckland thyme and spring speedwell. On the deeper acid soils, and where management favours it, heather can be abundant and on some heaths forms dense stands. The Brecks history of windblown sand has left fixed inland sand dunes, though there are no longer any active dunes in the NCA. Relict dunes can be found at Wangford Warren and Lakenheath, and within Thetford Forest.

The heaths teems with ants, spiders, beetles and solitary bees and wasps on hot summer days, and especially where the soil is disturbed by rabbits or human activity, can support many Brecks specialities. Over 40 species of moths are recorded on calcareous heath and over 20 species on the acid heaths. Characteristic butterflies include brown argus and small copper, while dingy skipper occurs in a few chalky sites.

The heaths provide nesting and feeding areas for a range of birds, but are especially important for stone curlew and woodlark.

**Open water:** rivers, meres and pingos: The Brecks also contains nationally important wetland habitats. Principal amongst these are pingos and groundwater-fed meres and chalk rivers. Pingos are found in three main concentrations in the NCA: Thompson/Breckles/Great Hockham, around East Harling, and around Foulden and along the Fen edge. The semi-permanent groundwater-fed Brecks meres, for example within East Wretham Heath and British Army Stanford Training Areas (STANTA) SSSI are all in Norfolk and are of international importance, being part of the Breckland SAC. A part of the River Nar SSSI, a nationally important chalk river, runs through the northern part of the NCA.

**Fens:** In the headwaters and tributaries of the Little Ouse, Lark, Wissey and Thet are spring-fed wetlands, known as valleyhead fens or headwater fens, which depend on this nutrient-poor, chalky, water. Some of these are included within the Special Areas of Conservation, coincident in some cases with pingo sites.

**Flood plain grazing marsh:** Mosaics of flood plain grazing marsh, fen, reedbed, and wet woodland occur throughout the Brecks in narrow strips, along the principal river valleys, but also to a lesser extent along the Brecks / Fen edge.

**Wet woodland:** Wet woodland is a UK priority habitat and an important element of the historic landscape and ecological character of the NCA. There are only small fragments left primarily associated with the river valleys.

**Woodland:** The cover of ancient semi-natural woodland is amongst the lowest of any National Character Area in England. The largest is the Fakenham Wood/ Sapiston Great Wood complex (108 ha) near Euston. The majority of other ancient woodlands occur in a scatter along the south-east border of the NCA. Wood-pasture and parkland with veteran trees is found occasionally, for example at Shadwell, Aspall Park and Risby. By contrast to ancient woods the pine and broadleaved woodlands of Thetford Forest cover nearly 20 per cent of the NCA. The main forest blocks stretch from West Stow in the south to Swaffham in the north and from Mildenhall in the west to Harling in the east. The Breckland Forest SSSI, with its sequences of rotational felling, rides and open space, supports internationally important populations of woodlark and nightjar, an important assemblage of rare and scarce vascular plant species, such as Breckland mugwort and red-tipped cudweed, and invertebrates like the five-banded weevil wasp.

**Arable farmland:** A substantial area of arable land is afforded SSSI status, the Breckland Farmland SSSI, due to its internationally important breeding population of stone-curlew. Many of the important species, especially plants and invertebrates, associated with the Brecks are dependent on disturbed, un-grazed situations, characteristic of the extensive arable fallows and 'brecks' that were common in the NCA until well into the 20th century. Species include sand catchfly, grey carpet moth and set-aside downy-backed beetle. Many of these 'breck' species are now extremely rare and threatened, requiring specific ground management. In the modern farmed landscape these are provided for primarily through cultivated margins in agri-environment schemes, and the Brecks has some of the most important arable margins for biodiversity in the country.

**Source: Breckland Natural Area Profile**

### 7.2 Priority habitats

The Government's new strategy for biodiversity in England, Biodiversity 2020, replaces the previous Biodiversity Action Plan (BAP) led approach. Priority habitats and species are identified in Biodiversity 2020, but references to BAP priority habitats and species, and previous national targets have been removed. Biodiversity Action Plans remain a useful source of guidance and information. More information about Biodiversity 2020 can be found at:

http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/englandsbiodiversitystrategy2011.aspx

The NCA contains the following areas of mapped priority habitats (as mapped by National Inventories). Footnotes denote local/expert interpretation. This will be used to inform future national inventory updates.

| Priority habitat | Area (ha) | Percentage of NCA |
|---|---|---|
| Lowland dry acid grassland | 6,185 | 6 |
| Reedbeds | 5,622 | 6 |
| Broadleaved mixed and yew woodland (Broad habitat extent) | 3,661 | 4 |
| Lowland heathland | 2,404 | 2 |
| Lowland meadows | 1,350 | 1 |
| Coastal flood plain & grazing marsh | 1,021 | 1 |
| Lowland calcareous grassland | 939 | 1 |
| Fens | 841 | 1 |
| Purple moor grass & rush pasture | 433 | <1 |

**Source: Natural England (2011)**

- Maps showing locations of priority habitats are available at: http://magic.defra.gov.uk – Select 'Habitats and Species/Habitats'

### 7.3 Key species and assemblages of species

- Maps showing locations of some key species are available at: http://magic.defra.gov.uk – Select 'Habitats and Species/Habitats'
- Maps showing locations of S41 species are available at http://data.nbn.org.uk/

## 8. Settlement and development patterns

### 8.1 Settlement pattern

The Brecks has a long history of settlement but is now very sparsely populated (1 person per hectare). Most of its population is in scattered nucleated villages in the river valleys to the west. Although scattered the villages are often close together. Otherwise the landscape comprises of the occasional farm, church or hamlet. The area between Thetford and Bury St Edmunds is characterised by large regular courtyard farms and fine houses dating from the enclosure period. The Brecks has 5 market towns; Attleborough, Dereham, Swaffham, Thetford and Watton, with Thetford being the only town of significant size. Thetford, Brandon and Mildenhall have been affected by the 20th-century London overspill development policies. In the Norfolk part of the NCA, there are some isolated and sometimes ruined churches that mark the sites of failed medieval settlements. The evacuated villages of Stanford, Sturston, Tottington and Bodney in Norfolk form part of the British Army Stanford Training Areas (STANTA). The remains of houses, halls and churches, as well as the Training Area's own legacy of military buildings and structures combine with the recent construction of a 'European and Afghanistan-style' village for urban warfare training. 49 per cent of the population live in the market towns and the other 51 per cent is spread across 108 rural parishes that vary in size from a population of 20 in Stanford to 3,195 in Swanton Morley. Two-thirds of these parishes have a population of fewer than 500.

**Source: Breckland Countryside Character Area description; Countryside Quality Counts (2003)**

### 8.2 Main settlements

The main settlements within the Brecks NCA are: Thetford; Swaffham; Mildenhall and Brandon.

**Source: Breckland Countryside Character Area description; Countryside Quality Counts (2003)**

### 8.3 Local vernacular and building materials

The dominant factor determining the character of the Brecks buildings is their age. Much of the traditional domestic architecture is estate architecture, dating from the late 18th and 19th centuries.

Buildings of brick, flint or chalk – or of some combination of these materials – and with roofs of slate or pantile – represent the local vernacular.

Pantiles can be found right across the area whereas slate roofs are slightly more common in the west and occur on buildings dating, from the later 18th and 19th centuries. Flints were also particularly use on buildings from this period.

Clunch, a form of impure hard chalk, is used as a building material on the western Fen edge and to a lesser extent in the western ends of the principal rivers draining into the Fen basin around Northwold, Methwold and Lakenheath. This corresponds with where clunch outcrops – or lies close enough to the surface to be quarried.

The use of 'White' brick, yellow-grey, cream in colour, which results from mixing the clay with lime is a feature which the Brecks shares with Cambridgeshire and the Fens and is particularly notable around Thetford and Culford.

Decorative brickwork is a noticeable feature with different coloured bricks laid in patterns, often in the form of diamonds or 'diapers'. Brick quoining is common and especially noticeable where flint or chalk buildings have openings with brick surrounds. Chimneys are also often afforded decorative treatment.

Clay lump or clay 'bat', large blocks of unfired clay and straw, rendered to make waterproof, buildings of 'lump' construction are widely scattered, although noticeably distributed towards the northern and eastern margins of the area.

Carrstone, iron-rich sandstone, is used as building stone in the extreme western part of the Brecks particularly in estate buildings, for example the estate cottages in Beachamwell.

Due to the lack of good-quality timber, and hazel for wattles, in this poorly wooded landscape there is a marked lack of timber-framed buildings. Examples are generally on the edges of the NCA, especially towards those districts of heavier clay soils where timber-framed buildings are more common, as at Thompson, East Harling and Ixworth Thorpe. A few others examples are found in villages close to the navigable waterways along the western Fen edge, at Mildenhall and Worlington.

**Source: Breckland Countryside Character Area description; Countryside Quality Counts (2003)**

## 9. Key historic sites and features

### 9.1 Origin of historic features

The open heathland landscape characteristics have been maintained by extensive grazing. Firstly by sheep introduced in Neolithic times and only declining in the last century and secondly by rabbits which have flourished on the dry soils since their introduction by the Normans.

The elevated heathlands and plateaux contain a number of bronze-age round burial mounds, barrows and mortuary enclosures. Iron-age settlement sites and Saxon earthworks also exist across the NCA.

Flint mines and pits dating from the Neolithic period, notably Grimes Graves to the north of Brandon within Thetford Forest, and from the 18th to the early 20th century illustrate a long if interrupted flint mining history in the Brecks. Remains of a deserted medieval village at Roudham and abandoned medieval hamlets of Little Bittering and Godwick which was first settled in late Saxon times and inhabited until the 17th century.

Monastic remains of a Dominican friary at Thetford that also overlay a Norman cathedral.

The extensive remains of one of the most important East Anglian monasteries, the Cluniac Priory of Our Lady of Thetford, and the burial place of the Earls and Dukes of Norfolk for 400 years.

Remains of approximately 26 extensive medieval and post medieval rabbit warrens and occasional warren lodges, such as Thetford and Mildenhall Warren Lodges which are still intact.

Roman settlements at Woodcock Hall and Mildenhall, and remains of a Roman villa south-west of Weatherhill farm.

Thetford was founded around c.870 AD as a guard post, where the prehistoric Icknield Way crosses the river Thet. In the 11th century it was the seat of the kings and bishops of East Anglia. The remains of a Norman castle, built on the remains of an earlier iron-age fort are present at the towns Castle Hill which is England's tallest medieval earthwork.

Many of the characteristic pine lines, hedgerows and field patterns date from the Napoleonic Wars when the previously open fields were enclosed.

There are a number of 18th and 19th-century designed parklands including; Euston Park, containing work by William Kent and 'Capability' Brown; Culford with work by Humphrey Repton; Shadwell Park; Lynford Park; and Pickenham Park. The Georgian hall of Elveden was transformed into East Anglia's version of a Mogal Palace by Maharajah Duleep Singh (1863 -1893).

There are surviving pillboxes, anti-glider ditches and other defence works of the 'Corps' and 'Command' stop lines built in WWII along the Rivers Lark, Stour and Colne, most notably at Jude's Ferry Bridge near Mildenhall.

Second World War airfields including, Lakenheath, Cavenham, Honington and Knettishall.

Thomas Paine (1736 -1809) one of the Founding Fathers of the United States was born in Thetford although evidence is not visible on the ground.

**Source: Countryside Quality Counts Draft Historic Profile, Breckland Countryside Character Area description**

### 9.2 Designated historic assets

This NCA contains the following numbers of designated heritage assets:

- 8 Registered Parks and Gardens covering 1,327 ha.
- 0 Registered Battlefield/s covering 0 ha.
- 157 Scheduled Monuments.
- 1,096 Listed Buildings.

**Source: Natural England (2010)**

- More information is available at the following address:
  http://www.english-heritage.org.uk/caring/heritage-at-risk/

  http://www.english-heritage.org.uk/professional/protection/process/national-heritage-list-for-england/

## 10. Recreation and access

### 10.1 Public access

- 17 per cent of the NCA 16,992 ha is classified as being publically accessible.
- There are 531 km of Public Rights of Way at a density of 0.5km per km$^2$.
- There is 1 National Trail within the NCA. 29 km of the Peddars Way and Norfolk Coast National Trail falls within the area linking to the Icknield Way stretching south to Buckinghamshire.

**Sources: Natural England (2010)**

**High Lodge, Mildenhall, one of two remaining warren lodges in Breckland.**

The table below shows the breakdown of land which is publically accessible in perpetuity:

| Access designation | Area (ha) | Percentage of NCA |
|---|---|---|
| National Trust (Accessible all year) | 0 | 0 |
| Common Land | 813 | <1 |
| Country Parks | 212 | <1 |
| CROW Access Land (Section 4 and 16) | 12,724 | 13 |
| CROW Section 15 | 260 | <1 |
| Village Greens | 25 | <1 |
| Doorstep Greens | 4 | <1 |
| Forestry Commission Walkers Welcome Grants | 65 | <1 |
| Local Nature Reserves (LNRs) | 153 | <1 |
| Millennium Greens | 2 | <1 |
| Accessible National Nature Reserves (NNRs) | 676 | <1 |
| Agri-environment Scheme Access | 53 | <1 |
| Woods for People | 14,337 | 14 |

**Sources: Natural England (2011)**

**Please note: Common Land refers to land included in the 1965 commons register; CROW = Countryside and Rights of Way Act 2000; OC and RCL = Open Country and Registered Common Land.**

## 11. Experiential qualities

### 11.1 Tranquillity

Based on the CPRE map of tranquillity (2006) it appears that the lowest scores for tranquillity are associated with the urban centres of Thetford, Swaffham, the northern edge of Bury St Edmunds and Mildenhall and Lakenheath which both contain large military air bases. Other areas of disturbance can be seen to be associated with the main transport route linking these centres, the A11, A1065, A134 and A1066. The highest scores for tranquillity are within the forested, heathland and vast agricultural areas as well as along the north-western Fen edge.

**Tranquil forest at Lynford Arboretum.**

A breakdown of tranquillity values for this NCA are detailed in the table below:

| Tranquillity | Score |
|---|---|
| Highest value within NCA | 149 |
| Lowest value within NCA | -141 |
| Mean value within NCA | 8 |

**Sources: CPRE (2006)**

- More information is available at the following address: http://www.cpre.org.uk/resources/countryside/tranquil-places

### 11.2 Intrusion

The 2007 Intrusion Map (CPRE) shows the extent to which rural landscapes are 'intruded on' from urban development, noise (primarily traffic noise), and other sources of visual and auditory intrusion. This shows that disturbance is associated with the busy 'A' roads that criss-cross the area including, the A11, A1065 and A134 together with the major settlements Thetford, Swaffham and the military bases of Mildenhall, Lakenheath and during army military exercises the STANTA training area. A breakdown of intrusion values for this NCA is detailed in the following table.

| Intrusion category | 1960s (%) | 1990s (%) | 2007 (%) | Percentage change (1960s-2007) |
|---|---|---|---|---|
| Disturbed | 9 | 29 | 39 | 30 |
| Undisturbed | 89 | 68 | 57 | -32 |
| Urban | 2 | 2 | 4 | 2 |

**Sources: CPRE (2007)**

Notable trends from the 1960s to 2007 are an increase in notably disturbed or intruded land by nearly 30 per cent which is matched by a reduction of around 32 per cent of undisturbed or un-intruded land over the same timescale.

- More information is available at the following address: http://www.cpre.org.uk/resources/countryside/tranquil-places

## 12. Data sources

- British Geological Survey (2006)
- Natural Area Profiles, Natural England (published by English Nature 1993-1998 )
- Countryside Character Descriptions, Natural England (regional volumes published by Countryside Commission/Countryside Agency 1998/1999)
- Joint Character Area GIS boundaries, Natural England (data created 2001)
- National Parks and AONBs GIS boundaries, Natural England (2006)
- Heritage Coast Boundaries, Natural England (2006)
- Agricultural Census June Survey, Defra (2000,2009)
- National Forest Inventory, Forestry Commission (2011)
- Countryside Quality Counts Draft Historic Profiles, English Heritage (2004)*
- Ancient Woodland Inventory, Natural England (2003)
- Priority Habitats GIS data, Natural England (March 2011)
- Special Areas of Conservation data, Natural England (data accessed in March 2011)
- Special Protection Areas data, Natural England (data accessed in March 2011)
- Ramsar sites data, Natural England (data accessed in March 2011)
- Sites of Special Scientific Interest, Natural England (data accessed in March 2011)
- Detailed River Network, Environment Agency (2008)
- Source protection zones, Environment Agency (2005)
- Registered Common Land GIS data, Natural England (2004)
- Open Country GIS data, Natural England (2004)
- Public Rights of Way Density, Defra (2011)
- National Trails, Natural England (2006)
- National Tranquillity Mapping data, CPRE (2007)
- Intrusion map data, CPRE (2007)
- Registered Battlefields, English Heritage (2005)
- Record of Scheduled Monuments, English Heritage (2006)
- Registered Parks and Gardens, English Heritage (2006)
- World Heritage Sites, English Heritage (2006)
- Incorporates Historic Landscape Characterisation and work for preliminary Historic Farmstead Character Statements (English Heritage/Countryside Agency 2006)

Please note all figures contained within the report have been rounded to the nearest unit. For this reason proportion figures will not (in all) cases add up to 100%.
The convention <1 has been used to denote values less than a whole unit.

# Supporting document 2: Landscape change

## Recent changes and trends

### Trees and woodlands

- Managing the Brecks plantations to achieve profitability has continued to be challenging in the context of world timber markets, and the Forestry Commission has sought to broaden the base of income generation, for example, through formal recreation and tourism enterprises. This has increased recreation and tourism to the area and has enabled more people to access and interpret some of the special habitats and rare species found in the Brecks. Increases in the numbers of visitors, although carefully managed, can increase pressures on a limited resource, which has in some cases increased the pressure on the NCA's sensitive forest/heath habitats and associated bird species.

- Variation in felling and planting policies and sensitive provision and management of open areas, rides and woodland edge has increased in support of the Breckland Forest SSSI/SPA designation.

- There has been some loss of ancient trees associated with the estate parklands, as well as old roadside trees and the characteristic pines in the rows and belts, due to the fact that many of these trees are now in decline or senescent. Without planned and targeted replacement, their loss results in the erosion of landscape character.

- The planting of poplar in Thetford Forest along the Little Ouse has altered the character of the riverside fenlands and obscured the landform. However, as these plantations are abandoned and decay, a rich mix of open fen, carr and standing dead wood is developing.

### Boundary features

- Agricultural intensification and improvement has in some places resulted in the loss and damage to landscape features, including traditional patterns of wooded and thorn-hedged field boundaries, which have become increasingly mature. This has occurred where inappropriate or a lack of management is applied. Reduced replanting has resulted in gappy hedgerow boundaries that weaken the traditional landscape character.

- Removal of hedgerows has largely ceased and hedgerow replanting and management under environmental stewardship is increasing, although uptake for Environmental Stewardship in the area remains consistently below the national average.

- Between 1999 and 2003 Countryside Stewardship capital agreements for linear features included fencing (7 km), hedge management (1 km), hedge planting and restoration (17 km) and restored boundary protection (7 km). The estimated boundary length for the Brecks is about 5,351 km meaning only about 2 per cent of field boundaries (hedges) were covered by agreements between 1999 and 2003.

- The length of hedgerows in environmental stewardship boundary management in 2011 was 657 km, with 742 km of woodland, 118 km of ditch, 220 km of ditches and 445 km of stone wall in environmental stewardship boundary management schemes.

### Agriculture

- The light, free-draining soils are attractive to outdoor pig producers and these are often let out to producers as part of an arable rotation. This practice has seen an increase of 31 specialist pig farm holdings in the period between 2000 and 2009. Intensive indoor and outdoor poultry rearing has also increased. Where inappropriate management of intensive outdoor livestock farming has occurred, this has in some cases lead to problems with soil erosion and the eutrophication of water courses and subsequently water resources.

- Land used for cereal crop production declined by 13 per cent (2,840 hectares) between 2000 and 2009 and the NCA has also seen decreases in the area of grassland and uncropped land (565 ha, 3 per cent), cash roots (7 per cent), vegetables (11 per cent) and oil seed (16 per cent) although land used for stock feed has increased from 92 to 391 ha due to the increases in livestock farming.

- Uptake of Environmental Stewardship has increased, although it remains consistently below the national average due to the high profitability of the land.

- The NCA has seen an increase in in-field farming associated structures such as animal housing pens and infrastructure buildings connected with specialist pig farms, intensive indoor and outdoor poultry rearing sheds, new water storage reservoirs and the wide-scale use of large irrigation equipment. The use of plastic crop mulches has also seen an increase, changing the character of the landscape when in use.

### Settlement and development

- There has been some expansion of housing around Thetford and Bury St Edmunds on the southern fringe of the area.

- Vertical structures, including communications masts and the Swaffham and North Pickenham wind turbines are new elements in the landscape.

- The initial preparatory works for the duelling of A11 between the Fiveways roundabout and Thetford began in the summer of 2012.

### Semi-natural habitat

- The Brecks heathland is a fragment of its past extent but the principal threat now is lack of appropriate grazing management resulting in scrub invasion. Physical disturbance of the ground for grass-heath species is also important. Subsequent conservation management at some key sites (for example Cranwich Camp) has included practices such as rotovation and turf stripping. However, across most sites, the area of physical disturbance treatment has remained minimal, with sheep grazing (and occasionally cattle or ponies as at Knettishall Heath) considered the key tool for conservation. Conservation efforts have been successful in restoring grazing management regimes to the majority of heathland SSSI.

- Heathland restoration has been helped by initiatives such as the Tomorrow's Heathland Heritage programme (2000 to 2005). 300 ha of predominantly grass-heath within Thetford Forest has been restored by the Brecks Heaths Project and The Securing the Future Project has also supported habitat restoration on the Norfolk Wildlife Trust's Brecks heathland and wetland nature reserves over recent years.

- With the areas of commercial forest, careful planning of felling and woodland management has improved over recent years, to retain the variety of different woodland structures and transitions to heath and woodland edge habitats, for internationally important populations of woodlark and nightjar and for rare and declining plants and invertebrates. This has included the widening of rides to link the areas of open habitat within the forest, which has helped secure and enhance ecological networks.

- Under the Breckland ESA scheme over 2,000 ha of river valley grassland and associated wetland habitats have been managed under sympathetic management regimes and a further 320 ha re-created from arable land. Some of this has only modest value for nature conservation (with the landscape value of these grasslands the main rationale).

- The technical challenges of the large-scale restoration and management of the area's wetlands (especially pingo sites) are great. New techniques have facilitated extensive restoration works at Thompson Common, Cranberry Rough, and Hockham, clearing carr to re-establish fen alongside wet woodland, with the introduction of an extensive grazing regime encompassing this and adjacent pingos. Pingo restoration work has also been undertaken on the Stanford military training area and on Foulden Common, and an increasing number of pingo sites (both SSSI and County Wildlife Sites) are now being managed under Environmental Stewardship.

- The extinct pool frog Rana lessonae (a Brecks specialist, extinct in the United Kingdom since the 1990s) has been reintroduced to one pingo site.

- Conservation success includes the reversal of decline in the Breckland SPA population of stone curlew with a doubling of the priority species target, 180 breeding pairs by 2010, being met and surpassed ahead of schedule with 230 pairs in 2009. The successful increase in the stone curlew population is predominantly down to nest protection on arable land, which means that currently the population is not sustainable without this intervention.

- The condition of most (87 per cent) of the NCA's SSSI has been classified as favourable with 11 per cent unfavourable but recovering.

### Historic features

- There is a wealth of heritage assets; buildings, visible features ranging from the Neolithic to the more recent Second World War military installations. They offer insights into the past and should be protected. The Heritage at Risk register for the area has 22 entries (mainly churches, but some Scheduled Ancient Monuments). Development and intensive agriculture put pressure on this resource although management agreements, included in agri-environmental schemes continue to help identify and protect this resource where possible.

### Rivers

- Over-abstraction of water from the NCA's rivers and chalk aquifer for industry and public water supply has increased, leading to insufficient levels for agriculture and the environment. Demand has reached the point where the rivers Thet and the Little Ouse have an 'over licensed' Catchment Abstraction Management (CAM) status and the River Wissey has a 'no water available' CAM status. The upper portion of the River Lark is classed as 'no water available whereas the lower portion of the Lark is classed as 'over abstracted'.

- High nutrient levels are a problem in many of these rivers and can lead to prolific algal growth and associated dissolved oxygen problems, particularly during periods of low flow.

- Watercourses suffer from high nitrate and phosphate levels as a result of discharge from sewage treatment works, industrial processes (food processing, sugar refining and poultry plants), surface water drains as well as some inappropriate or poorly managed agricultural practices (such as manure and slurry applications, intensive pig rearing units), nutrient leaching, and inefficient crop nutrient management. There is some localised pollution from pesticides with soil erosion and sedimentation also transporting pollutants to watercourses.

- The percentage of rivers and lakes that have good ecological and biological status or potential is consequently low, highlighting a need to improve this, through adopting improved land management to prevent these issues.

### Minerals

- Recent mineral extraction is focused on glacial sands and gravels. Established quarries, for example Cavenham Quarry produce materials for construction and local infrastructure projects.

- Gravel extraction has created new wetlands in place of more typical river valley habitats at Lackford, Lynford and south of Thetford.

- Aggregate extraction has had a significant effect on archaeological sites clustered along the valley floors.

## Drivers of change

### Climate change

- The Brecks is amongst the warmest and driest parts of the UK, with a markedly less maritime climate than other parts of England.

- A number of characteristic specially adapted species, more typical of continental climates survive here, on the northern and western edge of their European range. Native species distributions may change as they migrate northwards with increases in temperature.

- The area supports extensive lowland heathland on sandy, free-draining soils, in addition to pine and broadleaf forests and a productive agricultural system. It is most likely that these are the three elements that will be most modified as a result of climate change.

- Water availability will continue to be a concern, with the potential loss of specific drought-intolerant species as a result of reduced soil water moisture and rising temperatures, may lead to changes in cropping patterns and land use.

- Higher temperatures and prolonged periods of drought will put heathland vegetation under stress and increase the risk of wild fire events, impacting on the diversity of habitat structure and species numbers.

- Erosion and loss of sandy topsoils, as a result of reduced soil moisture and periods of drought leaving exposed ground, can be managed through appropriate land management although unseasonal high rainfall causing flash flooding and increased soil erosion may also be a product of a warming climate.

- Opportunities arise for increasing the size and connectivity of priority habitats such as heaths, wetlands, arable margins and forest land to provide for species adaptation and movement between favourable sites.

- The creation of more resilient habitats and landscapes, as well as providing opportunities for creating cooler spaces, such as forest or woodland cover, will be a challenge as the climate changes over the coming years and decades.

- New detrimental pest species, as well as some beneficial pollinators, may prove more adaptable and successful in a changing climate.

- Vulnerability of tree crops to pests and diseases is already being seen. Red band needle blight effects pine species with, Corsican pine, lodgepole pine and more recently Scots pine all being affected. It causes premature needle defoliation, resulting in loss of yield and, in severe cases, tree death. 80 per cent of the trees in Thetford forest are already affected.

- A warmer climate will lead to more resilience in crops and cropping patterns being required, which may also lead to opportunities for the growing of new crops that are more suitable to the changing environment.

### Other key drivers

- The Brecks NCA contains many rare species and valuable habitats of national and international ecological importance. Conserving these features, along with the overall landscape character and historic legacy, from the pressures of climate change, recreation and changing land management processes, will remain key concerns within the Brecks.

- The need for food security may result in changing farming practices, which may impact on ecological habitats, networks and species, as well as landscape character. Agri-environment schemes provide opportunities to work with land managers to incorporate farmland habitats, develop networks of linked habitats and enhance the rural character of the landscape although increasing the uptake of Environmental Stewardship remains challenging due to high agricultural returns achievable in the area.

- Increased agricultural production including intensive outdoor pig units may impact on the quality of the soils, increase the stress on water demand and water quality, so will require targeted management. The increased need for water storage facilities such as winter storage reservoirs for food production may provide opportunities for wildlife while sensitive planning of their location will be required to safeguard the distinctive quality of the local landscape.

- As a consequence of the light sandy soils, cropping is heavily reliant on chemical fertiliser use coupled to irrigation for drought-sensitive crops (for example salad and vegetable crops) and therefore poses major sustainability challenges for the future.

- The area is likely to remain attractive for recreation, with good access to nature along with opportunities for environmental education and understanding our heritage.

- Alongside increasing its role in climate change adaptation and mitigation, Thetford Forest has the capacity to increase its contribution as a regional and national recreational resource, leading to opportunities for increased funding for environmental enhancement schemes. The management of visitor numbers will be required to prevent damage and disturbance of sensitive habitats and species.

- The Thetford Area Action Plan identifies Thetford as a Growth Point with significant future expansion of around 5,000 new homes by 2021. It is unique as a Growth Point being focussed on one town and surrounded by internationally designated nature conservation sites that are both an opportunity and a constraint.

- Core Strategies of Local Authorities also include some expansion of Bury St Edmunds, Mildenhall and Brandon. Residential development close to the Breckland SPA has to undergo a Habitats Regulations Assessment to ensure that it will not adversely affect the integrity of the internationally important designated site.

- New developments including the A11 (Fiveways) improvements provide opportunities to ensure a high standard of design and a contribution to green infrastructure increasing opportunities for people to access greenspace and countryside as well as for habitat, landscape and heritage enhancement and climate change adaptation.

- Future demand for public water supply is likely to increase with potentially 6,000 new homes planned at Thetford alone. Overall demand for water will increase with climate change while the recharge of all water sources is likely to decrease.

- Conserving and enhancing the nationally important habitats of the river valleys and tributaries of the Little Ouse, Thet, Wissey and Lark as well as managing and enhancing the area's internationally important wetlands, pingos, meres, creating strong networks for multiple benefits including recreational water and land-based access routes and adaptation to climate change.

**Predominantly agricultural land use focused on arable production is characteristic of the area.**

# Supporting document 3: Analysis supporting Statements of Environmental Opportunity

The following analysis section focuses on a selection of the key provisioning, regulating and cultural ecosystem goods and services for this NCA. These are underpinned by supporting services such as photosynthesis, nutrient cycling, soil formation and evapo-transpiration. Supporting services perform an essential role in ensuring the availability of all ecosystem services.

Biodiversity and geodiversity are crucial in supporting the full range of ecosystem services provided by this landscape. Wildlife and geologically-rich landscapes are also of cultural value and are included in this section of the analysis. This analysis shows the projected impact of Statements of Environmental Opportunity on the value of nominated ecosystem services within this landscape.

**Thetford Forest and Kings Forest are a positive focus for access and countryside recreation.**

| Statement of Environmental Opportunity | Ecosystem service | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Food provision | Timber provision | Water availability | Genetic diversity | Biomass energy | Climate regulation | Regulating water quality | Regulating water flow | Regulating soil quality | Regulating soil erosion | Pollination | Pest regulation | Regulating coastal erosion | Sense of place/inspiration | Sense of history | Tranquility | Recreation | Biodiversity | Geodiversity |
| **SEO 1:** Conserve, enhance and increase public awareness of the distinctive heritage landscape of the Brecks, which is of national and international significance through securing and expanding its unique and varied habitat mosaic, protecting and managing its sensitive periglacial landscape and enhancing sustainable recreation opportunities. | ↔ *** | ↔ *** | ↗ ** | ↔ *** | ↔ *** | ↗ ** | ↗ ** | ↗ ** | ↗ ** | ↗ ** | ↗ *** | ↗ *** | n/a | ↑ *** | ↑ *** | ↗ ** | ↑ *** | ↑ *** | ↔ *** |
| **SEO 2:** Manage the Brecks' distinctive agricultural landscape to benefit biodiversity, soil and water quality, by promoting sustainable but productive farming practices, that are able to adapt to changing agricultural economics, the considerable challenge of climate change and the increasing water stress within the NCA. | ↔ *** | ↔ *** | ↗ ** | ↔ *** | ↗ ** | ↗ ** | ↗ *** | ↗ *** | ↗ *** | ↗ *** | ↗ ** | ↗ ** | n/a | ↗ ** | ↗ ** | ↔ *** | ↔ *** | ↗ *** | ↗ ** |

Note: Arrows shown in the table above indicate anticipated effect on service delivery: ↑ = Increase ↗ = Slight Increase ↔ = No change ↘ = Slight Decrease ↓ = Decrease. Asterisks denote confidence in projection (*low **medium***high) ° symbol denotes where insufficient information on the likely effect is available.

Dark plum = national importance; mid plum = regional importance; light plum = local importance

| Statement of Environmental Opportunity | Ecosystem service | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Food provision | Timber provision | Water availability | Genetic diversity | Biomass energy | Climate regulation | Regulating water quality | Regulating water flow | Regulating soil quality | Regulating soil erosion | Pollination | Pest regulation | Regulating coastal erosion | Sense of place/inspiration | Sense of history | Tranquility | Recreation | Biodiversity | Geodiversity |
| **SEO 3:** Manage the Brecks' forest plantations and woodlands to combine commercial forestry and fuel production with a mix of habitats for rare and endangered plants and animals, enhancing both their capacity and capability as a national recreational resource and their role in climate change adaptation and regulation. | ↔ *** | ↔ *** | ↗ ** | ↔ *** | ↗ *** | ↑ *** | ↗ ** | ↔ ** | ↗ ** | ↗ ** | ↗ ** | ↗ ** | n/a | ↗ *** | ↔ ** | ↔ ** | ↗ *** | ↗ *** | ↔ *** |
| **SEO 4:** Encourage measures which lead to the enhancement of landscape character and the historic environment, the sense of place and tranquillity and the conservation of historic features when considering the design and location of new development and infrastructure and land management options, securing multiple benefits through the provision and management of high quality green infrastructure networks. | ↔ *** | ↗ ** | ↔ ** | ↔ *** | ↗ ** | ↑ *** | ↗ *** | ↗ *** | ↗ ** | ↗ ** | ↗ *** | ↗ ** | n/a | ↑ *** | ↗ ** | ↔ *** | ↑ *** | ↗ *** | ↔ *** |

Note: Arrows shown in the table above indicate anticipated effect on service delivery: ↑ = Increase ↗ = Slight Increase ↔ = No change ↘ = Slight Decrease ↓ = Decrease. Asterisks denote confidence in projection (*low **medium***high) ° symbol denotes where insufficient information on the likely effect is available.

Dark plum = national importance; mid plum = regional importance; light plum = local importance

## Landscape attributes

| Landscape attribute | Justification for selection |
|---|---|
| The free-draining geology and complex soils support rare and valuable mosaics of lowland heathland and lowland acid and calcareous grassland. | ■ The Brecks heathlands were once widespread although land use change over the centuries has drastically changed the ancient character of the landscape, turning the sandy soils into productive agricultural land. Subsequently much of this habitat has been lost through arable conversion, afforestation and urban development. The habitat now mainly remains in managed areas such as the Brettenham and Cavenham Heath National Nature Reserves.<br>■ It is a rare and important priority habitat, characteristic of this NCA due to the complex soils and prevailing management conditions, but not common in neighbouring areas. Sense of place is supported by the strong, open, historic landscape character, formed by the remaining unique mosaics of lowland habitats.<br>■ Dry sandy lowland heathland and acid and calcareous grassland bring colour and textural variation to the landscape. The pockets of remaining heathland are rigorously protected and managed. They are a rich haven for many rare species of flora and fauna. Fingered speedwell, military orchid and Breckland thyme flourish on the heaths with the more calcareous areas supporting open turf grasses; cushion-like mosses and in a few instances on areas where chalk has been brought to the surface, the broken turf supports rare lichens. The deeper acid soils are dominated by colourful heather, bracken, gorse and broom with developing birch or pine woodland in un-grazed situations.<br>■ The habitats are important for a range of characteristic breeding birds such as the stone curlew, woodlark, and nightjar alongside many insects, butterflies and moths as well as the all important Brecks denizen the rabbit, which is an important grazer, maintaining the short grass swards and patches of bare ground that many other characteristic heathland species need to thrive.<br>■ Large areas of heathland and grassland are commonly found within the managed estates, areas of marginal land and on the Stanford military training area where the continuing management practices, locality, lack of fragmentation of ownership and lack of disturbance have safeguarded their existence.<br>■ Existing geological sites and characteristic soils (including periglacial patterned ground) provide opportunities for study, appreciation and enjoyment by the public. |

| Landscape attribute | Justification for selection |
|---|---|
| Forest and woodland is a strong feature of the landscape with substantial blocks of coniferous plantation, predominantly of Corsican and Scots pines mixed with some broadleaf. | ■ Views throughout the area, even long-distance ones, are often bounded by woodland on all sides, giving a sense of uniformity, enclosure and tranquillity and adding to the sense of place.<br>■ Thetford Forest forms the largest area of lowland woodland in England and covers nearly 20 per cent of the NCA. The created forest landscapes are unusual in lowland England.<br>■ The Forestry Commission together with some private landowners manage the forest predominantly for timber although management for public recreation is increasing as the woodland sites are popular visitor locations.<br>■ The Breckland Forest SSSI with its mixed coniferous and broadleaved woodland provides a range of woodland habitats. These support internationally important populations of woodlark and nightjar that maximise the use of the rotational felling, rides and open space whereas the forest itself provides nesting habitat for secretive raptors such as the goshawk and hobby. Important assemblages of rare and scarce vascular plants such as the Breckland mugwort and red-tipped cudweed together with invertebrates such as the five-banded weevil wasp, are also found there.<br>■ The high amount of woodland cover provides a carbon sink and there is potential for privately-owned woodlands to increase supply for heat generation (but not electricity) from woody co-products. |
| The geometric landscape of 18th and 19th-century enclosure with medium to large fields bounded by hawthorn hedges. | ■ Large estate enclosure with long straight roads contrasts with older arable fields bounded by characteristic belts of twisted and gnarled Scots pine or 'Deal Rows' planted in the early 19th century, some on older earth banks.<br>■ The field pattern contributes to the cultural history formed as a result of historic land uses. Sense of place is supported by this strong, open, historic agricultural landscape character.<br>■ Agricultural intensification has resulted in the loss of traditionally grazed heathland areas which in many places have been converted for arable production. The older arable fields are often bounded by pine shelter belts and the former Scots pine hedgerows, originally planted and managed as wind break hedgerows to protect the topsoil in the early 19th Century. Traditional hedgerow management has been abandoned but leaving behind distinctive, short, well spaced lines of pine trees which are a strong characteristic of the area.<br>■ A substantial area of arable land is afforded SSSI status (Breckland Farmland SSSI) due to its internationally important breeding population of stone curlew. Many other important species (especially plants and invertebrates) associated with the Brecks are dependent on disturbed, ungrazed situations, characteristic of the extensive arable fallows. Species include sand catchfly and the grey carpet moth. |

| Landscape attribute | Justification for selection |
|---|---|
| The narrow, shallow, wooded river valleys with their rich soils and lush marshy sides are important features in this predominantly dry landscape. | ■ The lush river valleys are tucked into the landscape forming a marked but limited contrast as well as adding the human element of settlement that is strongly connected to the availability of water in comparison to the dry extensively arable uplands that are unsettled.<br>■ The river valleys are important elements of the ecological character of the NCA containing mosaics of floodplain grazing marsh, fen, reedbed, and wet woodland habitats in narrow strips.<br>■ The river valleys are important elements of the historic landscape as they contain a high concentration of archaeological features that provide strong evidence of the Brecks' long continuity of human settlement, illustrating the importance of water in this area. |
| The chalk rivers, fluctuating meres and clusters of relic pingos are of local and national importance. | ■ The nutrient-poor rivers fed by calcareous groundwater support rich aquatic habitats containing beds of aquatic and emergent plants, the native white clawed crayfish (in the Little Ouse), good populations of fish as well as otter and water vole. A part of the River Nar SSSI, a nationally important chalk river, runs through the northern part of the NCA.<br>■ In the headwaters and tributaries of the Little Ouse, Lark, Wissey and Thet are spring-fed wetlands also known as valleyhead fens or headwater fens which are dependent on nutrient-poor, chalky, water. They are floristically rich supporting scarce insects with some included within the Special Area of Conservation.<br>■ There are 3 main concentrations of pingos: Thompson/Breckles/Great Hockham, around East Harling, and around Foulden and along the Fen edge which contain remarkable assemblages of water beetles and flies. The semi-permanent groundwater-fed Brecks meres, within East Wretham Heath and the Stanford military training area SSSI are of international importance and part of the Breckland SAC. They contain invertebrate species adapted to phases of wetting and drying, as well as more mobile species which colonise when water levels rise.<br>■ The land surrounding the meres includes high concentrations of archaeological features that are important in supporting the wider understanding of the Brecks. |

| Landscape attribute | Justification for selection |
|---|---|
| Large country house estate parkland landscapes. | ■ The 18thto 19th century estates with their designed parklands are important historic features. Some have cultural associations such as Euston Park containing work by William Kent and Lancelot 'Capability' Brown, including wooded pleasure grounds and a serpentine lake. Culford includes work by Humphry Repton.<br>■ The estates are particularly distinctive in character. Unlike many parts of the country the Brecks (and many Norfolk estates) are not remodelled from medieval and Tudor estates, but new, 'enlightened' model estates. Some, particularly those to the east, include model estate villages with unifying architecture built to house estate workers, most notably Euston and Elveden.<br>■ The estates are important links to the agricultural 'improvers' of the 18th and 19th centuries which is portrayed by the large isolated estate farmsteads and model farms that help to define the area, particularly in the southern half of Brecks.<br>■ The wood-pasture and parkland created in the landscape to enhance the visual appearance, now provides rare and valuable habitat including occasional veteran trees, for example at Shadwell, Aspall Park and Risby. |
| Sparse settlement, the use of locally sourced traditional building materials, isolated farmsteads and churches, together with an abundance of important archaeological sites. | ■ Dispersed nucleated villages in river valleys are characteristic of the Brecks long history of settlement and add to the sense of place.<br>■ Traditional knapped flint, clunch and 'white' brick farm buildings and other vernacular buildings together with churches which are isolated from the villages have considerable impact within the landscape of sparse settlement.<br>■ The remains of a medieval warren lodges contribute to the Brecks' rich archaeological history and remind us of the rabbit's former value. |
| Some parts of the Brecks, especially in the central forested areas, retain a high level of tranquillity and a low level of intrusion from urban influences and light pollution. | ■ The Brecks remain one of the least intruded NCAs in the East of England with high levels of associated tranquillity. This benefits bird species such as the stone curlew as well as visitors attracted to the area that come to view the special wildlife. Tranquillity and intrusion is an issue though around the main communication corridors as well as around the main settlements in the NCA. |

## Landscape opportunities

- Protect, manage and expand areas of lowland heathland especially acid and chalk grass heaths and heather heaths. Encourage appropriate habitat mosaics at heathland sites to support a wide variety of species including populations of internationally important species such as the stone curlew and European nightjar and plants including Spanish catchfly, Breckland thyme and spring speedwell. Where appropriate thin, conifer plantations to increase heathland understory and habitat to areas of poor quality and sandy soils.

- Maintain, enhance and expand the mosaic of wetland habitats within the river valleys as well as those associated with the pingos and ground water- fed meres. In particular, repair fragmented spring-fed wetlands in the Little Ouse, Lark, Wissey and Thet.. Plan to adapt agriculture in these areas to focus away from the river edge and to adopt complementary land management practices for wildlife, such as haymaking. Plan to reduce impacts of agriculture and development on the riverine systems, carefully managing water availability.

- Manage and enhance the wet woodland in the valley bottoms, veteran trees in areas of wood-pasture and parkland and coniferous and broadleaf plantations throughout the area for their contribution to the wooded landscape character, their wildlife value, high recreational value and their contribution to retention of greenhouse gases.

- Replant late enclosure windbreak hedgerows and Scot's pine lines where they have been lost and positively manage and maintain those which have become neglected to bring about ecological and landscape benefits.

- Protect and enhance internationally and nationally important geological sites (SSSI ) and locally important geological sites (Local Geological Sites) and unique features, including periglacial patterned ground and the meres and pingo pools. Enhance access to geodiversity features, and increase interpretation and appreciation of geodiversity including interpreting the links between these features and archaeological evidence of human activity.

- Maintain quality and knowledge of archaeological evidence and historic built features across the NCA. Plan for land management practices to be sympathetic to potential evidence in the area and enhance public awareness of the breadth of historic wealth of the Brecks.

- Protect the distinctive large-scale Brecks landscape ensuring that new development enhances landscape character and secures multiple benefits through the provision and management of high quality green infrastructure networks where possible.

## Landscape opportunities continued...

- Manage development to reduce its impact on tranquillity, and where appropriate screen the impacts of development particularly where adjacent to protected sites. Protect identified existing rural areas where tranquillity and intrusion, including light pollution, are low to ensure this valued resource is maintained.

- Conserve and enhance the character resulting from the sparse pattern of settlement including historic farmsteads, churches and other vernacular buildings, and views to them, that often have a strong impact in a landscape. Promote the use of traditional, locally sourced building materials such as flint, 'white' brick and clunch (in the west of the area), in any restoration or new development.

- Work with landowners, farmers and businesses to manage and enhance tourism and recreational opportunities for local people and visitors alike to enjoy the Brecks landscape and heritage assets, ensuring a high quality experience for all users and increase interpretation at key locations to help explain the Brecks' past historical importance.

- Plan for, the challenges of climate change and increasing water stress for wetlands, agriculture and public water supplies, in one of the driest areas in England.

**Traditional knapped flint used in new development and building restoration.**

## Ecosystem service analysis

The following section shows the analysis used to determine key ecosystem service opportunities within the area. These opportunities have been combined with the analysis of landscape opportunities to create Statements of Environmental Opportunity.

Please note that the following analysis is based upon available data and current understanding of ecosystem services. It does not represent a comprehensive local assessment. Quality and quantity of data for each service is variable locally and many of the services listed are not yet fully researched or understood. Therefore the analysis and opportunities may change upon publication of further evidence and better understanding of the inter-relationship between services at a local level.

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
|---|---|---|---|---|---|---|
| **Food provision** | Soils – sandy soils which are predominantly grade 3 and 4 agricultural, supporting arable farming | The Brecks is a major producer of vegetables and cereals with nearly 68 per cent of the area cultivated in 2009. The light sandy soils are mostly Grade 3 and 4. Cropping is heavily reliant on chemical fertiliser use coupled to irrigation for drought-sensitive crops (for example salad and vegetable crops). The freely draining, sandy soil does not become waterlogged in the winter, allowing good year round growing and lifting conditions. The light sandy soil also benefits outdoor pig rearing. Extensive grazing of generally acid grasslands continues with suckler herds and sheep flocks. | National | Food provision is an important service and cereal and root crops grown here together with livestock farming, particularly pigs and poultry make a significant contribution to local, and national food resources. Farming activity can have a significant impact on other services particularly those relating to water and soils. Crop irrigation is very important on the sandy soil, and has to be carefully managed so as not to lead to increased shortfalls in water resource. 100 per cent of the Brecks NCA is designated as a Nitrate Vulnerable Zone to prevent excess nitrate entering the aquifer.<br><br>**Continued on next page...** | There is an opportunity to ensure agriculture is managed sustainably and does not have a significant detrimental effect on the value of other ecosystem services or assets for example water availability, water quality, soil quality and biodiversity. This will in turn bring benefits to agricultural land and assist with future provision of food.<br><br>There is an opportunity to facilitate agricultural businesses, through the encouragement and support provided by agri-environment schemes, to undertake more tailored conservation management to achieve a range of habitats to support rare and declining species. | **Food provision**<br><br>**Water availability**<br><br>**Regulating water quality**<br><br>**Climate regulation**<br><br>**Regulating soil erosion**<br><br>**Sense of place/ inspiration**<br><br>**Sense of history**<br><br>**Pollination**<br><br>**Biodiversity** |

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
|---|---|---|---|---|---|---|
| **Food provision** | | | | **... continued from previous page**<br><br>The heavily reliance on chemical fertiliser use coupled to irrigation for drought-sensitive crops poses major sustainability challenges for the future.<br><br>The dry friable nature of the soils means that some farming practices can lead to increased rates of soil erosion, which can subsequently have a detrimental effect on agricultural productivity over the long term. Maintaining vegetation cover, adding organic matter, and creating wind breaks through hedgerows and tree belts are important measures within this NCA. | There is an opportunity to encourage sustainable farming to adapt to climate change, while extending ecological networks and supporting the continued production of food supplied to local and national food markets while ensuring it does not have a significant detrimental effects on the value of other key ecosystem services.<br><br>There is an opportunity to encourage the use of advanced 'drip and trickle' irrigation techniques and subsequent provision of increased yields of high quality fruit and vegetables for high-value and local markets. | |

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
|---|---|---|---|---|---|---|
| **Timber provision** | The pine and broadleaf woodlands of Thetford Forest cover nearly 20 per cent of the NCA and are managed for timber alongside other interests<br><br>Soils | Over a quarter of the character area (28 per cent) is woodland, which is predominantly made up of large commercial conifer plantations on historic heathland sites. The woodland sites are managed to benefit wildlife with felling undertaken to produce areas of open heath habitat. About 32 per cent of this woodland is broadleaved woodland, and of this 2.6 per cent is recorded as ancient semi-natural woodland. The commercial woodland areas, known as 'Thetford Forest'. The woodlands are major producers of softwood products (for example for construction, fencing materials). Thetford Forest includes multiple use areas for recreation, wildlife conservation and timber production. | National | The timber woodland sites of Thetford Forest are an important wildlife resource supporting rare plants, invertebrates, bats and birds as well as providing a popular recreational resource for the public which is supported by the freely-draining soils.<br><br>An increase in timber production could increase the varied mosaic of habitats with more heathland and acid grassland creation within the felled forest clearings. Further tree planting could also increase climate change regulation through increased carbon sequestration and bring local benefits to renewable energy through biomass production from forest waste being used to locally generate heat and energy. An increase in timber provision would require new land presently not wooded to be planted and this land would need to be appropriately identified so as not to affect other important habitats (heathland/grassland and wetlands), food provision or areas of archaeological resource. There may be potential for new woodland sites on marginal agricultural land and land bordering existing woodland. | There are opportunities to further enhance woodland management to improve biodiversity, refresh landscape features, provide sustainable heating fuel, recreate historic land use, create profit and secure jobs.<br><br>There are opportunities to contribute to energy security through the provision of low-carbon bio fuels.<br><br>There are opportunities to ensure continued careful planning of felling and woodland management to retain the variety of different woodland structures and transitions to heath and woodland edge habitats for the benefit of wildlife as well as providing year-round recreational opportunities on the freely-draining soils of the forest.<br><br>There may also be opportunities to increase timber production through further tree planting within appropriate settings. | **Timber provision**<br><br>**Biomass energy**<br><br>**Biodiversity**<br><br>**Recreation**<br><br>**Climate regulation**<br><br>**Sense of place/ inspiration** |

| Service | Assets/attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
|---|---|---|---|---|---|---|
| **Water availability** | The Chalk aquifer<br><br>Rivers<br><br>Surface waters | The Chalk aquifer beneath the NCA is a major source of potable and irrigation water. This aquifer is overlain by varying thicknesses of sand and gravels that act as locally important minor aquifers. Over-abstraction is a continuing issue for the aquifer. Summer surface water in rivers in the NCA is committed to existing abstractions and winter river flow is not generally available for abstraction. The Catchment Abstraction Management (CAMs) availability status ranges from 'over-abstracted' in the Upper Lark Chalk to 'no water available' in the Upper Wissey Chalk. Within the NCA a very large amount of water is abstracted for the irrigation of horticultural and arable crops and for use in the associated processing industries all of which are a key economic activity in the Brecks area.<br><br>In dry years the Norfolk rivers supply the Great Ouse Groundwater Scheme transferring groundwater to reservoirs in the Northern Thames Basin to meet public water demands in Essex and Cambridge. | Regional | Significant volumes of abstracted water are used as a public water supply to the growing population of Essex. The requirement for public water will increase with further planned development in the south-east. Climate change may increase the use of abstracted water to support agricultural practices in this dry landscape, meaning that the recharge of the underlying aquifer is likely to decrease. This may put the future of the groundwater transfer scheme at risk.<br><br>Low groundwater levels and low base-flows in the small number of rivers, pose a long-term threat to the maintenance of the Brecks' internationally and nationally important wetlands, which rely on groundwater emerging from the chalk aquifers. This is having an overall negative effect on the ecology of these waterbodies. Increasing water availability (through greater capture/infiltration) and continuing to carefully manage abstraction is likely to reduce biodiversity loss in the wetland habitats and improve water quality, while maintaining water availability in this generally dry landscape. Planning and incorporating sustainable water management across the area could also increase agricultural outputs during periods when water for irrigation is limited. | There is an opportunity to plan for the challenges of climate change and increasing water stress for the Brecks' wildlife habitats, agriculture and public water supplies in one of the driest places in England.<br><br>There is an opportunity to encourage agricultural practices and the uptake of agri-environment options that harvest and conserve water, protect watercourses, and prevent water quality deterioration caused by diffuse pollution and rapid runoff (although it is recognised that many land managers already operate using environmentally sensitive practices).<br><br>There is an opportunity to expand winter water storage capacity but ensure that new large-scale agricultural features (for example irrigation reservoirs) safeguard the distinctive quality of the local landscape.<br><br>**Continued on next page...** | **Water availability**<br><br>**Regulating water quality**<br><br>**Regulating soil erosion** |

| Service | Assets/attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
|---|---|---|---|---|---|---|
| **Water availability cont.** | | | | | ... **continued from previous page**<br><br>There is an opportunity to manage river valleys as grassland delivering direct aquifer re-charge into the chalk where overlying glacial deposits are discontinuous and/or permeable.<br><br>There is an opportunity to use agri-environment schemes to recreate low-input floodplain grazing marsh grassland benefiting landscape, habitat and aquifer re-charge as well as limiting flood risk.<br><br>There are opportunities to restore and create new wetland habitats and expand winter water storage capacity where possible, while exploiting opportunities for aquifer recharge. | |

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
|---|---|---|---|---|---|---|
| **Biomass energy** | Woodland covers 28 per cent of the NCA | A high proportion of NCA comprises forestry plantations dominated by conifers. Most woodland is managed by the Forestry Commission. All of the sustainable timber resource is harvested. The existing very high woodland cover (28 per cent) offers considerable potential for the provision of biomass, both through bringing any unmanaged woodland under management and as a by-product of commercial timber production. Generally the potential miscanthus and short rotation coppice yield in the NCA is high. For information on the potential landscape impacts of biomass plantings within the NCA, refer to the tables on the Natural England website. | Local | There is some additional capacity for appropriately-scaled heat production (but not electricity) exists in privately-owned woodland. Potential miscanthus and short rotation coppice (SRC) yields are high, although north-west of Thetford the potential miscanthus yield is classed as medium but the potential for SRC is high. The impact of biomass on the historic environment can be detrimental so for more detailed information on the possible landscape impact of biomass plantings, refer to the tables on the Natural England website. | There are opportunities to increase appropriate-scale generation of heat utilising woody biomass for woodchip boilers bringing further opportunities for improved woodland management, while being mindful of locally-valued and/or sensitive landscapes, habitats and associated species.<br><br>There are opportunities to manage forest plantations and woodlands to combine timber and fuel production in ways that create profits, secure jobs and contribute to energy security through the provision of low-carbon bio-fuels.<br><br>There are opportunities to Increase capacity for anaerobic digestion to utilise (and prevent pollution from) vegetable wastes, livestock manures and slurries, siting plant carefully to avoid adverse impacts. | **Biomass energy**<br><br>**Biodiversity**<br><br>**Regulating soil erosion** |

| Service | Assets/attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
|---|---|---|---|---|---|---|
| **Climate regulation** | Woodland<br><br>Semi-natural vegetation<br><br>Field boundary hedgerows and shelterbelts<br><br>Wetlands<br><br>Soils (limited contribution) | The high woodland cover (both coniferous plantation woodland and deciduous) of this NCA (28 per cent) heightens the role that the NCA plays in the sequestration and storage of carbon, especially where the woodland is under management.<br><br>The mineral soils over most of the NCA have a low carbon content (0-5 per cent). For these soils, carbon sequestration can be increased by increasing organic matter inputs within the agricultural system and through the use of grass leys. However, there are small areas of soil with higher carbon content (5-20 per cent) likely to be associated with the small areas of Fen. Some pockets of deep peat may also remain. | National | Carbon storage in the woodland is currently relatively high (woodland cover 28 per cent), but may be increased by the planting of additional woodland, on appropriate sites, and through management. Carbon is stored in the heathlands and grasslands which if expanded could increase carbon storage. There is limited potential for increasing the carbon sequestration and storage capacity of the soils by increasing organic matter inputs and reducing the frequency / area of cultivation. In the future, the storage potential of Brecks' soils could be increased if river valleys were to be re-wetted and peat formation was initiated. Replanting lost or neglected field boundary hedgerows and shelterbelts would also increase carbon storage. | There is an opportunity to increase the carbon storage potential of the area through the planting of new woodland (as referenced above in timber and biomass service provision). This would only be appropriate if suitable sites could be found.<br><br>There are opportunities to encouraging the sustainable production of crops on the area's fragile soils, including the reversion to grassland of severely damaged soils, which will aid carbon retention as well as reducing soil erosion.<br><br>There are opportunities to increase soil organic matter helping carbon retention as well as the drought-tolerance of crops in the short term.<br><br>**Continued on next page...** | **Climate regulation**<br><br>**Timber provision**<br><br>**Biodiversity**<br><br>**Sense of place/ inspiration**<br><br>**Regulating water quality**<br><br>**Biomass energy**<br><br>**Regulating soil erosion**<br><br>**Regulating soil quality**<br><br>**Water availability** |

| Service | Assets/attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
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| **Climate regulation cont.** | | | | | **... continued from previous page**<br><br>There are opportunities to increase and restore connectivity of key habitats (heathlands, grasslands and wetlands) across the landscape by extending these habitats by converting arable land and by replanting lost or neglected field boundary hedgerows and shelterbelts to provide greater resilience to climate change.<br><br>There are opportunities to adapt to climate change by promoting diversification of cropping and livestock, prioritising agricultural regimes which tolerate extremes of temperature, are resilient in the face of extreme storm events and help to conserve water while protecting associated arable biodiversity and landscape character. | |

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
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| **Regulating water quality** | Woodland<br><br>Wetlands<br><br>Rivers<br><br>Aquifers | The groundwater chemical status in the majority of the NCA is poor. The chemical status of the main rivers in the NCA; the River Lark, the Little Ouse and the River Wissey is good but the ecological status of these three rivers is only moderate reflecting the problems of diffuse agricultural pollution (no data is available for the other main rivers in the NCA).<br><br>Only 17 per cent of rivers and lakes have good ecological status; biological status is higher (27 per cent). Good chemical status is more common (94 per cent).<br><br>The groundwater chemical status in the NCA is poor due to 43 sewage treatment works discharging to streams, effluent from industrial processes (food processing, sugar refining and poultry plants) and oil from surface water sewers. | Regional<br><br>Local | In priority catchments watercourses suffer from high nitrate and phosphate levels, associated with the discharge from sewage treatment works, industrial processes, surface water drains as well as the dominance of arable farming and the high proportion of pig and poultry farms. Excess farmyard manure and slurry applications, nutrient leaching, and inefficient crop nutrient management are also associated reasons. There is some localised pollution from pesticides. Soil erosion and sedimentation also transport pollutants to watercourses.<br>Low-intensity management of Thetford Forest helps to maintain water quality within the underlying aquifer. | There are opportunities to encourage agricultural practices and the uptake of agri-environment options that protect watercourses, prevent water quality deterioration caused by diffuse pollution and rapid runoff, such as increasing grassland strips along field drains and watercourses to capture sediment and nutrients.<br><br>Ensure the use of fertiliser and pesticide is more informed and associated with good in–field analysis to ensure input is more exact to reduce the volumes which are applied.<br><br>There are opportunities to create buffer areas between nutrient input and sensitive riparian habitats, areas high in biodiversity and watercourses.<br><br>There are opportunities through working in partnership with farmers to encourage soil management improvements to help prevent deterioration of water quality caused by soil erosion and nutrient leaching. | **Regulating water quality**<br><br>**Biodiversity** |

| Service | Assets/attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
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| **Regulating soil quality** | Semi-natural vegetation cover<br><br>Hedgerows and tree belts (windbreaks)<br><br>Woodland, copses, scrub | There are 9 main soilscape types in this NCA:<br><br>■ Freely draining sandy Breckland soils, covering 39 per cent of the NCA.<br>■ Shallow lime-rich soils over chalk (25 per cent).<br>■ Freely draining slightly acid sandy soils (15 per cent).<br>■ Loamy and sandy soils with naturally high groundwater and a peaty surface (11 per cent).<br>■ Freely draining slightly acid but base-rich soils (3 per cent).<br>■ Freely draining lime-rich loamy soils (3 per cent).<br>■ Slightly acid loamy and clayey soils with impeded drainage (1 per cent).<br>■ Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils (1per cent).<br>■ Fen peat soils (1 per cent).<br><br>Those covering above 10 per cent of the NCA are described below. | Local | Freely draining sandy Brecks soils (39 per cent) and freely draining slightly acid sandy soils (15 per cent) will benefit from increased organic matter content and the use of grass leys to improve soil structure and help minimise erosion risk. The shallow lime-rich soils over chalk (25 per cent), due to their calcareous nature have a degree of natural resilience. All these three soil types are valuable for aquifer recharge requiring the maintenance of good structural conditions to aid water infiltration and the matching of nutrients to needs to prevent pollution of the underlying aquifer.<br><br>Loamy and sandy soils with naturally high groundwater and a peaty surface (11 per cent) are at risk of continuing organic matter loss where drained and cultivated and topsoil loss /redeposition.<br><br>Changing management practices to reduce damage to soil quality could provide increases in food production in the long term. Increases in soil quality will reduce negative impacts from farming on the natural environment through reduction in run-off pollution; this will improve water quality and biodiversity. | There are opportunities to increase management measures that increase organic matter content through the use of grass leys to improve soil structure and minimise erosion risk while improving resilience.<br><br>There are opportunities to promote agri-environment schemes at targeted sites to deliver resource protection gains (for example by reverting severely damaged soils to grassland focusing on higher risk areas). | **Regulating soil quality**<br><br>**Regulating soil erosion**<br><br>**Regulating water quality**<br><br>**Food provision** |

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
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| **Regulating soil erosion** | Semi-natural vegetation cover<br><br>Hedgerows and tree belts (windbreaks)<br><br>Woodland, copses, scrub | With the Brecks' light sandy soils, soil erosion is identified as an issue. There is a risk of wind and water-based soil erosion, especially if the impact of climate change brings about drier summers, more intense rainfall events and higher wind speeds. Issues occur where the light sandy soils support open grown crops such as maize, and root crops such as potatoes and sugar beet or field-grown vegetables. Soil erosion is equally associated with spring-sown crops where soils remain uncovered during winter months and with outdoor pig rearing. Sand blows can occur when soils are dry and there is a lack of crop cover.<br><br>**Continued on next page...** | Regional/ Local | Soil erosion is a significant issue in this NCA. Increasing regulation of soil erosion by careful management of agricultural practices and by planting more permanent vegetation would help to reduce compaction, trap sediment and improve soil health. This approach would offer benefits to biodiversity, climate regulation and agriculture in the long run, by helping bind the soil, reducing sedimentation in rivers and by storing limited amounts of carbon in the soil. This could help maintain fertility in the longer term. | There are opportunities to encourage outdoor pig enterprises to limit soil erosion and encourage the sustainable production of crops (for example by minimising bare land, employing and incorporating green cover crops, adopting low ground pressure vehicles, avoiding compaction and slaking of soils) on the area's fragile soils thereby reducing soil erosion.<br><br>There are opportunities to ensure that soil management plans are in place to prevent deterioration of water quality caused by soil erosion and nutrient leaching.<br><br>There are opportunities to encourage the reversion to semi- natural vegetation cover by restoring heathland and planting small areas of woodland /short rotation coppice on severely damaged soils, focusing on higher risk areas. This may also help increase organic matter content of the freely draining sandy soils that dominate this NCA. These management measures will improve soil structure, help increase water infiltration (aiding aquifer recharge) and reduce the risk of water and wind based erosion. | **Regulating soil erosion**<br><br>**Regulating soil quality**<br><br>**Regulating water quality**<br><br>**Water availability** |

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
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| **Regulating soil erosion cont.** | | **... continued from previous page**<br><br>There is an enhanced risk of soil erosion on sloping cultivated ground or where bare soil is exposed. This is exacerbated where organic matter levels are low after continuous cultivation or soils are compacted. As noted above, there is also widespread potential for wind erosion where soils are cultivated or left bare, especially in spring. Within the freely draining slightly acid but base-rich soils, a few of the component soils may be susceptible to capping and slaking, again increasing the risk of soil erosion. These soils need to be managed carefully to reduce erosion risks with careful timing of cultivations and maintenance of vegetation cover.<br><br>The limited areas of peaty soils have a high risk of wind erosion (blowing), resulting in peat and carbon loss. | | | | |

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| **Regulating water flow** | Woodland<br><br>Wetlands<br><br>Rivers<br><br>Surface waters | The NCA falls mainly within the Great Ouse catchment. The Environment Agency flood risk map indicates that for much of the NCA flooding is not generally a major issue, although there are some small areas of high and medium flood risk associated with the River Lark and the River Wissey and small areas along the River Thet and the Little Ouse River. Historically, there has been fluvial and sewer flooding in Thetford, and sewer and surface water flooding in Swaffham. In Thetford it is considered that the current level of flood risk is managed appropriately and is not likely to increase significantly. Using river valleys for the storage of flood waters is being tested within this NCA at Cavenham Heath National Nature Reserve. | Local<br><br>Regional | Generally, the sandy soils and chalk bedrock enable rainfall to soak away. Historic river straightening and deepening has removed natural connections to floodplains. Recreation of floodplains to store floodwater is being tested at Cavenham Heath NNR. For the future, flood mapping of the rivers has shown that most development sites are not in a Flood Zone and flood risk is therefore reduced. | There are opportunities to increase the use of river valleys for flood storage; ideally divert excess winter rainfall into reservoirs for summer use thereby reducing the impact on aquatic habitats and species.<br><br>There are opportunities to adopt innovative and sustainable building and settlement design solutions, particularly using solutions such as sustainable urban drainage and green roofs given scarce water resources and the challenges of climate change.<br><br>There are opportunities to create and extend semi-natural floodplain habitats such as flood meadows, wet woodland and reedbed to mitigate the severity of downstream flood events. | **Regulating water flow**<br><br>**Regulating water quality**<br><br>**Regulating soil erosion**<br><br>**Regulating soil quality** |

| Service | Assets/attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
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| **Pollination** | Areas of semi-natural habitat, hedgerows, grass margins | The habitats in the area support a variety of pollinators which are essential to their maintenance and to agricultural production. The NCA contains 2,559 ha of lowland heathland and 1,360 ha of lowland meadows which both support nectar sources. It is possible that the numbers of pollinators has reduced due to species isolation which may be caused by commercial scale farming separating habitats, the changing climate or use of chemicals. | Local | Heathland, forest-edge, wood pasture and acid grassland habitats provide important nectar sources for pollinating insects and should be managed in good condition and expanded where possible to ensure this service continues effectively. Where arable cropping dominates, interstitial habitats (for example the edges of farm tracks) become the key sources of both pollen and nectar. These habitats are particularly important as they support the insects that pollinate commercial arable crops.<br><br>Financial support for farmers channelled through agri-environment schemes (for example Environmental and Countryside Stewardship) can fund these habitats in arable areas.<br><br>A good network of semi-natural habitat should be developed throughout the NCA to ensure this service performs to maximum effect. | There are opportunities to protect and extend the semi-natural habitat mosaics currently in the Brecks, particularly the heathland, grassland and woodland species that provide early and late nectar sources for native pollinators.<br><br>There are opportunities to increase pollen and nectar resources in intensive arable areas through the creation of (ideally species-rich), grass margins and bespoke pollen and nectar strips. | **Pollination**<br><br>**Biodiversity** |

| Service | Assets/attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
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| **Pest regulation** | Areas of semi-natural habitat/ hedgerows/ grass margins | The habitats in the area support a variety of species, such as beetles, which can regulate the populations of pests such as aphids. | Local | Interstitial habitats provide important over-wintering habitats for beneficial predatory invertebrates (for example ground and rove beetles) that feed on pests. Careful management of agro-chemicals (through Integrated pest management approaches) may in some cases remove the requirement for chemical intervention, although evidence of efficacy is patchy. Financial support for farmers channelled through agri-environment schemes (for example Environmental and Countryside Stewardship) can fund these habitats in arable areas. | A stronger and wider network of semi natural habitats would bring benefit for pest regulation, as well as pollination and biodiversity services. | **Pest regulation**<br><br>**Pollination**<br><br>**Biodiversity** |

| Service | Assets/attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
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| **Sense of place/ inspiration** | The Breckland SPA with its unique mosaic of arable farming, heath, river valleys and conifer forest<br><br>Geodiversity landforms (pingos and karst features)<br><br>Scots pine lines<br><br>Large manorial estates | Sense of place is provided by the distinct sandy soils and internationally important areas of lowland heathland that provide colour and texture within the landscape, with the Brecks characterised by a unique mosaic of arable, heath, river valleys and conifer forest, as well as the distinctive periglacial landforms such as pingos and karst features (including fluctuating meres). This is supported by a strong geometric field pattern clearly defined by pine shelterbelts along with a general absence of settlement. Traditional knapped flint, clunch and yellow brick buildings are distinctive features within the landscape, as are isolated churches. Localised contrast is provided by a number of lush, shallow river valleys, including some unusually fast-flowing chalk streams.<br><br>Large estates provide a reminder of the early 20th century sporting history of this area.<br><br>**Continued on next page...** | Regional | Increasing sense of place has the potential to increase tourism. Management to enforce sense of place is also likely to increase sense of history. Conserving and enhancing the distinct patchwork of landscape features is also likely to benefit biodiversity by enhancing or expanding available habitat. | There are opportunities to conserve and enhance the unique large-scale landscape character and historic environment of the NCA including the strong geometry of large, regular, arable fields and heaths, the contrasting mosaic of lowland and wetland habitats and parklands, the strong framework of Scot's pine lines, belts or forests, late Enclosure hawthorn hedgerows and long, straight roads.<br><br>There are opportunities to promote the links between geological sites, boundaries, archaeological evidence of human activity and the biological interest of these areas to achieve a wider understanding of the importance of the Brecks.<br><br>There are opportunities to conserve and enhance the farmsteads, churches and other vernacular buildings (and views to them) as these have a strong impact in a landscape of sparse settlement. | **Sense of place/ inspiration**<br><br>**Sense of history**<br><br>**Recreation**<br><br>**Biodiversity**<br><br>**Regulating soil erosion** |

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| **Sense of place/ inspiration cont.** | | **... continued from previous page**<br><br>Senses of inspiration are likely to be associated with the area's varying views of open heaths and wooded skylines that create a strong sense of enclosure in an otherwise open landscape. Localised river valleys, and large areas of quiet, undisturbed forests, reinforced by the historic features that are evidenced in the landscape add to feelings of inspiration and escapism. | | | Opportunities exist to promote the use of traditional building materials (flint, yellow-grey brick, and clunch) in restorations or new development and also to use local design guidance to maintain the characteristic nucleated settlement character and street patterns.<br><br>There are opportunities to engage new and existing communities in becoming actively involved in caring for their local environment and in doing so contributing to social cohesion, a sense of place and inspiration which then becomes rooted in the natural environment.<br><br>There are opportunities to support environmental community cohesion through the provision of managed access opportunities to wild and remote areas which provide solitude and inspirational views. | |

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| **Sense of history** | The Neolithic flint mines of Grimes Graves<br><br>Rabbit warrens and occasional warren lodges<br><br>Thetford's Norman castle<br><br>18th and 19th century designed parklands<br><br>Old airfields and Second World War structures | A significant sense of history is engendered evidenced by the high concentration of important archaeological features, relating to its long continuity of human settlement. The relationship of a number of these sites to the area's geology / geomorphology adds considerably to historic knowledge. Significant sites include those producing Neolithic flint artefacts, bronze-age burial monuments, iron-age and Roman settlements, Saxon earthworks, medieval churches, monastic remains and abandoned villages. Of particular importance, are the remains of extensive medieval / post medieval rabbit warrens. A sense of history is associated with the surviving parklands such as Euston, Elveden, Culford, Shadwell, Lynford and Pickenham Parks. This historic character is reinforced by the local village architecture related to country houses such as at Elveden and Euston. More recent evidence of the past includes the remains of military activity, including Second World War airfields such as at Lakenheath and Honnington. | National<br>Regional | Maintaining, conserving and enhancing the sense of history, through promoting the links between geological sites, boundaries, archaeological evidence of human activity and the biological interest of these areas would achieve a wider understanding of the importance of the NCA.<br><br>Increased opportunities to interact with the history, may have potential to increase the service. This may lead to increased recreation and tourism in the area, although management would be needed to ensure this is sustainable and does not have a negative impact on the assets themselves. The reinforced sense of history could contribute strongly to sense of place in the landscape. | There are opportunities to continue to manage the NCA's agricultural, forest, wetland and heathland landscapes for biodiversity and the sense of history they provide to ensure the area remains in suitable condition while increasing the opportunities for sustainable recreation and tourism.<br><br>There are opportunities to increase the sense of history by protecting the character and historic resource of the historic estates and parklands, for the cultural history they contribute to the landscape character of the Brecks.<br><br>There are opportunities to investigate ways of securing better management of heritage assets particularly those which have been identified as 'heritage at risk' increasing their contribution to the distinctive cultural and physical landscape. | **Sense of history**<br><br>**Sense of place/ inspiration**<br><br>**Recreation** |

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| **Tranquillity** | Large areas of forest and private farmland. | The Brecks is amongst the most tranquil areas in the east of England. Around 60 per cent of its area is classified as undisturbed. Tranquillity has steadily fallen since the 1960s when 86 per cent of the area was classified as undisturbed.<br><br>Intruded areas are primarily associated with the town of Thetford, the A11 corridor and development in the west and with regular intermittent low flying from military aircraft.<br><br>Characteristics of the landscape that are particularly important in conveying a sense of tranquillity are the large areas of forest and private farmland. Threats to tranquillity come from new housing (especially around Thetford) and increased car travel. | Local | The high recreation value around Thetford Forest reduces the tranquillity levels and is at risk of causing disturbance and damage to the important habitats within the area. An increase of intrusion should be reduced and carefully managed where possible.<br><br>Preventing the further disturbance of areas of tranquillity by sustainably managing the increasing recreational forest tourism would bring benefits for people's enjoyment of the NCA as a tranquil landscape.<br><br>New development, can be mitigated and softened with appropriate landscaping and planting which in turn would increase levels of tranquillity and help to increase biodiversity, natural beauty and the sense of place. | There are opportunities to plan for the sense of tranquillity when considering the location and design of new development and infrastructure, securing multiple benefits through the provision and management of high-quality green infrastructure including planting woodland shelter belts, strengthening the hedgerow pattern and ensuring new development on settlement fringes is sensitively designed.<br><br>Opportunities exist to protect areas of high biodiversity value particularly containing key species (such as stone curlew, woodlark and nightjar) that are sensitive to human disturbance, by ensuring positive access management to tranquil favourable habitat areas. This will also allow people to feel connected to nature and contribute to well-being and health. | **Tranquillity**<br><br>**Sense of place/ inspiration**<br><br>**Biodiversity** |

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| **Recreation** | Thetford Forest and the Kings Forest<br><br>Country parks<br><br>Nature reserves<br><br>Footpaths and open access land | Recreation is supported by 531 km of public rights of way (at a density of just 0.51 km per km2), and 2,343 ha of open access land covering 2.3 per cent of the NCA, although much of this is closed between February and November to protect rare ground-nesting birds (for example stone curlew).<br><br>Recreation is largely centred on Thetford Forest with forest walks and rides as well as more formal provision at the High Lodge Centre, with facilities such as Go-Ape, mountain bike hire, summer concerts, and guided activities. Wide-ranging opportunities for exploration are also offered by country parks and heath and wetland nature reserves.<br><br>The Peddars Way and Norfolk Coast National Trail also both run through the NCA. | Regional | Countryside recreation is on the increase within the NCA. Increased recreation creates the potential for increased conflict with the conservation of important bird species (for example stone curlew). Recreational opportunity within the NCA could be increased without impacting significantly on other services, so long as appropriate management is in place ensuring that the area's sensitive and often rare biodiversity, rich geodiversity and historical sites are protected. The creation of new recreation resources close to areas of growth in Thetford, however, should reduce the pressure on more sensitive sites. | There are opportunities to continue to develop the area as a responsible tourism destination with potential for appropriate use of the Forestry Estate and adjoining farmland linked to the access network.<br><br>There are opportunities to promote the recreational and education opportunities offered by managed public access to all habitats through clear signposting and interpretation improving understanding and enjoyment of fragile environments and sensitive bird species.<br><br>Support local partnerships to invest in access and recreation provision; implement the Thetford Green Infrastructure Strategy and Norfolk and Suffolk Rights of Way Improvement Plans to improve recreational and health benefits for the local population.<br><br>Maintain and improve access to important geological exposures, rivers and the Neolithic flint mine at Grimes Graves. | **Recreation**<br><br>**Geodiversity** |

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| **Biodiversity** | Semi-natural /priority habitats (calcareous and acid grasslands, heathlands, wetlands, coniferous and deciduous woodlands).<br><br>Arable farmland | There are over 10,985 ha (11 per cent of the area) of priority habitats within the NCA. The NCA contains 1 SPA, 4 SACs and 40,372 ha are nationally designated as SSSI. Subsequently 40 per cent of the NCA is covered by national nature conservation designations.<br><br>Semi-natural habitats including lowland heathland and acid grassland are under pressure from commercial scale farming, which is an important land use in this area.<br><br>The demand for water used to irrigate crops grown on the dry Brecks soils and nutrient leaching and run-off from outdoor livestock farming, particularly pigs, can also impact upon the important wetland habitats. | Local<br>National | There is scope to improve biodiversity by working with land managers through conservation and Environmental and Countryside Stewardship schemes. | There are opportunities to expand and create new habitats and ecological networks for species.<br><br>There are opportunities to enhance the management of dry habitats, especially acid and chalk grass heaths and heather heaths,<br><br>Ensure continued careful planning of felling and woodland management to retain the variety of different woodland structures and transitions to heath and woodland edge habitats.<br><br>Opportunities exist to enhance the management of wetland habitats and river corridors, carefully managing water availability and quality to achieve favourable ecological condition.<br><br>Secure and enhance spring fed and groundwater fed habitats, river flows through appropriate water resource management. | **Biodiversity**<br><br>**Sense of place/ inspiration** |

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| **Geodiversity** | Geology, patterned ground features (striped soils), pingos<br><br>Designated geodiversity sites<br><br>Traditional knapped flint and clunch (a form of hard chalk) are characteristic local building materials | The Brecks has one of the longest surviving histories of mineral extraction in England with flint mining dating to Neolithic times. Grimes Graves is the only Neolithic flint mine open to visitors in Britain.<br><br>Over 400 mine shafts are surrounded by an open 'lunar' landscape of shafts, pits, quarries and spoil dumps.<br><br>More recent mineral extraction has focused on sands and gravels deposited during and after glaciation. Long-established quarries (for example Cavenham Quarry) abut sensitive and internationally-important areas of habitat. | Local | The geology of the NCA gives it a sense of place clearly distinctive from surrounding NCAs. The assets such as the patterned ground, pingos and meres provide opportunities for interpretation and access to the public. These features make a significant contribution to the sense of place and sense of history of the area.<br>As a consequence of further development in the NCA and the east of England as a whole, demand is likely to continue for quarried raw materials. | There are opportunities to maintain and improve access to the full range of important geological exposures, rivers and the Neolithic flint mines at Grimes Graves, to help increase understanding and enjoyment in the resource, and the history of the area.<br><br>Opportunities exist to provide resources for management of geodiversity (for example through CES or agri-environment schemes).<br><br>Seek opportunities to interpret the link between the area's defining geodiversity and interests such as archaeology and early settlement pattern, the influence of geodiversity on the landscape of the NCA and the relationship between geodiversity and provisioning services such as water supply.<br><br>There are also opportunities to ensure new development is in keeping with the character of the area by using traditional building materials (flint and clunch) wherever possible to enhance the sense of place. | **Geodiversity**<br><br>**Sense of history**<br><br>**Sense of place/ inspiration**<br><br>**Recreation** |

**Photo credits**

Front cover: Old twisted pine lines within the mosaic of woodland and heathland is a defining feature of Breckland. © Jonathan Dix

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