



## Introduction

As part of Natural England's responsibilities as set out in the Natural Environment White Paper<sup>1</sup>, Biodiversity 2020<sup>2</sup> and the European Landscape Convention<sup>3</sup>, 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.

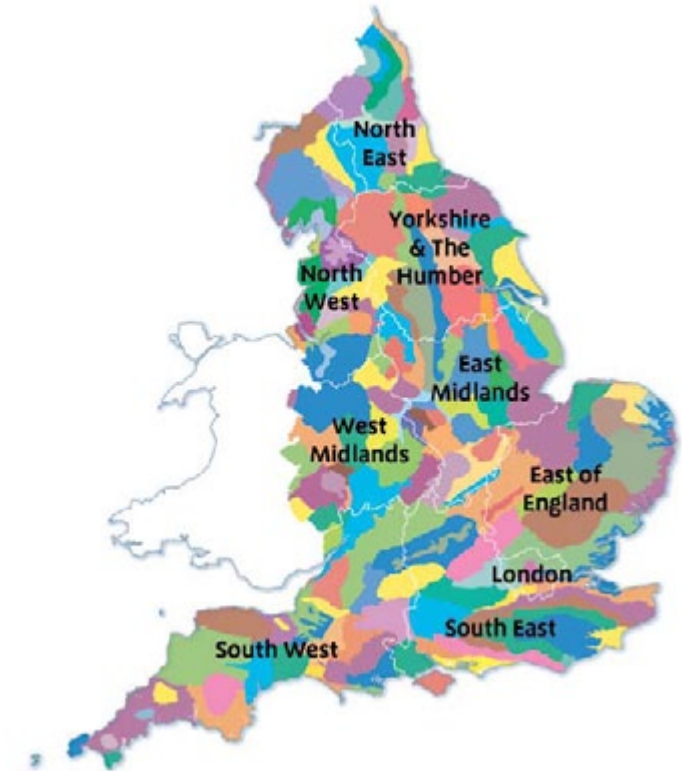
NCA profiles are guidance documents which can help communities to inform their decision-making about the places that they live in and care for. The information they contain will support the planning of conservation initiatives at a landscape scale, inform the delivery of Nature Improvement Areas and 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](mailto:ncaprofiles@naturalengland.org.uk)

## National Character Areas map



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

<sup>2</sup> 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](http://www.defra.gov.uk/publications/files/pb13583-biodiversity-strategy-2020-111111.pdf))

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

## Summary

The East Anglian Chalk National Character Area (NCA) is characterised by the narrow continuation of the chalk ridge that runs south-west–north-east across southern England. The underlying geology is Upper Cretaceous Chalk, which is covered in a surface deposit of ice and river-deposited material laid down during the last ice age. This creates a visually simple and uninterrupted landscape of smooth, rolling chalkland hills with large regular fields enclosed by low hawthorn hedges, with few trees, straight roads and expansive views to the north.

The vast majority of its landscape is open countryside, under cereal production. Sustainable farming practices are required to help to manage the thin chalk soils and support wildlife in the wider countryside. It is an open landscape but trees on hill tops are visually distinct and characteristic. The smooth, rolling chalkland hills are dissected by the two gentle valleys of the rivers Granta and Rhee, which converge to form the River Cam just south of Cambridge.

The porosity of the area's Chalk geology is one of its most noticeable assets. Rain is largely absorbed through tiny, connected pores and natural fractures, instead of lying on the surface and forming rivers, lakes and ponds. Rainwater moves through the thin chalk soils and slowly replenishes the strategically important chalk aquifer below.

Historically, sheep rearing and corn production have shaped the area, leading to the creation of botanically rich grasslands, which are now often small and fragmented. Large-scale cereal production dominates the predominantly agricultural landscape, and care must be taken to ensure that the soil quality is maintained to support a viable and sustainable future for farming.

Settlement was limited, but over the last 50 years towns – including the university city of Cambridge – and commuter villages have grown rapidly. There is pressure for more development, which is adding to the demand for water and is likely to further reduce the tranquillity of the NCA.

A significant influence around Newmarket has historically been horse-racing and stud farms, which have brought a manicured appearance to the landscape. There is great opportunity to work with the horse-racing industry to improve the quality of the grassland and shelterbelts for the benefit of biodiversity.

The chalklands are traversed by several ancient trackways, including the major ancient trackway, the Icknield Way, which extended along the length of the south-west–north-east chalk outcrop to The Ridgeway in Oxfordshire. The importance of strategic road and railway transport links across this landscape continues today.

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

## Statements of Environmental Opportunity

- **SEO 1:** Maintain sustainable but productive agricultural land use, while expanding and connecting the chalkland assemblage of semi-natural grasslands, for example by sensitive management of road verges and extending buffer strips along field margins, to benefit soil and water quality, reduce soil erosion, strengthen landscape character and enhance biodiversity and pollinator networks.
- **SEO 2:** Conserve the regionally important East Anglian chalk groundwater resource, by working in partnership to ensure that an integrated catchment-scale approach is secured for its enhanced long-term management, including the chalk streams, for the benefit of biodiversity, landscape character and recreational experience.
- **SEO 3:** Conserve and promote the landscape character, geodiversity, historic environment and historical assets of the chalklands, including the open views of undulating chalkland, large rectilinear field pattern and linear ditches, strong equine association and the Icknield Way prehistoric route. Improve opportunities to enhance people's enjoyment of the area while protecting levels of tranquillity.
- **SEO 4:** Conserve the settlement character and create or enhance sustainable urban drainage systems and green infrastructure within existing and new developments, particularly in relation to the urban fringe and growth areas such as south-east Cambridge, to provide recreation opportunities, increase soil and water quality and enhance landscape character.



Looking towards Cambridgeshire claylands and modern transport routes from Therfield Heath.

## Description

### Physical and functional links to other National Character Areas

The East Anglian Chalk of Bedfordshire, Cambridgeshire, Hertfordshire, Suffolk and north-west Essex forms a narrow continuation of the chalk ridge that runs south-west–north-east across southern England, continuing in the Chilterns National Character Area (NCA) and along the eastern edge of The Wash. The northern boundary is clearly defined by the base of the north-west-facing chalk scarp slope, around the southern limit of Cambridge and along the fenland edge. From the higher ground to the south-east there are wide panoramas across the Bedfordshire Claylands NCA and the adjoining Fens NCA. To the north-east, sandy soil is blown over the Chalk, exerting a shared 'breck' character with the neighbouring Brecks NCA, visible in characteristic knarled Scots pine hedgerows. To the south and east it is bounded by the overlying chalky boulder clay of the South Suffolk and North Essex Clayland NCA, which includes Saffron Walden. The Wadlow Wind Farm, north of Balsham in Cambridgeshire, is a prominent feature along the boundary between the two NCAs.

The chalkland landscape is united with the rest of the East Anglian NCAs as a major food producer, with arable farming being the predominant land use. The smooth, rolling chalkland hills are dissected by the two gentle valleys of the rivers Granta and Rhee, which converge flowing westward into the River Cam just south of Cambridge. The Rhee begins at Ashwell Springs in Hertfordshire, running north then east 19 km through the farmland of southern Cambridgeshire. The longer tributary, the Granta, starts in Essex and flows north into the East Anglian Chalk NCA near Saffron Walden. The underlying chalk aquifer provides functional links between these areas and the population of East Anglia, whose water the aquifer supplies.



**Gallops, near Newmarket showing rectilinear field pattern, enclosed by tall hedges and currently species-poor grassland.**

The East Anglian Chalk NCA is traversed by a major prehistoric routeway, the Icknield Way, which links the Peddars Way and The Ridgeway National Trails. Important strategic railways and road transport links still exist, including the M11, A14, A505 and A10 (Ermine Street).

## Key characteristics

- The underlying and solid geology is dominated by Upper Cretaceous Chalk, a narrow continuation of the chalk ridge that runs south-west–north-east across southern England, continuing in the Chilterns and along the eastern edge of The Wash. The chalk bedrock has given the NCA its nutrient-poor and shallow soils.
- Distinctive chalk rivers, the River Rhee and River Granta, flow in gentle river valleys in a diagonally north-west direction across the NCA.
- The chalk aquifer is abstracted for water to supply Cambridge and its surroundings and also supports flows of springs and chalk streams; features associated with a history of modification include watercress beds, culverts and habitat enhancements.
- The rolling downland, mostly in arable production, has sparse tree cover but distinctive beech belts along long, straight roads. Certain high points have small beech copses or 'hanger', which are prominent and characteristic features in the open landscape. In the east there are pine belts.
- Remnant chalk grassland, including road verges, supports chalkland flora and vestigial populations of invertebrates, such as great pignut and the chalkhill blue butterfly.
- Archaeological features include Neolithic long barrows and bronze-age tumuli lining the route of the prehistoric Icknield Way; iron-age hill forts, including that at Wandlebury; impressive Roman burial monuments and cemeteries such as the Bartlow Hills; a distinctive communication network linking the rural Roman landscape to settlements and small towns, such as Great Chesterford; the four parallel Cambridgeshire dykes that cross the Chalk: the Anglo-Saxon linear earthworks of Devil's Dyke, Fleam Dyke, Heydon/Bran Ditch and Brent Ditch; ridge-and-furrow cultivation remains of the open field systems of the earlier medieval period; and large numbers of later moated enclosures, park lands



Wandlebury Hill Fort from the air in 1980. The wooded concentric earth bank can be clearly seen.

- created, sheepwalks, arterial routes and nucleated villages that emphasise the land use change of this period.
- Brick and 'clunch' (building chalk) under thatched roofs were the traditional building materials, with some earlier survival of timber frame. Isolated farmhouses built of grey or yellowish brick have a bleached appearance.
  - Settlement is focused in small towns and in villages. There are a number of expanding commuter villages located generally within valleys. Letchworth Garden City is a nationally significant designed garden city.
  - In and around the wider area of Newmarket, stud farms impose a distinctive geometric, enclosed and manicured pattern to the landscape.
  - The NCA is traversed by the Icknield Way, an ancient route that is now a public right of way. Roads and lanes strike across the downs perpendicularly and follow historical tracks that originally brought livestock to their summer grazing. Today major roads and railways are prominent landscape characteristics of the NCA.

## East Anglian Chalk today

The East Anglian Chalk of Bedfordshire, Cambridgeshire, Hertfordshire, Suffolk and north-west Essex forms a narrow continuation of the chalk ridge that runs south-west–north-east across southern England, continuing in the Chilterns and along the eastern edge of The Wash.

This is a visually continuous, open landscape, with occasional long views over the lower land to the north and west. The valleys of the rivers Granta, Rhee and Cam have a contrasting small-scale intimacy that is enhanced by small woods, pasture and wetland vegetation. The river flow changes seasonally, nearly drying up completely in summer. Chalk rivers and their aquifers have long provided drinking water for East Anglian residents. The porous chalk results in limited surface water, but there are springlines where surface topography intercepts the aquifer or where groundwater emerges at less permeable horizons, such as the Totternhoe Stone at Ashwell. The clean spring water of the chalk has also had an influence on local industry, reflected in the local paper- and parchment-making tradition and frequent watercress beds.

Arable farming, as well as sheep grazing, have been significant since the prehistoric period; their importance has ebbed and flowed, as in the other chalk and limestone plateaux and downs of southern England. The smooth, rolling chalkland hills were historically grazed by sheep but the land use is now dominated by large-scale cereal production. The large fields are enclosed with low thorn, and characterised by often 'gappy' hedgerows and few trees. There is very little grazing pasture or livestock except within the small river valleys. Medieval deserted settlements testify to the shrinkage of arable cultivation after the 14th century, and there is an abundance of archaeological sites dating from the Neolithic Period. Also prominent are Anglo-Saxon linear dykes (Devil's Dyke,



Racehorses setting off for morning exercise near Newmarket.

Fleam Dyke and Brent Ditch), consisting of earthbanks with an adjacent ditch, which span the chalkland from the fen edge east of Cambridge to the wooded edge on the higher claylands. Devil's Dyke is 11 km long, 6 m high and 4 m wide. A fourth, Heydon/ Bran Ditch near Fowlmere, has been almost completely lost to agriculture over time.

Roads are often lined with shelterbelts of beech, particularly to the eastern end, and these, together with hill-top clumps and copses, offer a little diversity. In the transitional area bordering the Brecks, pine belts begin to take over from beech. Ancient woodland and spring-fed meadows also feature here.

A significant influence around the southern edge of Newmarket has been that of horse-racing and stud farms, which have brought localised wealth and a manicured appearance to the landscape. The horse-racing industry has created a geometric grid, as the fences and shelterbelts of the stud farms provide a more enclosed pattern. This gives a well-wooded character within an area that extends in a broad sweep from the south-west (Six Mile Bottom) around to Moulton in the east.

On the fen edge in the north of the NCA is Chippenham Fen, an important wetland. Most sites of biodiversity interest today are remnants of the once-extensive chalk grassland scattered throughout the natural area. The largest survivors are managed grasslands: the gallops at Newmarket and Royston; and the golf courses of the Gog Magog Hills and Therfield Heath. Fragments occur on roadside verges, in chalk pits such as Cherry Hinton, and along sections of the ancient linear dykes, Roman roads and disused railway lines.

Invertebrates such as the chalkhill blue butterfly are still associated with grasslands, but populations have generally declined with habitat fragmentation. Blue Lagoon is an old chalk and clay pit at Arlesey which has filled with water, but the surrounding land has become good semi-natural grassland. In the arable landscape there are still hotspots for the arable weeds ground pine and Venus' looking-glass. In the Whittlesford area, the hollows formed by ground ice in periglacial conditions support grass-poly and fairy shrimp, one of the few British populations. There are still areas that support good populations of farmland birds, for example grey partridge around Royston, but generally there is a decline, for example in species such as turtle dove and skylark.

The village cores have a traditional appearance, with houses constructed of brick or 'clunch' under thatched roofs. Clunch is a soft chalk or limestone that hardens when dry but is prone to weathering erosion. To the east of Newmarket the villages tucked into the more undulating terrain are often Georgian, built of red brick and flint with slate, pegtile or thatched roofs. Further south there is a transitional zone around Saffron Walden (in the South Suffolk and North Essex Clayland NCA) onto the till, which supports a series of small attractive villages such as Barley, Barkway and the Chishills. Settlement has expanded as a result of significant 20th-century development. Letchworth Garden City is a planned garden city.

The chalklands are traversed by the prehistoric routeway, the Icknield Way, which is now a long-distance footpath offering recreational opportunity for locals and for seasoned ramblers, linking the Peddars Way and The Ridgeway National Trail. In *The Icknield Way*, nature writer Edward Thomas wrote about this ancient route. Grassland along the Icknield way is a stronghold of great pignut. The Fleam Dyke and Roman Road Walk is a 40-kilometre waymarked route, incorporating two of Cambridgeshire's ancient linear sites.

Race days at Newmarket, and Duxford, now part of the Imperial War Museum, are significant leisure attractions, bringing thousands of visitors, many from long distances, while the iron-age hill fort at Wandlebury is now much-used locally for picnics and wildlife walks. A Cambridge student's memory of visits to Wandlebury Ring and the Gog Magog Hills is described by E.M. Forster in *The Longest Journey*.

Historically, the Chalk has been a significant source of raw materials for building purposes. Today, chalk is extracted for agricultural lime, as at Great Wilbraham, and notably for industrial whiting fillers at Steeple Morden quarry.



## The landscape through time

During the Upper Cretaceous this area was dominated by marine environments. Locally, Cretaceous Gault Clay and Upper Greensand are overlain by the Chalk which forms the characteristic ridge of the NCA. The Chalk was deposited in a shallow, warm sea that covered much of Europe from 94 to 66 million years ago. It is made up of the calcareous microscopic remains of plankton and includes remains of fossils, such as ammonites, and characteristic flint nodules. After its deposition and uplift, and following the retreat of the Cretaceous seas, the Chalk was significantly eroded during the ice ages with the advance and retreat of ice during the Anglian glaciations, some 400,000 years ago. Glacial action 'bulldozed' large masses of chalk to form the chalk ridge to the west and east of Royston. During the most recent glaciations the area was not ice covered but was tundra-like during which time the dry valleys and swallow holes of the Chalk and the patterned ground of the nearby Brecks were formed.

In the post-glacial period, 'early man' would probably have cleared the more lightly forested area on the chalk escarpment. Fossil pollen records show significant changes from about 6,000 bp as the wildwood was cleared and pastoral farming became more widespread, leading to the open, treeless downland.

Spring-fed prehistoric settlements developed on the chalk downs (such as at Ashwell, Melbourn and Steeple Morden), on the terraces of the Cam valley and around exploitation sites where flint nodules used for tool making (for example at Duxford and Thriplow) were exposed in the upper strata of the Chalk. Neolithic and bronze-age ceremonial and funerary monuments are widespread across the Chalk (for instance at Therfield Heath), attesting to their long-term



Trees growing on Wandlebury hill fort and surrounding land seen from a 1946 aerial photograph.

use for settlement and agriculture. Although distributed more widely across the chalklands, the Cam valley became a focal point for larger-scale iron-age and Roman settlements, such as at Great Chesterford (similar to the modern A11 route), where the rivers and new roads forged further connections, linking older routes with the new settlements on the clay plains or gravel terraces. Ermine Street, the London (*Londinium*) to York (*Eboracum*) road, passed by the Chalk-based settlement at Royston, before crossing the clays to the north to reach Godmanchester. Four great linear dykes (Devil's Dyke, Fleam Dyke, Brent Ditch and Heydon/Bran Ditch) were built by the Saxons to control movement along the Icknield Way between the 5th and 7th centuries ad.

Medieval moated sites, park lands and nucleated villages are distinctive features of medieval settlement on the Chalk, many of which are preserved in the grounds of later country estates (for example Barrington, Sawston and Fulbourn), and many are also Scheduled Monuments.

The light chalk soils were well suited to arable farming, which contracted in the 14th and 15th centuries. Extensive unenclosed downland pasture remained until the late 18th century, but from this period an increasing area was enclosed and returned to the plough. Dry heaths were burnt before cultivation in the area around Dullingham, as described by agricultural writer Arthur Young in 1805. The cleared areas would have either become grazing land or been cropped. As productivity fell, the fields were abandoned and allowed to revert to woodland or they became pasture. On the chalky soils, calcareous grassland would have developed, with sheep preventing the return to woodland. An increasing use of manure from yard-fed cattle and of artificial fertilisers characterised the 19th and early 20th centuries. Isolated white- or yellow-brick farmhouses were built on the hill tops, mainly in the 19th century, reflecting this period of agricultural growth.

Settlement occurred along the sides of the river valleys, where small villages were founded, such as Linton. Sheep farming survived well into the 20th century; since then agricultural land has been used to grow barley and other high-value crops such as flax and oilseed rape despite the thin, poor soils.

The clean spring water of the chalk has had an influence on local industry, such as watercress beds and the paper industry at Sawston. Much local chalk and 'clunch' quarrying took place, particularly at villages on the fen edge, for example at Steeple Morden. Until recently Barrington quarry provided huge quantities of chalk and clay for cement making, and Cherry Hinton provided builder's lime and also the chalk 'clunch' used to build Cambridge.

Cambridge, outside this NCA but of influence, developed as an internationally significant university city in the medieval period, not substantially expanding out of its medieval boundaries until the 19th century; and a market was established at Newmarket in the 13th century (hence the name). Horse-racing's history in Newmarket can be traced back to at least the reign of King James I. With its paddocks and gallops, it has been a centre of racing and horse-breeding excellence since the early 17th century. By the early 18th century the thoroughbred racehorse was the aristocratic status symbol par excellence and people crowded to the racecourse on top of the rolling downland. (The embankment, or vallum, of Devil's Dyke, which divides the July and Rowley Mile courses, provides a viewing platform.)

Horse-racing and golf courses have safeguarded chalk grasslands, but species diversity has been lost. Great bustard was last seen nearly 200 years ago and used to breed near Newmarket. Although chalk grassland is present today, the number of individual species it supports is reduced; for example, the chalkhill blue butterfly is in decline.

In the 20th century villages have maintained a historic core but some, especially those with a railway station, have become commuter villages, such as Foxton and Meldreth. Letchworth Garden City, the world's first garden city, was established in the 20th century, and other towns grew substantially in the latter part of that century.

Cambridge is one of the fastest-growing cities in Western Europe and its expanding southern developments in the greenbelt influence the built-up character of this area. The railway across the south Midlands linking East Anglia with the West Country by way of the cities of Cambridge and Oxford was closed amid great controversy in the 1970s.

Since the 1950s, tranquillity has declined around the urban centres and - the transport routes, especially around the M11, A505 and A10. Several wind farms have been built in the last five years which have a visual impact on the landscape.

Post-war enlargement of fields by hedgerow removal saw the creation of open fields, particularly concentrated in Hertfordshire and Bedfordshire, although some places, such as Bygrave, were never enclosed. The area is still important for arable weeds, including grass-poly and Venus' looking-glass; with the intensification of agriculture in the last 50 years there has been a large decline in species numbers.

The NCA has experienced dramatic land use changes in past and recent times. These changes have influenced the present nature, location and extent of the wildlife resource. There is recognition of the importance of the remnant habitats, sometimes confined to roadside verges; the small scale of these sites makes management - and therefore maintenance of biodiversity value - very difficult.



**Fleam dyke, one of the four ancient defensive earthworks preventing access to East Anglia.**

## Ecosystem services

The East Anglian Chalk 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 East Anglian Chalk NCA is contained in the 'Analysis' section of this document.



Large-scale arable production: view taken near Newham.

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

- **Food provision:** As a result of the prominence of Grade 2 agricultural land, cereals dominate the arable production and wheat is the main crop. Oilseeds and malting barley are also significant crops.
- **Water availability:** Although this is a dry landscape it is an important catchment, as the underlying chalk aquifer supplies have been generally assessed as being 'over-licensed' or 'over-abstracted'.<sup>1</sup> The majority of the water supply to Cambridge comes from these chalk strata aquifers south of the city. Low flows and the cessation of flows, caused by water abstraction and drought, affect watercourse habitats and adjacent habitats in the NCA. Spring-fed fens and mires also suffer from low flows and the absence of flows at times of the year due to abstraction and drought.

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

- **Regulating soil erosion:** The chalk soils over most of the NCA have a low carbon content. Soil erosion is identified as an issue in this catchment; the most vulnerable areas are on the steep slopes under arable production, particularly at times when there are high-intensity downpours when crops are establishing, or during harvesting. Prevention involves increasing green cover crops such as extending grasslands on field margins and slopes.
- **Regulating water quality:** The surface water chemical status of the River Granta, the River Cam and the New River is good. In the north-east and the south of the NCA the groundwater chemical status is poor, while in the south-west of the NCA the groundwater chemical status is good.

- **Regulating soil quality:** Some 57 per cent of the NCA has high-quality Grade 2 agricultural soils. Cultivation practices need to address the low organic content of soils, such as by extending grasslands where appropriate and ensuring that nutrient inputs are carefully managed, adhering to nitrate vulnerable zone guidelines.

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

- **Sense of place/inspiration:** Sense of place is provided by the low-lying chalk ridge that forms the easterly extension of the Chilterns, creating a visually simple and uninterrupted landscape of smooth, rolling chalkland hills, with light-coloured soils in winter and cereal crops in summer. The prominence of the horse-racing industry at Newmarket is reflected in the manicured appearance of the landscape. A sense of inspiration includes a Cambridge student's memories of visits to Wandlebury Ring and the Gog Magog Hills as described by E.M. Forster in *The Longest Journey*.
- **Sense of history:** The history of the landscape is evident in the landscape-scale earthwork features, including the iron-age fort at Wandlebury and the defensive structures of Devil's Dyke, Therfield and Fleam Dyke. In addition, a wealth of Romano-British and late iron-age settlement remains (for example at Great Chesterford and Baldock). Aspects of history likely to be most evident to the general public include the large-scale earthworks related to the Icknield Way, the Cambridgeshire dykes and the impressive prehistoric burial monument earthworks along it, while some sections of the Roman roads and the dykes are well-supported Local Nature Reserves (for example Worsted Street, Devil's Dyke and Fleam Dyke). Medieval moated manorial earthworks, historic and traditional buildings, nucleated villages, historic farmsteads and grand houses, many of which are open to the public, form a mosaic of interest in the historic environment of the chalklands.



Worsted Street, Roman road, clearly seen from an aerial photograph.

- **Recreation:** Race days at Newmarket and air shows at Duxford attract a significant number of visitors from the UK and from abroad. Newmarket is renowned for its horse-racing, while Duxford airfield forms part of the Imperial War Museum. Recreational opportunities are provided by nearly 850 km of rights of way, including some of ancient origin (for example Icknield Way and Worsted Street Roman Road), but there is only just over 200 ha of open access land. Therfield Heath is periodically host to kite-flying festivals.
- **Biodiversity:** Site of Special Scientific Interest (SSSI) designation protects more than 1,000 ha of habitat. The majority of habitats lowland calcareous grassland, but much of this is fragmented and sometimes confined to roadside verges. It is difficult to manage small and/or linear sites (such as Roman roads) to retain the biodiversity value of chalkhill blue and great pignut. Chalk streams and fens or spring-fed marshes (for example Fowlmere, Thriplow and Shepreth L-Moor SSSI) are of importance in this NCA, but modification and over-abstraction have led to a decline in the ecological value of the streams.
- **Geodiversity:** The Chalk produces water that is naturally mineral rich, sediment free and of a stable temperature and as such supports specialised chalk stream ecology. A series of important nature reserves are located along the springline at the base of the chalk scarp, notably at Chippenham, Fulbourn and Fowlmere. Barrington Chalk Pit cuts down through the Lower Chalk into the phosphatic Cambridge Greensand and underlying Gault Clay. Barrington Chalk Pit exposes sediments to the warm interglacial Ipswichian, deposited between the Anglian and Devensian glaciations, and has yielded a diverse Pleistocene fossil mammal fauna including hippopotamus, rhinoceros, elephant, lion and hyena. These sites, together with the other locally important sites, help us to understand the changing environments and life of the region.



Chalkhill blue butterfly feeding on knapweed, on a small remnant grassland site.

## Statements of Environmental Opportunity

**SEO 1: Maintain sustainable but productive agricultural land use, while expanding and connecting the chalkland assemblage of semi-natural grasslands, for example by sensitive management of road verges and extending buffer strips along field margins to benefit soil and water quality, reduce soil erosion, strengthen landscape character and enhance biodiversity and pollinator networks.**

**For example, by:**

- Encouraging resource-efficient farming where risks are identified and can be managed to reduce negative impacts. For example, arable reversion should be targeted in areas of high soil erosion risk and fertiliser use minimised where infiltration into the aquifer is rapid.
- Conserving and maximising the soil resource, aiming particularly to avoid deterioration of soils with high Agricultural Land Classification grades.
- Encouraging sheep grazing on biodiverse grasslands to bring benefits to biodiversity and sense of place. Advise longer growing periods between grazing and increase sward diversity in leys to improve root penetration and soil stability.
- Seeking opportunities for restoration and creation of low-input and unimproved grassland and creation of buffer strips for wildlife where appropriate within catchments in the National Character Area (NCA). This will reduce run-off and provide improvements in water availability from the rivers and the main aquifer, as well as providing networks of habitats for pollinators.
- Optimising benefits for farmland birds and rare arable plants by maintaining stubble and cultivated and uncropped field margins to provide winter food and safe nesting habitats.
- Lowering the nutrient input and ensuring grazing or cutting after flowering by the horse-racing industry. This could significantly expand the species-rich grassland area.
- Establishing a resilient ecological network, identifying and addressing gaps and building core areas, particularly in relation to chalk grassland and flood plain habitats.
- Promoting and enhancing management of road verges for high-quality grassland habitat.
- Exploring and realising opportunities for restoration and creation of favourably managed wetland habitats along the flood plains of the rivers Cam, Granta and Rhee.



Chalk grassland roadside verge with remnant grassland flora.

**SEO 2: Conserve the regionally important East Anglian chalk groundwater resource, by working in partnership to ensure that an integrated catchment-scale approach is secured for its enhanced long-term management, including the chalk streams, for the benefit of biodiversity, landscape character and recreational experience.**

**For example, by:**

- Working in partnership with water companies across the water supply network area to replace or prevent/limit damaging abstraction and consumption, including engaging water consumers about negative impacts of unsustainable abstraction on East Anglian chalk streams.
- Exploring opportunities for the expansion of semi-natural wetland habitats along the flood plains of the rivers Cam, Granta and Rhee, including reedbeds next to watercourses to act as nutrient sinks.
- Engaging communities in better understanding of the relationship between geodiversity, the underlying aquifer, water quality and availability, and soils and the natural processes that limit available resources.
- Creating grassland buffer strips running across slopes within catchments to reduce sediment and nutrient run-off into adjacent watercourses, thereby improving the quality of the rivers and their flood plains. Also restore river character, for example pollarding willows.
- Maintaining and restoring semi-natural habitats and woodlands to intercept and infiltrate surface water down into the aquifers.



**Looking from the open chalk landscape near Gazely towards the more wooded Brecks NCA.**



**SEO 3: Conserve and promote the landscape character, geodiversity, historic environment and historical assets of the chalklands, including the open views of undulating chalkland, large rectilinear field pattern and linear ditches, strong equine association and the Icknield Way prehistoric route. Improve opportunities to enhance people's enjoyment of the area while protecting levels of tranquillity.**

**For example, by:**

- Protecting and appropriately managing the historic environment for its contribution to local character and sense of identity and as a framework for habitat restoration and sustainable development, and enhancing biodiversity.
- Managing and conserving the area's heritage assets as an integral part of its distinctive landscape, while recognising the potential for undiscovered remains, including those revealed through agricultural change.
- Minimising and – where possible – eliminating risk to Scheduled Monuments and nationally significant archaeology, including through arable reversion, shallow cultivation or minimum tillage agriculture, and encouraging uptake of agri-environment schemes to fund such work.
- Maintaining, developing and improving the rights of way network and access to sites and areas of interest.
- Raising the profile of the strategic importance of the Icknield Way by promoting it as the link between the existing Peddars Way and The Ridgeway National Trails.
- Engaging with communities and owners of historic features in celebrating and conserving the historic environment, including developing skills in historic environment conservation and traditional building skills and conservation.
- Ensuring that the distinctive elements of the chalk landscape, flowing water and rural scene are conserved and managed to retain and enhance the strong sense of place.
- Encouraging and supporting traffic-calming measures and non-car travel at popular countryside destinations, to improve tranquillity and recreation experiences generally.
- Working with the horse-racing industry and major landowners of historic properties to expand the area of species-rich grassland through appropriate management techniques.
- Encouraging geo-conservation, working with local geology groups and geologists, connecting with the Chalk East initiative and strengthening the link between geodiversity and the character and landscape of the NCA.
- Promoting the use of white and yellow brick and thatch in the north and west and red brick and flints in the east as traditional building materials. Encourage local councils to grant planning permission for small-scale extraction of chalk 'clunch' for repairing historic buildings and building new structures of conservation value.



**Icknield Way, prehistoric routeway as seen today.**

**SEO 4: Conserve the settlement character and create or enhance sustainable urban drainage systems and green infrastructure within existing and new developments, particularly in relation to the urban fringe and growth areas such as south-east Cambridge, to provide recreation opportunities, increase soil and water quality and enhance landscape character.**

**For example, by:**

- Avoiding or minimising further erosion of tranquillity by ensuring that development is appropriate to the setting and incorporates suitable measures, such as tree planting or green buffers.
- Supporting, creating and improving links between recreational assets and settlements, particularly where growth is planned.
- Improving green infrastructure within settlements and through new development, particularly in relation to urban fringe and growth areas such as south-east Cambridge, by providing accessible greenspace and potentially creating new biodiverse grasslands.
- Targeting the development of sustainable urban drainage systems and greenspace within urban centres to filter pollutants. This will be increasingly important as building continues to expand the commuter villages and towns.
- Conserving and enhancing historic earthworks and routes that evidence past settlement by scrub removal. This will also provide access to and enhance biodiversity corridors, for example Icknield Way, Worsted Street and Fleam Dyke.
- Encouraging further provision of cycle routes and, exploring the feasibility, in the long term of new rail routes.
- Engaging with communities and owners of heritage features in celebrating and conserving the historic environment, including developing skills in historic environment conservation, historic landscape management and conservation.
- Exploring opportunities to enhance the setting, interpretation and visitor facilities of heritage assets, for example the historic dykes and other earthwork monuments.

## Supporting document 1: Key facts and data

Total area: 83,870 ha

### 1. Landscape and nature conservation designations

There are no protected landscapes within the East Anglian Chalk 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	Ramsar	Chippenham Fen	112	<1
European	Special Protection Area (SPA)	n/a	0	0
	Special Area of Conservation (SAC)	Fenland SAC, Devil's Dyke SAC	164	<1
National	National Nature Reserve (NNR)	Chippenham Fen NNR	112	<1
National	Site of Special Scientific Interest (SSSI)	A total of 30 sites wholly or partly within the NCA	1,192	1

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.**

Chippenham Fen is a Ramsar site that lies wholly within the Fenland SAC.

Chippenham Fen NNR lies wholly within the Fenland SAC. Chippenham Fen Ramsar, NNR and Fenland SAC lay wholly within Chippenham Fen and Snailwell Pools SSSI.

There are 203 local sites in East Anglian Chalk NCA covering 2,046 ha, which is 2 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: [http://www.lnr.naturalengland.org.uk/Special/lnr/lnr\\_search.asp](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	354	30
Favourable	459	38
Unfavourable no change	102	9
Unfavourable recovering	277	23

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 -0.05 m below sea level to a maximum of 167 m above sea level. The average elevation of the landscape is 53 m.

Source: Natural England (2012)

### 2.2 Landform and process

This NCA is an eastward extension of the Chilterns, although notably more subdued in its topography. This is because this part of East Anglia was subjected to glacial erosion, beneath an ice sheet moving down from a northerly direction. This glacial erosion took place during the Quaternary period (the two million years before present time). This erosion process is known to have taken place on at least one occasion, but possibly several times.

Source: East Anglian Chalk Countryside Character Area description

### 2.3 Bedrock geology

The underlying solid geology of the East Anglian Chalk NCA is dominated by Upper Cretaceous Chalk. This is a very pure type of limestone, deposited in clear, tropical sea conditions and which dates back to a period between 97 and 74 million years ago.

Source: East Anglian Chalk Countryside Character Area description

### 2.4 Superficial deposits

Patterned ground, widespread in neighbouring Breckland and occurring in the Newmarket area, is indicative of the edges of the ice sheet and are the result of repeated thawing and re-freezing of soil moisture, together with leaching of materials. These processes lead to sorting of soils into polygonal patterns or, on slopes, into stripes of either a chalky or acidic nature. There results a mosaic, or striping, of different soils which are reflected in the vegetation they support. Another feature of the ice sheet margin can be seen in the Whittlesford-

Thriplow area. Here is found a series of shallow depressions subject to seasonal flooding. They arose under conditions of intense cold, when large lens-shaped ice masses formed within the soils. These ice masses pushed overlying soils and sediments upwards, so that mound-like features were formed. These hollows were created as a result of thawing, loss of surface materials, and collapse of the overlying sediments into the void.

Source: East Anglian Chalk Countryside Character Area description

### 2.5 Designated geological sites

Tier	Designation	Number
National	Geological Site of Special Scientific Interest (SSSI)	2
National	Mixed interest SSSI	0
Local	Local Geological Sites	5

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 Chalk has given the NCA its rolling topography and its occasionally poor soils, which affect the colour of the landscape. Soils are predominantly nutrient-poor and shallow on the escarpments, with better soils at the base of the slopes, all of which are easily worked. Plants that grow on the poorest soils cannot grow large because of the low levels of soil nutrient. Freely draining, calcareous loamy soils are present along the fen edge and on road-side verges.

Source: East Anglian Chalk Countryside Character Area description

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	0	0
Grade 2	47,599	57
Grade 3	29,828	36
Grade 4	1,124	1
Grade 5	15	<1
Non-agricultural	1,625	2
Urban	3,680	4

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)
New River	7
River Beane	<1
River Cam	1
River Cam or Granta	23
River Cam or Rhee	18
River Granta	14
River Hiz	3
River Ivel	9
River Kennett	9
River Lark	1

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.

#### 3.2 Water quality

The total area of Nitrate Vulnerable Zone is 83,870 ha, or 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

[http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=\\_e](http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=_e)

### 4. Trees and woodlands

#### 4.1 Total woodland cover

This NCA contains 4,095 ha of woodland (where woodland is over 2 ha in size), including 403 ha of ancient woodland. Woodlands over 2 ha in size cover 5 per cent of the NCA.

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

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

The distinctive ash, maple and hazel woodland typical of chalk landscapes are not widespread in this area since a number of the woods have had a history of partial or total coniferisation. However, standard native trees exist within the conifer matrix. Some original tree cover remains along and on ridge sides with beech belts along roads and ash dominated copses and hilltop clumps. Pine belts begin to take over from the beech towards the Brecks in the east of the NCA.

Source: East Anglian Chalk Countryside Character Area description

## 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)

Woodland type	Area (ha)	Percentage of NCA
Broadleaved	3,402	4
Coniferous	366	<1
Mixed	62	<1
Other	265	<1

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	288	<1
Ancient re-planted woodland (PAWS)	115	<1

Source: Natural England (2004)

## 5. Boundary features and patterns

### 5.1 Boundary features

Boundary features under stewardship options as at March 2011 included; 87,809 m of ditches, 1,370 m of earthbanks, 597,507 m of hedgerow and 30,386 m of woodland.

Source: East Anglian Chalk Countryside Character Area description; Countryside Quality Counts (2003)

### 5.2 Field patterns

The smooth rolling chalkland hills offer a broad-scale landscape of large, very late enclosure fields with low thorn hedgerows and few trees. Roads are often lined with shelter belts of beech, particularly to the east of the NCA. This is a visually continuous landscape, historically very open, uninterrupted and flowing, with occasional long views over the lower land to north and west. Around Newmarket the rectilinear landscape is subdivided to give a more closely geometric feel, as the

fences and shelter belts of the stud farms provide a more enclosed pattern, both to shelter the equine occupants and to protect them from external movement that might startle them. Roads in this area are therefore frequently tree-lined.

Source: East Anglian Chalk 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 has long been sheep-grazing chalk downland but, since the 19th century, with improvements in farming techniques it has increasingly been given over to large-scale cereal production. The total number of holdings registered in the NCA in 2009 was 498; a reduction by 23 compared with 2000. Fifty-five per cent of the total number of holdings in the NCA are cereal producers with 275 holdings registered in 2009, a reduction by 23 from the year 2000. Fifty-two holdings are general cropping, representing 10 per cent of the total. Seventy-one per cent, or 355 holdings, were registered as arable in 2009. Lowland grazing livestock represented 6 per cent of the total in 2009. Nineteen per cent, or 93 holdings, were registered as 'other types' in 2009. Compared with 2000, there was a 37 per cent increase in the number of livestock holdings in 2009, a reduction of 17 per cent in arable holdings during the same period, and an increase of 55 per cent in 'other types'.

Source: Agricultural Census, Defra (2010)

### 6.2 Farm size

In 2009, 39 per cent, the majority of commercial holdings in the NCA were greater than 100 ha, a reduction of 9 per cent compared with 2000. In 2009 21 per cent of the commercial holdings were between 20 and 50 ha, a reduction of 2 per cent compared with 2000. In terms of area, the most notable change was in commercial holdings between 5 and 20 ha.

Source: Agricultural Census, Defra (2010)

## 6.3 Farm ownership

2009: Total farm area = 59,324 ha; owned land = 41,814 ha

2000: Total farm area = 66,465 ha; owned land = 46,868 ha

Source: Agricultural Census, Defra (2010)

## 6.4 Land use

In 2009 more than half the area of farmed land in the NCA (55 per cent) was for cereals production which compares with 57 per cent in 2000. In 2009 16 per cent of the farmed area was grass and uncropped land and 11 per cent used for oilseeds. Compared with 2000 this represents a 3 per cent reduction in grassland and uncropped land and an increase of 4 per cent in land growing oilseeds.

Source: Agricultural Census, Defra (2010)

## 6.5 Livestock numbers

In 2009 there were 3,000 cattle (4,200 in 2000), 13,800 sheep (10,300 in 2000) and 8,100 pigs (13,600 in 2000).

Source: Agricultural Census, Defra (2010)

## 6.6 Farm labour

In 2009 there were 634 principal farmers, representing 45 per cent of the total work force, this compares with 733 principal farmers, or 44 per cent of the total work force, in 2000. The largest significant change between 2000 and 2009 was in the number of full-time workers. In 2009, 339 workers, or 24 per cent of the total workforce, were employed full-time compared with 527 or 32 per cent of the total employed in 2000. This represents a 7 per cent reduction.

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

Arable land and cereal field margins on the chalk support a number of scarce and declining arable plants. The best areas occur at higher elevations and are often associated with chalk grassland remnants. For example, a rich arable flora is found on the Strethall Field which forms part of a larger area stretching from west of Icknield to south of Heathfield to Heydon Grange, south to Heydon and Chrishall and east to Strethall.

It is an open, generally tree-less landscape, within which beech shelter belts and copses are a prominent feature, which reflects the tradition of grazing the downland pasture. There is little ancient woodland, but where it does occur it can be found along the transitional southern boundary where boulder clay overlies the chalk.

Along the spring line wet woodland can be found, with alder being the dominant species and great tussock sedge and reed characteristic in the ground flora. Some stands of mixed downy birch–grey willow woodland have developed from fen and still retain a tall herb fen ground flora. Both of these types are found at Chippenham Fen.

Reedbed, fen, coastal and flood plain grazing marsh habitats have developed on alkaline fen peat in the vicinity of springs that issue a constant supply of lime-rich water. Grazing marsh is scattered along the chalk spring line supporting characteristic species such as marsh orchids, meadowsweet and adders tongue fern.

The chalk streams are significant for invertebrates, serving water-cress beds, ditches, streams and rivers. The tributaries and corridors of the rivers Granta, Rhee and Cam are home to otter, water vole, white-clawed crayfish and kingfisher, with old pollard crack and white willows being a significant feature of almost all of them.

Remnants of the once extensive calcareous grassland remain scattered throughout the area, often on roadside verges, margins of golf courses and in chalk pits, on dry raised banks of some unimproved meadows, and along sections of ancient linear earthworks and track ways.

Due to the proximity of the Breckland sands a number of places, particularly on the eastern side of the area, have a mosaic of habitats. Calcareous and acidic species grow in close proximity reflecting the chalky and sandy soil mix.

Lowland meadow is found on unimproved loamy soils and in particular along roadside verges. The grasslands have a rich herb and grass flora.

The total area of all priority habitats, excluding the area of woodland, is 2,115 ha representing 3 per cent of the total area of the East Anglian Chalk NCA.

In addition the NCA contains important arable habitats. These support nationally important assemblages of arable birds.

Source: East Anglian Plain Chalk 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; [www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/englandsbiodiversitystrategy2011.aspx](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 calcareous grassland	1,276	2
Coastal and flood plain grazing marsh	390	<1
Lowland meadows	338	<1
Fens	215	<1
Reedbeds	158	<1
Purple moor-grass and rush pastures	78	<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 541 species are available at <http://data.nbn.org.uk/>



## 8. Settlement and development patterns

### 8.1 Settlement pattern

Historically this dry chalkland area has not encouraged settlement but provided a good transport corridor, for example the Icknield Way. Landscape features include long, straight roads, open grass tracks and isolated 19th-century white or yellow brick farmhouses. Settlement comprises distinctive nucleated villages located generally within valleys. Subsequent settlement occurred along the sides of the river valleys where small villages, such as Linton, developed and which have, many centuries later, become commuter villages for Cambridge. On the hill tops the isolated white or yellow brick farmhouses are mainly of 19th-century origin, reflecting a period of agricultural growth, and they often stand bare and gaunt against hillsides.

**Source: East Anglian Chalk Countryside Character Area description; Countryside Quality Counts (2003)**

### 8.2 Main settlements

The main settlements within the East Anglian Chalk NCA are Letchworth Garden City and Newmarket.

**Source: East Anglian Chalk Countryside Character Area description; Countryside Quality Counts (2003)**

### 8.3 Local vernacular and building materials

The area was historically sparsely populated and villages tended to develop on the valley sides of streams running off the chalk and towards the surrounding claylands. Elmdon in Essex is a typical example of these 'transition' villages; an attractive mixture of brick, 'clunch' (building chalk) and timber-framed houses under thatched and tiled roofs. For the most part the settlements typically contain a higher proportion of yellow brick and thatch to the west and red brick and flints with clay tile to the east. Some earth-walled buildings exist, predominantly of 19th century date, in clay lump and cob.

**Source: East Anglian Chalk Countryside Character Area description; Countryside Quality Counts (2003)**

## 9. Key historic sites and features

### 9.1 Origin of historic features

The area was an anciently cleared and grazed, the upland plateau and slopes partitioned by linear earthworks and scattered with hill forts and burial mounds, the latter most noticeable on Therfield Heath near Royston. Cropmarks and excavations have demonstrated widespread nature Romano-British settlement. There is a wealth of Romano-British and late-Iron Age settlement remains (significant small towns existed at Great Chesterford and Baldock for example). Nucleated villages developed from the late Saxon period onwards are still the characteristic settlement type along the dip slope edge, within the bisecting river valleys and wherever reliable springs break from the chalk. There is a very low density of dispersed settlement in the landscape. Religious houses formed the kernel of many of the larger medieval settlements, although few have left highly visible evidence in the landscape. Fine examples of late medieval timber-framed houses can be found in many parts of the area, frequently re-clad in the 17th and early 18th centuries. The larger market towns have seen considerable expansion in the 20th century. Villages likewise have shared in the expansion of dormitory and commuter housing.

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

### 9.2 Designated historic assets

This NCA has the following historic designations:

- 15 Registered Parks and Gardens covering 649 ha
- No Registered Battlefields
- 149 Scheduled Monuments
- 3,060 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

- Only 0.3 per cent of the NCA or 209 ha is classified as being publically accessible.
- There are 848 km of public rights of way at a density of 1 km per km<sup>2</sup>.
- There are no National Trails within the East Anglian Chalk NCA.

Sources: Natural England (2010)

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)	7	<1
Common Land	192	<1
Country Parks	51	<1
CROW Access Land (Section 4 and 16)	209	<1
CROW Section 15	366	<1
Village Greens	34	<1
Doorstep Greens	0	0
Forestry Commission Walkers Welcome Grants	18	<1
Local Nature Reserves (LNR)	166	<1
Millennium Greens	0	0
Accessible National Nature Reserves (NNR)	112	<1
Agri-environment Scheme Access	64	<1
Woods for People	207	<1

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) the locations of the lowest scores are concentrated around the settlements of Baldock/Letchworth Garden City, Newmarket and the outskirts of Cambridge. Low values are also associated with the transport corridors of the A505 and A10, which run through the core of the NCA, and the M11 that bisects the NCA in a north-south direction. Highest values for tranquillity can be found located at the periphery of the NCA away from the transport corridors that traverse the centre of the area, and away from the urban centres of Newmarket and Letchworth Garden City.

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

Tranquillity	Score
Highest value within NCA	31
Lowest value within NCA	-91
Mean value within NCA	-7

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 the most disturbed areas are found around the urban centres of Baldock/Letchworth Garden City, Newmarket and the outskirts of Cambridge and also along the transport routes especially along the M11 and A10. A breakdown of intrusion values for this NCA is detailed in the table below.

Intrusion category	1960s (%)	1990s (%)	2007 (%)	Percentage change (1960s-2007)
Disturbed	20	56	62	43
Undisturbed	79	42	33	-46
Urban	1	1	5	3

Sources: CPRE (2007)

Notable trends from the 1960s to 2007 are an increase in disturbed areas with a corresponding decrease in the tranquil areas. The increase in disturbed areas can be attributed to increased traffic noise along transport corridors and an expansion to the urban centres rather than any new sources of disturbance.

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 Inventory of Woodland & Trees, Forestry Commission (2003)

- 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)Detailed River Network, Environment Agency (2008)

**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

- There has been a slight increase in the woodland being managed under agreements with the Forestry Commission; this suggests that the woodland character is being maintained.
- England Woodland Grants have funded limited woodland creation between 1999 and 2003.

#### Boundary features

- Between 1999 and 2003 Countryside Stewardship agreements for linear features included fencing (14 km), hedge management (23 km), hedge planting and restoration (39 km) and restored boundary protection (14 km).
- Where land has previously been enclosed there is often poor boundary maintenance leading to 'gappy' hedgerows and areas where hedgerows have become absent altogether.

#### Agriculture

- Agricultural production is increasingly becoming more intensive arable cultivation. More oilseed rape is being grown and limited spring crops are sown. There has been a demise in traditional grassland, grazing marsh and flood plain grassland in lower-lying areas next to water courses such as rivers Granta, Rhee and Cam.

- Countryside Stewardship uptake for annual area features is below national average. Most extensive annual agreements in 2003 were for overwintered stubble followed by a spring crop (173 ha) and lowland pastures on neutral/acid soils (146 ha).

#### Settlement and development

- Settlement expansion and by-passes have changed the scale and character of the historic market towns and development pressures are likely to increase. There is huge pressure to develop the Cambridge southern greenbelt with modern town buildings, which will dilute the historic city character.
- Recreational land uses, including horse paddocks and golf courses, are replacing commercial agricultural land uses.
- The Chalk scarp/plateau is under pressure from potential wind farm development.
- An increase in the number of large, new farm buildings is a noticeable change in the character of the landscape.

#### Semi-natural habitat

- There are no major changes in semi-natural habitat, apart from some scrub clearance on grassland and historic sites; for example scrub removal on Devil's Dyke, enabling the feature to be more pronounced.



Golf course on Therfield Heath with good biodiverse grassland.

## Historic features

- There is evidence that some new development has not respected and reinforced the nucleated pattern of settlement in the landscape, hence altering the balance of settlement hierarchy and intrinsic landscape character.
- Duxford Airbase is highlighted in English Heritage's Scheduled Monuments at Risk Register 2012 as being in declining condition.
- The horse-racing industry at Newmarket is a thriving multi-million pound industry and the Newmarket 'stud landscape' is encroaching further on the transitional zone between chalkland and adjacent areas, blurring the distinction between them and the changing local character.
- Maintenance agreements have been less than satisfactory for many archaeological earthworks and ongoing ploughing on archaeological sites. This is of particular concern regarding prehistoric burial monuments, the

buried remains of late iron-age and Roman settlements and ridge and furrow and Scheduled Monuments.

## Rivers

- The majority of chalk streams suffer from low summer flow, which has been increasing in recent years due to over-abstraction from the aquifer and surface water sources.
- Projects have been initiated to provide advice to farmers and land managers to tackle pollution affecting surface water and groundwater, for example the work of the Cam Valley Forum. These have had limited success, but small-scale improvements to chalk streams such as putting back riffles are beginning to be noticeable.

## Minerals

- Active chalk quarrying, particularly around Steeple Morden. Management of several old chalk quarries such as Ansty, Barrington Chalk Pits and Orwell Clunch Pit, to maintain the geological interest and enhance their biodiversity value.
- A large former quarry at Arlesey, known as the Blue Lagoon, has become a well-known bathing spot and the surrounding grassland is becoming chalk-rich grassland.

## Drivers of change

### Climate change

- Aquifer recharge will be reduced, due to hotter, drier summers, changing precipitation patterns of extreme events. Rainfall events in the winter may be increasingly concentrated in major downpours, much of which could be lost to surface run-off.

- Water-dependent chalk streams and springs and wetland habitats are vulnerable to low groundwater levels and their resilience is already reduced by historical low flows along many streams. Unpredictable and frequent periods of drought and flood will give rise to erratic flows and difficulties in managing flows. Water quality may also deteriorate as a result of high temperatures, lower oxygen levels and polluted run-off during storm events.
  - Thermal stress will also impact on a range of species, especially those near or at the southern limit of their range. This is exacerbated when connectivity to upstream habitats or other catchments is inhibited.
  - Climate change favouring a longer growing season will exacerbate the problem of scrub and woodland encroachment onto valued open features such as the ancient linear dykes and burial mounds.
  - More frequent drought periods increases the risk of fire in semi-natural habitats and will tend to depress agricultural productivity. With increasing warmth, new crops, varieties, cropping patterns and livestock systems may emerge.
  - Trees in exposed positions, particularly within orchard, hedgerows and small woodlands, will be vulnerable to sun scorch, crown/root die-back and wind throw. Associated lichen, fungi and invertebrate interest will also be affected. Loss of landmark trees will be particularly significant.
  - High temperatures and summer drought are expected to reduce the species diversity of chalk grassland. Younger calcareous grasslands composed of fast-growing or short-lived species are likely to be more vulnerable than older calcareous grasslands. South-facing habitats will suffer greatest exposure to increased solar radiation.
  - The fragmented and small size of some habitats, including chalk grassland roadside verges, reduces their resilience to threats. The wider heterogeneity of the landscape offers a variety of aspects, for example hedgerows, as 'movement corridors' that will assist more mobile species in finding more favourable conditions.
  - Climate change adaptations to building design could give rise to new features in the built environment, such as green roofs.
- Other key drivers**
- As growth areas are identified, for example along the M11 corridor, this will impact on the NCA. Green Infrastructure plans should be implemented. Further development and infrastructure in commuter villages is also possible. Development will alter the appearance of the landscape and will reduce the sense of tranquillity. There will be associated demands on a variety of ecosystems in the area, including water availability and accessible greenspace. The Cambridge Water Cycle Study has a role to play in influencing future developments.
  - Agricultural economics will continue to shape the character of the rural landscape. Scrub and woodland encroachment on open areas may continue as livestock numbers declines and viability of sheep and cattle farming remains limited. Agri-environment schemes will continue to support sustainable agriculture.
  - The driver to implement the Water Framework Directive will help to enhance the biodiversity value of the rivers and all the chalk streams.
  - Land purchases driven by perceived development opportunities will give rise to land falling into disuse or temporary uses while awaiting development. This will be particularly acute in the urban fringe and especially in growth areas.

## 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.



Beech hanger on top of a hill, surrounded by arable fields, near Dullingham.

Statement of Environmental Opportunity	Ecosystem service																		
	Food provision	Timber provision	Water availability	Genetic diversity	Biomass provision	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	Tranquillity	Recreation	Biodiversity	Geodiversity
<b>SEO 1:</b> Maintain sustainable but productive agricultural land use, while expanding and connecting the chalkland assemblage of semi-natural grasslands, for example by sensitive management of road verges and extending buffer strips along field margins, to benefit soil and water quality, reduce soil erosion, strengthen landscape character and enhance biodiversity and pollinator networks., while expanding and connecting semi-natural	↔**	↗*	↗*	○	↗*	↑*	↔*	↗*	↑*	↑*	↗*	○	○	↗*	↗*	↔**	↔*	↑**	↔*
<b>SEO 2:</b> Conserve the regionally important East Anglian Chalk groundwater resource, by working in partnership to ensure that an integrated catchment-scale approach is secured for its enhanced long-term management, including the chalk streams, for the benefit of biodiversity, landscape character and recreational experience.	↘*	↔***	↑**	○	↔**	↗*	↗***	↑***	↑***	↑***	↔***	○	○	↑***	↔***	↔***	↑***	↑***	↔***
<b>SEO 3:</b> Conserve and promote the landscape character, geodiversity, historic environment and historical assets of the chalklands, including the open views of undulating chalkland, large rectilinear field pattern and linear ditches, strong equine association and the Icknield Way prehistoric route. Improve opportunities to enhance people’s enjoyment of the area while protecting levels of tranquillity.	↔**	↔**	↗*	○	○***	↗*	↗**	↗*	↔**	↗**	↗**	○	○	↑***	↗*	↔**	↑***	↗*	↗*
<b>SEO 4:</b> Conserve the settlement character and create or enhance sustainable urban drainage systems and green infrastructure within existing and new developments, particularly in relation to the urban fringe and growth areas such as south-east Cambridge, to provide recreation opportunities, increase soil and water quality and enhance landscape character.	↔**	↔**	↗*	○	○***	↗*	↗**	↗*	↔**	↗**	↗**	○	○	↑***	↗*	↔**	↑***	↗*	↗*

Note: Arrows shown in the table above indicate anticipated impact 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 impact is available .

Dark plum =National Importance; Mid plum =Regional Importance; Light plum =Local Importance



## Landscape attributes

Landscape attribute	Justification for selection
Chalk and periglacial landforms and features, including an escarpment and dry valleys.	<ul style="list-style-type: none"> <li>■ The chalk ridge is distinctive, open, variable topography that is a continuation of the Chilterns.</li> <li>■ The valleys of the rivers Granta, Rhee and Cam have a contrasting small-scale intimacy.</li> <li>■ Chalk pits are scattered throughout the area.</li> </ul>
Agricultural landscape.	<ul style="list-style-type: none"> <li>■ The large-scale fields are often very open but in some parts of the area are divided by low thorn 'gappy' hedges.</li> <li>■ Livestock numbers have declined but livestock farming continues and helps to preserve areas of downland meadow.</li> <li>■ Despite mixed farming decline in the last 50 years, East Anglian chalk is still important for arable weeds, including grass-poly, Venus' looking-glass and ground pine.</li> <li>■ It is still an important area for farmland birds including grey partridge, with a stronghold around Rosyton.</li> </ul>
Localised and modified chalk streams.	<ul style="list-style-type: none"> <li>■ Chalk streams and associated wetland habitats occur in an otherwise dry landscape and support a high diversity of plants and animals.</li> <li>■ Chalk streams only occur where groundwater reaches the surface in the chalk valleys and along the foot of the scarp. Chalk valleys tend to be a minor landscape feature.</li> <li>■ Chalk streams are significant for their local biodiversity, history and community interests, for example, Friends of the River Shep have undertaken a wide range of habitat restoration measures which have shown benefits to the river's ecology and individual species such as brown trout.</li> <li>■ Historic features include watercress beds; at Fowlmere these are now a SSSI and part of an RSPB reserve.</li> </ul>
Manicured character of stud landscape around Newmarket, with intimate smaller-scale landscape to the east with rows of pine.	<ul style="list-style-type: none"> <li>■ Unique equestrian landscapes, as the fences and shelterbelts of the stud farms provide a more enclosed pattern.</li> <li>■ Horse-racing's history in Newmarket can be traced back to at least James I; with its paddocks and gallops and large Victorian and Edwardian houses and stables, the industry has secured the survival of extensive chalk grassland.</li> <li>■ Gnarled pine lines of the adjoining NCA, The Brecks.</li> </ul>

Landscape attribute	Justification for selection
Remnant areas of chalk-rich grassland.	<ul style="list-style-type: none"> <li>■ These remnants are often associated with linear features such as road verges and the margins of golf courses, for example on the Gog Magog Hills.</li> <li>■ The chalk grassland supports invertebrates and a diverse array of scarce plants, such as great pignut, along the Icknield Way.</li> <li>■ Chalk quarries and brick pits, such as the grassland around Blue Lagoon in Bedfordshire, are becoming sites of chalk-rich grassland.</li> </ul>
Distinctive beech belts along roads and in hill-top clumps, plus small ash-dominated woodland.	<ul style="list-style-type: none"> <li>■ Generally a treeless landscape, within which beech shelterbelts and copses are a prominent feature.</li> <li>■ Hill-top woodlands emphasise the natural topography.</li> </ul>
A settled landscape with 20th-century development, associated with major transport routes, connecting a few large towns, enlarged commuter villages and isolated farmhouses.	<ul style="list-style-type: none"> <li>■ Settlements with a strong sense of place and a historic core are being diluted at their edges by modern development. Commuter villages near Cambridge, such as Sawston, or villages with railway stations that have grown since the Second World War, such as Foxton and Meldreth, have all been unable to retain their rural character.</li> <li>■ Distinctive 19th-century white or yellow brick farmhouses, some of which have expanded into small rural enterprises.</li> <li>■ 20th-century development of Stevenage, adjoining the NCA in the south-west, and Letchworth Garden City which is the world's first 'garden city'.</li> <li>■ Cuttings alongside new road developments such as the Baldock bypass (A505) can be left unsprayed to encourage natural plant re-colonisation with associated invertebrate populations.</li> <li>■ To the east of Newmarket the villages tucked into the more undulating terrain are often Georgian, built of red brick and flint with slate, pegtile or thatched roofs.</li> <li>■ Further south there is a transitional zone around Saffron Walden onto the till which supports a series of attractive villages such as Barley, Barkway and the Chishills.</li> <li>■ Although Cambridge lies to the northern boundary of the NCA it is one of the fastest-growing cities in Western Europe and its expanding southern developments in the green belt influence the developed character of this NCA.</li> </ul>
Historic archaeological features.	<ul style="list-style-type: none"> <li>■ Significant linear features, such as Devil's Dyke, Fleam Dyke, Heydon/Bran Ditch, Brent Ditch, Icknield Way and some stretches of Roman roads.</li> <li>■ Earthbanks – populated by hill forts and burial mounds, the latter being very noticeable at Therfield Heath.</li> </ul>

## Landscape attribute

Features linked to recreation are widespread – rights of way networks, horse paddocks and golf courses.

## Justification for selection

- Popular visitor sites include Newmarket racecourse, Duxford Air Museum and Wandlebury Hill Fort.
- Strategic access routes within the open arable landscapes offer fine panoramic views as seen from a number of routes including the Icknield Way, Roman Road, Devil's Dyke and Fleam Dyke.
- Recreation and retail opportunities throughout the NCA, including farm shops, garden centres, riding stables and golf courses.



Chalk grassland road cutting along the A505 towards Baldock.

## Landscape opportunities

- Protect the character and integrity of the rural landscape by conserving its mosaic of cultural heritage and natural assets, semi-natural habitats and historic buildings and archaeological features.
- Identify and conserve views to and from key viewpoints and landmarks by careful design and vegetation management, minimising the visual impact and effects of development, woodland planting and scrub encroachment.
- Conserve and enhance the land use pattern, valued farmland species and productivity of the landscape by securing sustainable forestry and agricultural activity. This includes conservation of small farm woodlands, historic hedgerows, farmland birds and arable weeds.
- Plan and manage private and public spaces for recreation such as golf courses and restored chalk pits, so that their design and their features contribute positively to landscape character. Seek the conservation, restoration and creation of natural and cultural features in these landscapes.
- Secure sustainable development which also reflects traditional local building styles and materials. Where landscape character and features are degraded by development, identify opportunities to redevelop areas and infrastructure. Encourage the widespread use of red brick and other local building materials and styles through the use of design guidance and strict planning control. Create strong visions in the urban fringe as it is developed, as this will contribute positively to the sense of place.
- Seek to reduce threats to natural and historic features by conserving or restoring their setting, addressing the problem of fragmentation particularly associated with chalk grassland. Work at a landscape scale which reflects the ecosystem approach, ecological network approach and historic character.
- Conserve, enhance and create new public access infrastructure, access links and accessible natural and cultural features, especially near settlements, in order to enhance the transitional areas between urban landscape and countryside. For example, develop the Icknield Way as the link between the Peddars Way and The Ridgeway National Trails and improve provision for cycling through this NCA.
- Undertake appropriate visitor management to ensure sustainable visitor pressure at all sites but particularly focus upon 'honey pot' sites and those sites near new development. Identify and promote alternative greenspaces and entry points to reduce visitor pressure.
- Plan for the regeneration and replanting of existing, predominately small, hill-top beech plantations. Make sure that the resilience of woodland to climate change impact is understood and acted upon; particularly the valued beech woodland which is vulnerable. Consider new species compositions and secure woodland across a variety of aspects.

- Conserve ancient routeways across the landscape to maintain biodiversity and routeways to restore historic patterns and enhance connectivity. Carry out targeted surveys and possible Local Wildlife Site designation to conserve species-rich hedgerows and identify hedgerow trees of significant landscape and biodiversity value.
- Protect and enhance chalk streams and wetlands in both their rural and urban settings. Manage the flood plain of chalk streams, including historic features such as watercress beds and channels, in order to conserve and create wetland habitat. In the urban environment, seek to restore degraded channels and extend the areas of greenspace surrounding rivers for biodiversity and public access benefits.
- Manage recent change in the landscape by establishing dialogue with growing stakeholder groups, particularly hobby farmers, horse owners and non-farmers owning significant areas of land and valued features. Develop best practice management guidance to disseminate to these growing audiences. Build on existing community interest and activity around chalk streams and common land to secure further improvements.
- Encourage local geo-conservation projects between wildlife trusts and local geological groups; manage local geological sites with the beneficial side-effect of maintaining local biodiversity.



Wadrow wind farm, north of Balsham, is a prominent feature in the landscape.

## 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 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	
<b>Food provision</b>	Soils,	Soils are predominantly nutrient-poor and shallow on the escarpments, with better soils at the base of slopes.	Regional	Food provision is a significant service in the	Encourage sustainable	<b>Food provision</b>	
	Grade 2 and 3 land			East Anglian Chalk but intensive cultivation of land may also lead to loss of water quality due to nitrate inputs.	farming practices		<b>Regulating soil erosion</b>
	Arable farming	Cereal production accounted for over half of the farmed area and this has increased by 4 per cent between 2000 and 2009. There has also been an increase in oilseeds and a decrease in grassland in the same period.		Livestock and meat production are generally limited. Despite the history of sheep grazing the area is not associated with any traditional rare breeds and there are also no local foods recognised at a regional or national level.	including compliance with nitrate vulnerable zone (NVZ) regulations.		<b>Regulating soil quality</b>
	Aquifer				Encourage sheep grazing on biodiverse grasslands to benefit biodiversity and sense of place.		<b>Biodiversity</b>
	Grassland	Between 2000 and 2009, cattle and sheep numbers declined. The numbers of sheep have slightly reversed a long term decline.		Extensive arable land and limited semi-natural habitat reduces the range of nectar sources for pollinating insects.	Resource-efficient farming should be encouraged and risks identified and managed to reduce negative impacts, for example, arable reversion should be targeted to areas of high soil-erosion risk and fertiliser use minimised where infiltration into the aquifer is rapid.		<b>Regulating water flow</b>
	Vine growing	Chilford Hall is one of England's oldest established vineyards.		Soil regulation may be reduced if more land is cultivated and if it replaces semi-natural habitats such as species-rich grassland.	Optimise benefits for farmland birds and rare arable plants by maintaining stubble and field margins providing winter food, and safe nesting habitats.		<b>Regulating water quality</b>
			Climate change may encourage the expansion of vineyards in the area, with free draining 'flinty' soil overlaying Chalk; south-west-facing slopes to maximise available sunshine are suitable for vine growing.	Opportunity for further vineyard establishment.	<b>Sense of place/ inspiration</b>		

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
<b>Timber provision</b>	Beech and conifer woodland	<p>There are only 4,095 ha of woodland within the NCA, covering 5 per cent of the area. Limited new planting has taken place.</p> <p>Certain high points have small beech copses or 'hangers' which are prominent and characteristic features in the open landscape.</p> <p>Some woodlands are used for shooting.</p>	Local	<p>Commercial timber production is limited as certain species, including conifer plantations, do not reach full maturity on thin soils and become subject to drought stress which is likely to be exacerbated with longer, drier summers resulting from climate change.</p> <p>There is potential to develop small-scale local markets for timber products.</p> <p>New planting has taken place in the NCA, mainly in the form of smaller plantations scattered through the area, and there has been an increase in active management through the Woodland Grant Scheme.</p> <p>Parts of the area provide valuable habitat for partridge shoots.</p>	<p>Promote and develop very local, small-scale markets and added value products, for example fencing.</p> <p>Woodlands managed for timber can also be managed to provide public amenity opportunities and conserve heritage.</p> <p>Agri-environment schemes could help alleviate the impact by buffering shallow-rooted trees from the impact of cultivation using field/grass margins.</p> <p>Planting of new beech hangers on carefully-sited knolls, hill tops and scarp tops would form focal points to re-enforce the local chalkland landscape character.</p> <p>Promoting further partridge shooting with the British Association for Shooting and Conservation to encourage their responsible members to undertake woodland management.</p>	<p><b>Timber provision</b></p> <p><b>Sense of place/inspiration</b></p> <p><b>Sense of history</b></p> <p><b>Biodiversity</b></p> <p><b>Regulating soil quality</b></p>

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
<b>Water availability</b>	Chalk aquifers  Rivers, streams and wetland areas	<p>There are no major rivers running through the NCA.</p> <p>There is a chalk aquifer under the majority of the NCA. Low flows and the cessation of flows, caused by water abstraction and drought, affect water course habitats and adjacent habitats in the NCA.</p> <p>The majority of water supply to Cambridge comes from these chalk strata aquifers south of the city.</p> <p>The River Rhee and the River Granta have an 'over licensed' CAMS status.<sup>5</sup> The River Ivel currently has a 'no water available' CAMS status and the River Hiz has an 'over abstracted' status.<sup>6</sup></p> <p>For the River Kennet, it is stated that the river should not have any additional water licensed during low flows.</p>	Regional	<p>Abstracted water used for drinking water supplied to the region is likely to affect water availability in drought conditions.</p> <p>Spring-fed fens and mires are suffering from low flows and/or the absence of flows at times of the year due to abstraction and drought. This leads to a lowering of the water table and drying of the soils, which in turn leads to nutrient release and a replacement of fen species by dry land species.</p> <p>Low flows and the cessation of flows, caused by water abstraction and drought, affect water course habitats and adjacent habitats in the NCA.</p>	<p>Work in partnership with water companies across the water supply network area to secure sustainable abstraction and consumption including engaging water consumers about negative impacts of unsustainable abstraction upon East Anglian chalk streams.</p> <p>Seek opportunities for the restoration of low-input and unimproved grassland and the creation of buffer strips for wildlife, where appropriate, within catchments in the NCA to reduce run-off and provide improvements to water availability of the rivers and main aquifer.</p> <p>Maintain and restore semi-natural habitats and woodlands to intercept and infiltrate surface water down into the aquifers.</p>	<p><b>Water availability</b></p> <p><b>Regulating water quality</b></p> <p><b>Biodiversity</b></p> <p><b>Regulating soil quality</b></p> <p><b>Climate regulation</b></p>
<b>Genetic diversity</b>	Orchards	<p>Several small, mainly unmanaged, orchards are found in this NCA.</p> <p>Increasing interest in managing and planting community orchards in villages.</p>	Local	<p>These small-scale orchards are in decline; however, they preserve a number of local varieties.</p> <p>Through the work of the East of England Apples and Orchard Project there has been an increase in the awareness of traditional varieties of orchard fruits.</p> <p>There is some evidence of and potential to develop and market local produce, for example, Fulbourn villagers marketing Fulbourn apple juice.</p>	<p>Engage owners in managing their orchards, following guidance of the East of England Apples and Orchard Project to conserve the genetic diversity they contain along with their biodiversity and cultural heritage.</p> <p>Encourage further development/marketing of local products.</p>	<p><b>Genetic diversity</b></p> <p><b>Biodiversity</b></p> <p><b>Sense of place/inspiration</b></p> <p><b>Sense of history</b></p> <p><b>Food production</b></p>

<sup>5</sup>The Cam and Ely Ouse Catchment Abstraction Management Strategy, Environment Agency (March 2007)  
<sup>6</sup>The Upper Ouse and Bedford Ouse Catchment Abstraction Management Strategy, Environment Agency (March 2005)



Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
<b>Biomass energy</b>	Existing woodland	Woodlands over 2 ha in size cover 5 per cent of the NCA.  The Energy Crops Scheme 2000–2006 did not fund any miscanthus or short rotation coppice crops in this NCA.	Local	The existing woodland resource has limited potential for the local provision of biomass.  Potential miscanthus yield in the NCA is generally high, although there are areas of medium potential around Cambridge, to the north east of Baldock and around Royston.	Ensure existing woodlands are managed to produce surplus timber that could be used to provide local sources of biomass.	<b>Biomass energy</b>  <b>Biodiversity</b>
<b>Climate regulation</b>	Mineral soils Semi-natural grassland Wetland Existing woodland  Organic matter in soils	The chalk soils over most of the NCA have a low carbon content (0–5 per cent) although there is a band of soils running from the north to the south-west of the NCA with a higher carbon content (5–20 per cent) likely to be associated with the peaty surface soils found in the north and north-west of the NCA and with woodland and wetland habitats.  Rendzina soils are also likely to store carbon in this NCA.	Local	As low levels of organic matter in soils are largely widespread across the NCA, carbon storage can be increased by increasing organic inputs and expanding the semi-natural grassland.	Soil carbon stores should be conserved and well-managed to maximise storage across the NCA.  Incorporate organic matter, use cover crops and adopt reduced tillage techniques to improve soil structure so that there are benefits for carbon regulation, soil quality and soil erosion.  Encourage reduced fertiliser inputs on cultivated soils by ensuring Government guidelines (NVZ regulations) are followed by farmers and land managers.  Encourage management of hedges and hedgerow trees; fill in gaps.  Encourage woodland creation within valleys or in beech copses where appropriate.  Restore, expand and re-link the wetland habitats to provide further potential carbon stores.	<b>Climate regulation</b> <b>Regulating water quality</b> <b>Regulating soil quality</b> <b>Biodiversity</b>

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
<b>Regulating water quality</b>	<p>Chalk aquifers</p> <p>Streams and rivers</p> <p>Semi-natural habitats</p> <p>Cross-field hedgerows (in arable)</p>	<p>The chemical quality of groundwater (including the chalk aquifer) is classified as poor throughout the NCA. Where the water table is sufficiently high to permit river flows, surface water is of moderate ecological quality.</p> <p>Areas of permanent pasture reduce cross-groundwater flow rates thereby increasing infiltration and the processes of natural filtration.</p> <p>All of the NCA falls into a nitrate vulnerable zone (NVZ) providing groundwater and surface water protection.</p> <p>The Little Ouse Priority Catchment under the ECSFDI is partially located in the NCA. Excess nitrates and phosphates from farmyard manures and slurry application, the leaching of nitrates and phosphates from areas under intensive horticulture and arable production, localised pesticide problems and soil erosion are identified as issues within this catchment which can lead to sediments and pollutants entering watercourses (the River Kennet and the New River are located within this Priority Catchment).</p>	Local	<p>Due to the hydraulic connectivity between groundwater/aquifer and watercourses, pollutants can cross-contaminate.</p> <p>Chalk streams and rivers are important in their biodiversity value and it is essential that good water quality is maintained to support wildlife habitats.</p> <p>Areas covered by semi-natural habitat in good ecological condition are generally less susceptible to high rates of run-off.</p> <p>The ecological status of the River Granta and the ecological potential status of the River Cam is poor.</p> <p>The Anglian River Basin Management Plan identifies that ecological water quality in the rivers is moderate to good, however, the chemical and quantitative status of the groundwater is poor.</p> <p>Diffuse pollution can be a problem in these areas of light soils.</p> <p>Water levels in the aquifers are increasingly subject to additional demands from existing and increasing urban populations.</p>	<p>Significant restoration and creation of low-input chalk/unimproved grasslands within river catchments could help to improve the water quality of the area's rivers and of the main chalk aquifer.</p> <p>Promote the development of sustainable drainage systems/greenspace within urban centres to filter pollutants and protect the underlying aquifer, especially around high potential housing developments around Cambridge, Royston, Arlsey and Baldock.</p> <p>Explore opportunities for the expansion of semi-natural wetland habitats such as reedbeds adjacent to watercourses to act as nutrient sinks, plus creation of grassland buffer strips running across slopes within catchments to reduce sediment and nutrient run-off into adjacent watercourses, thereby improving the water quality of the rivers.</p> <p>All of the opportunities described should deliver the Water Framework Directive.</p>	<p><b>Regulating water quality</b></p> <p><b>Food provision</b></p> <p><b>Regulating soil erosion</b></p> <p><b>Regulation soil quality</b></p> <p><b>Regulating water flow</b></p> <p><b>Biodiversity</b></p>

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
<b>Regulating water flow</b>	Chalk bedrock watercourses	The permeable nature of the underlying chalk ensures that there are no large areas at risk from river flooding.	Local	<p>Flooding is not a major issue in the NCA partly because of the free-draining chalk characteristics of the area. However the flood meadows in the river valleys of the Cam, Granta and Rhee have a role to play in regulating flow at times of high water levels, which may become more frequent in the future due to climate change. This will help manage flood risk in the NCA and potentially ease flood risk further downstream; the rivers Cam, Granta and Rhee are tributaries feeding into the Great Ouse River in the Fens NCA.</p> <p>Restoration and creation of new wetland habitats will help to increase the storage of water in the flood plain and re-connect and enhance existing habitats for the benefit of biodiversity and landscape.</p>	<p>Explore and realise opportunities for restoration and creation of favourably-managed wetland habitats along the flood plains of the rivers Cam, Granta and Rhee.</p> <p>Bring rivers back into continuity with their flood plains where appropriate.</p>	<p><b>Regulating water flow</b></p> <p><b>Regulating soil erosion</b></p> <p><b>Biodiversity</b></p>
	Wooded valley sides	The Great Ouse Catchment Flood Management Plan covers much of the NCA. Groundwater flooding is limited but has occurred in Burwell and Newmarket when there are high groundwater levels in the underlying chalk rock.				
	Vegetated steep slopes					
	Water storage features, in-stream and in the wider flood plain, such as wet meadows and watercress beds					
<b>Regulating soil quality</b>	Permanent pasture	<p>The main soil types include: freely draining lime-rich loamy soils, covering 34 per cent of the NCA; shallow lime-rich soils over chalk (29 per cent); lime-rich loamy and clayey soils with impeded drainage (17 per cent); freely draining slightly acid but base-rich soils (15 per cent).</p> <p>Nutrient-poor soils, although they are vulnerable to drought, they also have a degree of natural resilience due to their calcareous nature. These soils are valuable for aquifer recharge.</p> <p>There is a limited area of uncultivated soils under woodland and grassland.</p>	Regional	<p>The freely draining lime-rich loamy soils are typically of moderate depth and droughty while the shallow lime-rich soils over chalk are typically shallow and droughty. The lime-rich loamy and clayey soils with impeded drainage are calcareous soils with some natural resilience and enhanced workability. These characteristics are also seen in the freely draining, slightly acid but base-rich soils, which have some calcareous layers near the surface.</p> <p>Due to the calcareous nature of loamy and lime-rich soil, they have a degree of natural resilience. These soils are both valuable for aquifer recharge requiring the maintenance of good soil structure to aid water infiltration and the matching of nutrients to needs to prevent pollution of the underlying groundwater.</p> <p>Soils are at risk from topsoil compaction and poaching.</p>	<p>Conserve and maximise the soil resource, aiming particularly to avoid deterioration of soils with high Agricultural Land Classification grades.</p> <p>Ensure there is good soil management in woodlands as well as across farmland.</p> <p>Work with farmers and land managers to seek opportunities to employ best practice methods of minimal tillage, increase soil organic matter and relieve soil compaction, aiding water infiltration. This will also have the benefit of reducing run-off and associated flood risk and aid aquifer recharge.</p> <p>There is the potential to increase organic matter content by management interventions, including the use of grass leys.</p>	<p><b>Regulating soil quality</b></p> <p><b>Regulating water quality</b></p> <p><b>Regulating water flow</b></p> <p><b>Food provision</b></p> <p><b>Biodiversity</b></p>
	Calcareous soils					
	Soils under woodland					

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
<b>Regulating soil erosion</b>	Soils Permanent pasture Woodland	<p>The majority of soils covering some 98 per cent of this NCA are at risk of erosion.</p> <p>It is only the small area of loamy and clayey flood plain soils with naturally high groundwater (covering 2 per cent) that has a low risk of soil erosion.</p> <p>Within the fens soils around Chippenham, sand blows can occur when soils are dry and there is a lack of crop cover.</p>	Local	<p>The freely draining slightly acid but base-rich soils (covering 15 per cent) and the slightly acid loamy and clayey soils with impeded drainage (covering 1 per cent) may be susceptible to capping/slaking, increasing the risk of soil erosion on sloping land where cultivated or bare soil is exposed.</p> <p>Additionally, in the east of England, sandy variants of the shallow lime-rich soils over chalk are prone to wind erosion.</p> <p>Equally, the lime-rich loamy and clayey soils with impeded drainage (covering 17 per cent) and the restored soils (covering 2 per cent) are easily compacted, increasing the risk of soil erosion by surface water run-off.</p>	<p>These soils need to be managed carefully to reduce risks of soil erosion.</p> <p>Incorporate organic matter and adopt reduced tillage in order to minimise run-off and soil erosion.</p> <p>Encourage longer growing periods between grazing and increase sward diversity in leys to increase root penetration and increased soil stability.</p>	<p><b>Regulating soil erosion</b></p> <p><b>Regulating soil quality</b></p> <p><b>Regulating water quality</b></p> <p><b>Food provision</b></p>
<b>Pollination</b>	Species-rich grassland, including roadside verges Hedgerows Woodland edge	<p>Habitats such as lowland meadows found in the NCA are likely to support a variety of pollinators and nectar sources.</p> <p>Nectar sources are also provided by gardens.</p>	Local	<p>A variety of habitats support a range of plants which provide a sound base for pollination.</p> <p>Networks of pollinator habitat limit the ability for pollinators to supply this service. Increase in habitats for pollinators such as the creation of areas of semi-natural habitat, hedgerow improvement and more field margins will increase the delivery of this service. These measures would create important corridors and habitat mosaics for pollinator species.</p>	<p>Where crops are grown that require insect pollination, create new pollinator habitats such as chalk grassland.</p> <p>Encourage the active Bee Keepers' Association in Cambridge to explain to different communities the links between pollination and bees.</p> <p>Opportunities to promote wildlife-friendly gardening.</p> <p>Ensure management of all roadside verges for species-rich grassland.</p>	<p><b>Pollination</b></p> <p><b>Food provision</b></p> <p><b>Biodiversity</b></p>
<b>Pest regulation</b>	Habitat mosaic Mixed farm systems and crop rotations	<p>The landscape can be quite a monoculture of arable production in places.</p> <p>Concern over non-native species, especially in the chalk streams.</p>	Local	<p>Non-native species such as signal crayfish are threatening native aquatic biodiversity.</p>	<p>Explore opportunities to increase diversity of structure and composition within areas of semi-natural habitat to support a variety of pest regulating species.</p> <p>Establish pest and diseases management strategies, for watercourses in particular.</p>	<p><b>Pest regulation</b></p> <p><b>Pollination</b></p> <p><b>Biodiversity</b></p>

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
<b>Sense of place/ inspiration</b>	<p>Rolling chalkland hills</p> <p>Historic route ways and ancient earth works</p> <p>Beech shelterbelts and copses</p> <p>Links to the university city of Cambridge</p> <p>Watercourses</p> <p>Traditional built environment</p>	<p>Sense of place is provided by the low-lying chalk ridge that forms the easterly extension of the Chilterns, creating a visually simple and uninterrupted landscape of smooth, rolling chalkland hills with large regular fields enclosed by low hawthorn hedges, with few trees and straight roads.</p> <p>The thin, light-coloured soils express the sculptural patterns of landform which are most noticeable when the fields are absent of crops. In contrast the arable-dominated landscape is characteristically punctuated by shelterbelts and copses predominantly of beech, as well as isolated estate farms in gault brick that date from the time of the Enclosure Acts, when the pattern of common fields was largely removed.</p> <p>Settlement is typically sparse on the steeper slopes with nucleated, inward-looking villages on the dip slopes and lower-lying ground; the local vernacular typically of yellow brick and thatch to the west contrasting with the red brick and flints with clay tile to the east.</p> <p>Newmarket has been a centre of horse-racing and breeding since the 17th century evolving into a distinctive landscape.</p> <p>Some historic earthworks and routes are managed well, for example Devil's Dyke, while others such as Heydon/Bran Ditch have been in-filled and ploughed over.</p>	Regional	<p>Ancient woodlands of ash and oak provide important features along the eastern boundary of the area, while the valleys of the rivers Granta, Rhee and Cam provide a contrasting, small-scale intimacy that is enhanced by their small woods, scattered villages and wetland vegetation.</p> <p>The prominence of the horse-racing industry at Newmarket is reflected in the manicured appearance of the landscape, while parish churches seldom form major landmarks in the wider landscape, there are notable exceptions such as at Ashwell.</p> <p>A sense of inspiration includes a Cambridge student's memories of visits to Wandlebury Ring and the Gog Magog Hills described by E.M. Forster in The Longest Journey.</p> <p>A sense of inspiration and escapism are also likely to be found within the area's remoter river valleys and ancient woodlands, as well as with other prominent earthworks such as the Devil's Dyke and the area's traditional towns and villages.</p> <p>Devil's Dyke has changed in function over time and now provides a viewing platform over the racecourse.</p> <p>The area continues to provide an inspiration for Cambridge students who attend one of the world's leading universities.</p> <p>Wind farm developments are now becoming a more accepted part of the landscape, with the potential to provide wider environmental benefits.</p>	<p>Conserve areas of chalk grassland and optimise management to maintain species diversity.</p> <p>Work with the horse-racing industry to expand the area of species-rich grassland through appropriate management techniques.</p> <p>Manage and restore the remnants of ancient woodland.</p> <p>Expand and re-link the wetland habitats which are characteristic of the river valleys.</p> <p>Realise the opportunities to conserve the traditional dispersed downland settlement pattern of villages in river valleys and scattered farmsteads.</p> <p>Promote the use of yellow brick and thatch in the west, and red brick and flints in the east, as traditional building materials.</p> <p>Through scrub removal, conserve and enhance historic earthworks and routes that illustrate past settlement. This will also provide access and enhance biodiversity corridors, for example Icknield Way and Fleam Dyke.</p> <p>Appropriately designed and located wind farms can become an accepted feature in the landscape.</p>	<p><b>Sense of place/ inspiration</b></p> <p><b>Recreation</b></p> <p><b>Sense of history</b></p> <p><b>Biodiversity</b></p> <p><b>Tranquillity</b></p>

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
<b>Sense of history</b>	<p>Prehistoric burial mounds</p> <p>Medieval moated enclosures and hollow ways</p> <p>Iron-age hill forts</p> <p>Roman and Saxon dykes</p> <p>Traditional buildings and farmsteads</p>	<p>The history of the landscape is evident in the landscape-scale earthwork features including the iron-age fort at Wandlebury and the defensive structures of Devil's Dyke and Fleam Dyke, built by the Saxons to control movement along the Icknield Way between the 5th to 7th centuries AD, as well as in less distinct remains such as prehistoric burial mounds, most noticeable on Therfield Heath near Royston.</p> <p>In addition, there is a wealth of Romano-British and late iron-age settlement remains (for example at Great Chesterford and Baldock) and sporadic survival of ancient field patterns surrounding some settlements.</p> <p>Cambridge Past, Present &amp; Future Society (CPPF) is an active campaign group encouraging the public to appreciate local history and preserve the historic landscape for future generations.</p>	Regional	<p>Some historic features, that are not so visually dominant, are perhaps well- understood only by Cambridge academics or keen amateur historians.</p> <p>Only fragments of the ancient field system survive.</p> <p>Many heritage assets are fragile and highly susceptible to loss or damage due to direct and indirect impact or inappropriate management.</p> <p>The range of features present in the area allows for the study of past human activity, informing current land management. Emphasis should be placed on the need to continue to protect and interpret the wealth of extant heritage.</p> <p>Archaeological features remain vulnerable from scrub encroachment.</p>	<p>Engage with communities and owners of historic features in celebrating and conserving the historic environment, including developing skills around historic environment conservation and traditional building skills and conservation.</p> <p>Improve visitor access and visitor facilities to key historic features.</p> <p>Seek opportunities to protect, manage and enhance historic features and their settings in relation to land management or land use changes, manage visitor pressures to prevent soil erosion and littering.</p> <p>Explore opportunities to enhance the setting, interpretation and legibility of heritage assets.</p> <p>Working with groups like the CPPF, seek opportunities to celebrate the past, respect the present and seek to influence the future.</p>	<p><b>Sense of history</b></p> <p><b>Sense of place/ inspiration</b></p> <p><b>Biodiversity</b></p> <p><b>Geodiversity</b></p> <p><b>Recreation</b></p>

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
<b>Tranquillity</b>	<p>Beech hangers</p> <p>Open scarp landscape</p> <p>River valleys</p>	<p>Tranquillity has declined significantly in the past 50 years, with the area of the NCA classified as 'undisturbed' falling from 79 per cent in the 1960s to 33 per cent in 2007, largely as a result of the traffic routes A11, M11 and A505 that cross the area.</p> <p>Expansion of urban centres (commuter developments) into rural landscapes.</p>	Local	<p>Although tranquillity has declined it is still an important localised resource in parts of the NCA, and a sense of tranquillity is likely to be particularly associated with the river valleys and traditional villages located away from major transport routes.</p> <p>Notable trends from the 1960s to 2007 are an increase in disturbed areas with a corollary decrease in tranquillity.</p>	<p>Distinctive elements of the chalk landscape, flowing water and rural scene, should be conserved and managed to improve perceptions of tranquillity, particularly near to settlements.</p> <p>Traffic-calming measures and support for non-car travel at popular countryside destinations should be encouraged and supported and will improve tranquillity and recreation experiences generally.</p> <p>Further erosion of tranquillity should be avoided or minimised by ensuring development in areas of high-to- medium tranquillity is appropriate to the setting and incorporates measures such as tree planting and 'green' buffers.</p>	<p><b>Tranquillity</b></p> <p><b>Sense of place/ inspiration</b></p> <p><b>Sense of history</b></p> <p><b>Recreation</b></p>

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
<b>Recreation</b>	<p>Public rights of way network</p> <p>Icknield Way</p> <p>Horse-racing industry focus on Newmarket</p> <p>Aviation heritage at Duxford</p> <p>Scarp slope</p> <p>Open access</p>	<p>Recreational opportunities are provided by 848 km of rights of way at a density of 1.01 km per km<sup>2</sup>, including some of ancient origin, for example, the Icknield Way and Roman Road</p> <p>Limited open access land, with just 209 ha covering less than 1 per cent of the NCA.</p> <p>The NCA has two significant visitor attractions, Newmarket Racecourse, and Duxford Airfield in the centre of the NCA which forms part of the Imperial War Museum.</p>	National	<p>There is currently a high number of car-dependent - visitors with associated impacts upon tranquillity in the area even though sites like Wandlebury Hill Fort are trying to redress this issue with a good offroad cycle route from Cambridge.</p> <p>Newmarket is heavily-visited for its horse-racing and Duxford is a major leisure attraction.</p> <p>This NCA has limited open access recreation available.</p> <p>Duxford Airfield site is on the Historic at Risk Register.</p>	<p>Support, create and improve links between recreational assets and settlements, particularly around growth areas.</p> <p>Liaise with the horse-racing industry on the importance of chalk grassland and to improve the species diversity of the grasslands around Newmarket</p> <p>Maintain and enhance recreation provision throughout the area by developing and improving rights of way, access to sites and areas of interest, plus raising the profile of the strategic importance of the Icknield Way.</p> <p>Improve the cycle and bridleway network.</p> <p>The Imperial War Museum should continue work to maintain the Duxford site as a national resource on aviation history and maintain the functioning historic airbase.</p>	<p><b>Recreation</b></p> <p><b>Biodiversity</b></p> <p><b>Sense of place/ inspiration</b></p> <p><b>Sense of history</b></p> <p><b>Tranquillity</b></p>



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<b>Biodiversity</b>	Species-rich chalk grassland	There is over 3,191 ha (4 per cent of the area) of priority habitats in the NCA, which includes 1,317 ha of lowland calcareous grassland (including road verges), 477 ha of coastal and flood plain grazing marsh, 352 ha of wet woodland, 339 ha of lowland meadows, areas of reedbed, fen, purple moor grass and rush pastures, as well as small areas of semi-natural woodland.	Regional	<p>Important areas and types of semi-natural habitat are designated, although stretches of chalk rivers and streams are under-represented.</p> <p>Woodlands and grassland represent core areas of habitat. Chalk streams, road verges and ancient hedgerows function as corridors.</p> <p>Long-term declining livestock numbers have made conservation of open habitats difficult, giving rise to losses of scrub and woodland. Open habitats are largely conserved only where agri-environment schemes support management.</p> <p>Conservation of woodland biodiversity relies upon grant schemes. Many woods have long been undermanaged, leading to a decline in woodland birds and butterflies.</p> <p>Effects of recreation, for example, trampling and littering on sensitive sites, needs to be considered particularly as there may be an increase in visitor numbers.</p> <p>Chippenham Fen with its chalk springs arising on site allowing the calcareous fen conditions to be created along with frequent ditches, pools and wet depressions making this a really diverse wetland. The peat soils on site vary from centimetres to 2 m thick.</p> <p>With correct management techniques numbers of grey partridge will increase.</p>	<p>Establish a resilient ecological network.</p> <p>Promote and enhance management of road verges for high quality grassland habitat.</p> <p>Identify and address gaps and build core areas, particularly in relation to chalk grassland and flood plain habitats.</p> <p>Incorporate access improvements to provide for public engagement with nature.</p> <p>Realise greater recognition of the biodiversity interest of chalk rivers and streams by seeking designations as appropriate and by integrating biodiversity conservation into management of associated historic assets.</p> <p>If visitor numbers increase on sensitive sites, visitors need to be educated on the value of biodiversity and be encouraged to avoid behaviour that could damage the site.</p> <p><b>Continued over...</b></p>	<p><b>Biodiversity</b></p> <p><b>Recreation</b></p> <p><b>Sense of place/ inspiration</b></p> <p><b>Sense of history</b></p> <p><b>Regulating soil quality</b></p>
	Ancient woodland					
	Ancient hedgerows					
	Sustainably managed farmland	The NCA contains two Special Areas of Conservation (SAC) including Chippenham Fen, which covers 117 ha and is also a Ramsar site. It is part of the Fenland Special Area of Conservation for its short species-rich fen meadows on calcareous peaty soils and its tall species-rich calcareous fen community dominated by Saw Sedge. Cambridge milk-parsley grows well on the site.				
	Chalk rivers and streams					
	Farmland birds	The NCA is important within the east of England for plants and invertebrates associated with chalk grassland species such as pasque flower, great pignut and chalkhill blue butterfly.				
	Arable weeds					
	Fenland	A grey partridge recovery project has been undertaken near Royston. <sup>7</sup>				
	Local Nature Reserves					
Road verges						

<sup>7</sup>Grey partridge *Perdix perdix* in the UK: recovery status, set-aside and shooting. *Ibis*, 152: 530–542, NJ Aebischer and JA Ewald (2010).

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Biodiversity continued					<p><b>... continued from previous</b></p> <p>Conserve important species populations in semi-natural and farmland settings by encouraging wildlife-friendly farming. Where possible, management to conserve biodiversity should seek to assist water and soil conservation, focusing upon areas where risks are highest and the value of the asset greatest, for example, on chalk grassland on steep slopes or wet meadows alongside chalk streams.</p> <p>Opportunities for Chippenham Fen should be considered by looking at The Fens NCA and the wider fens as a whole.</p> <p>Known practices to improve farmland bird numbers should be followed, for example providing conservation headlands.</p>	

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<b>Geodiversity</b>	<p>Chalk soils</p> <p>Rolling landscape</p> <p>Fluvial geomorphology</p>	<p>Underlying geology being reflected in traditional building materials, for example 'clunch' (building chalk).</p> <p>There are three geological Sites of Scientific Interest (SSSI) within the NCA. There are a further five sites of local interest.</p> <p>Quarrying of chalk is evident in some places, but the main influence of chalk bedrock is on the limited fertility of the soil and the effect this has on the landscape, both in colour and habitat diversity.</p> <p>Exposed faces in chalk pits, road cuttings and quarries all have value to specialist mosses and liverworts.</p>	Regional	<p>The geology and processes that underpin the NCA have generated much of the area's agriculture, land use and now, cultural heritage.</p> <p>Historic buildings are built with local materials.</p> <p>Need to manage the bare rock faces of chalk pits so rare flora is not lost as scrub encroaches.</p>	<p>Geo-conservation should be promoted by the local county geology groups, the Chalk East initiative and through the work of geologists at the University of Cambridge.</p> <p>The relationship between geodiversity in the area and the underlying aquifer, water quality and availability, and soils, presents an opportunity to engage a wide audience in a better understanding of the natural processes that limit available resources.</p> <p>Conserve Chalk exposures where they are of geodiversity and biodiversity value, for example at Reed, Barkway and Anstey Chalk Pits.</p> <p>Engaging communities and property owners in celebrating and using local building materials and developing skills in traditional building materials.</p>	<p><b>Geodiversity</b></p> <p><b>Regulating water quality</b></p> <p><b>Sense of place/inspiration</b></p> <p><b>Sense of history</b></p> <p><b>Biodiversity</b></p>

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