National Character Area profile:

95. Northamptonshire Uplands

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Introduction

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

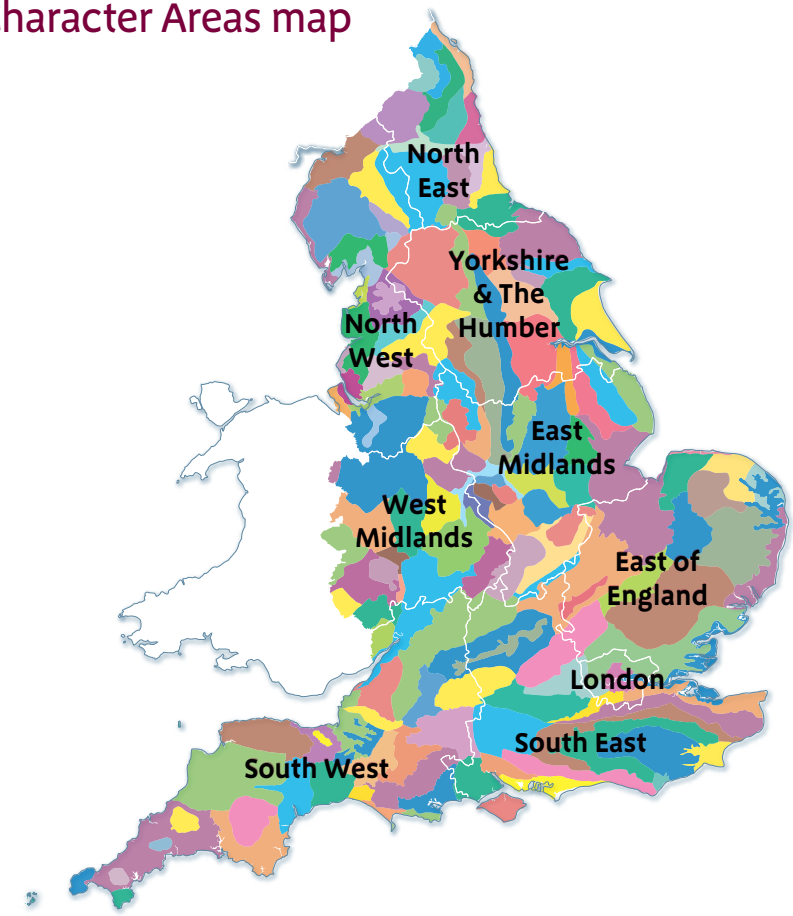
NCA profiles are guidance documents which can help communities to inform their decision-making about the places that they live in and care for. The information they contain will support the planning of conservation initiatives at a landscape scale, inform the delivery of Nature Improvement Areas and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

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

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

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

National Character Areas map



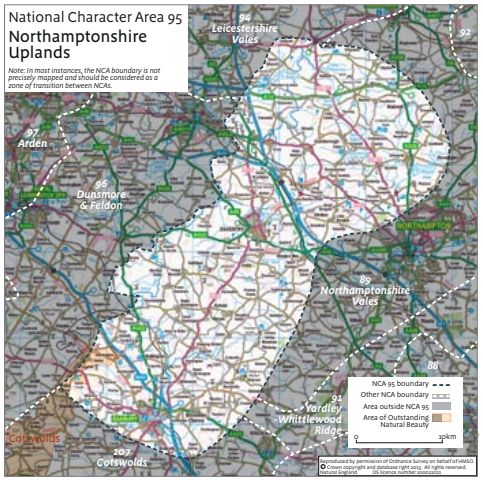
[1] The Natural Choice: Securing the Value of Nature, Defra (2011; URL: **www.official-documents.gov.uk/document/cm80/8082/8082.pdf**)
[2] Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services, Defra (2011; URL: **www.defra.gov.uk/publications/files/pb13583-biodiversity-strategy-2020-111111.pdf**)
[3] European Landscape Convention, Council of Europe (2000; **URL: http://conventions.coe.int/Treaty/en/Treaties/Html/176.htm**)

Summary

The Northamptonshire Uplands National Character Area (NCA) is an area of gently rolling, limestone hills and valleys capped by ironstone-bearing sandstone and clay Lias, with many long, low ridgelines. Rivers flow out from the NCA in all directions, including several major rivers – the Cherwell, Avon, Welland, Tove, Ouse, Nene and Ise. While there are areas of differing character, there are strong unifying landscape features across the Northamptonshire Uplands, most importantly the extensive areas of open field systems with ridge and furrow and the earthworks of deserted and shrunken settlements which occur throughout. Other features include the strong, mostly Parliamentary enclosure pattern with high, wide, A-shaped hedgerows bounding the largely rectilinear fields with their frequent mature ash and oak trees; the many country houses and their associated extensive areas of historic and nationally important designed parkland landscapes; the distinctive ironstone, cob and brick nucleated settlements with their large stone churches, often with prominent steeples; the narrow lanes with very wide grassy verges; and the small, scattered but prominent broadleaved woods and coverts. There are also wide, long-distance views from the edges and across the ridgetops throughout the area.

Land is in mixed agricultural use, mostly pasture and arable, and reservoirs are a significant feature. Woodland is sparse, with many scattered, small, broadleaved coverts and copses, some in prominent hill-top positions, dotted across the landscape. The few ancient woodlands, such as Badby, take on a special value and interest in an NCA with few other areas of semi-natural vegetation and relatively limited wildlife interest. Flood plain grazing marsh occurs around Banbury and there are small, scattered pockets of mire, lowland meadow, calcareous grassland and lowland dry acid grassland throughout the NCA, some designated Sites of Special Scientific Interest for their biodiversity interest. The area is also important for farmland birds.

Around the fringes and two main towns, the area has seen extensive development and construction of major strategic road and rail infrastructure, with associated reductions in levels of tranquillity and loss of rural character, though overall the area retains a strong sense of rural tranquillity. The area is particularly important for delivery of sense of history, sense of place, recreation and water availability and some ecosystem services are under pressure from development and agricultural practice, particularly water availability and water quality, soil erosion, soil quality and tranquillity.



Click map to enlarge; click again to reduce

Statements of Environmental Opportunities:

- **SEO 1:** Protect, manage and promote the historic and archaeological features, designed landscapes and field patterns – including the parkland, battlefield sites, canals, ridge and furrow and settlement sites, and distinctive high hedgerows with their many trees – to ensure that these key features for sense of place and history are conserved, people's enjoyment and understanding is increased, and recreation opportunities are enhanced.

- **SEO 2:** Conserve, enhance, expand and restore the semi-natural and farmed features of the area – including the mix of agricultural production, particularly the pasture and meadows, patches of semi-natural habitats, and veteran and ancient trees – to enhance biodiversity and landscape character and to safeguard the continued sustainable provision of food.

- **SEO 3:** Conserve, manage and enhance the river catchments and reservoirs, improving water quality and flow management and benefiting biodiversity and recreation through managing soils, diffuse pollution and run-off, reconnecting flood plains and extending natural habitats.

- **SEO 4:** Conserve, maintain and promote local building styles and materials and plan strategic growth, infrastructure development and mineral extraction to ensure they protect remaining areas of high tranquillity, strengthen local sense of place and biodiversity, and increase adaptation for climate change through multifunctional green infrastructure networks, building on existing resources such as canals, rivers and access routes, creating strong ecological and recreation networks.

Wide panoramic views are a key feature of the area, here from the Knightley Way, one of many named long-distance paths.

Description

Physical and functional links to other National Character Areas

The Northamptonshire Uplands National Character Area (NCA) extends north-east from the Cotswolds NCA south of Banbury to border the Northamptonshire Vales NCA and Leicestershire Vales NCA around Market Harborough at its northern extent. In the west it borders Dunsmore and Feldon NCA and it shares most of its eastern boundary with the Northamptonshire Vales NCA. A small area in the south-east abuts the Yardley Whittlewood Ridge NCA. It is part of the wider Jurassic 'wolds' landscapes that include the dip slope of the Cotswolds and extend north to the High Leicestershire NCA and the Leicestershire and Nottinghamshire Wolds NCA. The south-western corner of the NCA is designated as part of the Cotswolds Area of Outstanding Natural Beauty (AONB).

The hills are 'the main watershed of Middle England', with wide, far-reaching views from the edges and across the ridgetops. The area is an important supplier of water to towns in surrounding NCAs with many reservoirs and much abstraction from rivers. The River Cherwell rises in the south near Charwelton and flows south. The Tewkesbury Avon rises on the north-eastern edge near Naseby, and flows west then south-west, while the north-east-flowing Welland rises near Sibbertoft. The rivers Tove and Ouse rise here too and flow south-east. The eastern slopes form the upper catchment of the Nene, with the major tributary of the Ise in the far north-east. Topographically, the Upper Nene divides the Northamptonshire Heights to the north from the Cherwell/Ouse plateau, sometimes known as the 'Ironstone Wolds' in the south.

The NCA is crossed by several nationally important transport corridors. It is effectively divided in two from Rugby to Northampton by the M45, M1, A5, the West Coast Main Line railway and the Grand Union Canal. In the south, the M40, A423 and the Oxford Canal cross through, and further north the A14. Urban areas and large towns include Daventry and Banbury. Close by in neighbouring NCAs are Northampton and Milton Keynes, Kettering, Rugby, Coventry, Leamington Spa and Warwick. The many historic houses, parks and gardens, the Knightley Way, Jurassic Way, Brampton Valley Way, Battlefields Trail and the Grand Union and Oxford canals provide well-used recreation assets for people in surrounding areas.

Fawlsey Park; extensive areas of parkland are a key feature of the area, here being restored through agri-enviroment funding and grazed by the once locally common Hereford cattle.

Key characteristics

- Gently rolling rounded hills and valleys with many long, low ridgelines and great variety of landform. Wide, far-reaching views from the edges and across the ridgetops.
- Dominant Jurassic scarp slope of limestone and Lias clay hills capped locally with ironstone-bearing Marlstone and Northampton Sands. Glacial boulder clay covers the northern and eastern areas, with sands and gravels along river valleys.
- The Upper Nene Valley divides the gently undulating Northamptonshire Heights to the north from the hillier Cherwell/Ouse plateau (the 'Ironstone Wolds') to the south and has been exploited for sand and gravel.
- Rivers rise and flow outwards in all directions, including the rivers Cherwell, Avon, Welland, Tove, Ouse, Nene and Ise, and the area forms the main watershed of Middle England.
- Sparse woodland cover, but with scattered, visually prominent, small, broadleaved woods, copses and coverts, particularly on higher ground.
- Mixed farming dominates with open arable contrasting with permanent pasture.
- Typical 'planned countryside' with largely rectangular, enclosed field patterns surrounded by distinctive, high, often A-shaped hedgerows of predominantly hawthorn and blackthorn, with many mature hedgerow trees, mostly ash and oak. Some ironstone and limestone walls in places and some localised areas of early irregular enclosure.
- Small pockets of semi-natural vegetation with many small scattered broadleaved woodlands, some ancient and often on hill tops, with mires, areas of lowland meadow, calcareous grassland and lowland dry acid grassland in the river valleys. Bluebell woods occur in places.
- Nationally rare, locally abundant and prominent ridge and furrow, with frequent deserted and shrunken settlements. Several large historic country estates such as Cottesbrooke Hall and Althorp and many small country estates, with extensive parkland containing a great many mature, veteran and ancient trees.
- Nucleated villages often on hill tops or at valley heads with low densities of dispersed settlement. Cob, ironstone and limestone in older buildings with some remaining thatch, but mostly pantile and slate roofs. Brick buildings in some villages. Extensive new developments in villages along main transport corridors and in the two main towns.
- A dense network of narrow lanes with wide grassy verges, often following ridges, crossed by many strategic road and rail corridors, including the M1, M40, A14, West Coast Main Line railway, Great Western Railway line and the Oxford and Grand Union canals.
- The many historic houses, parks and gardens open to the public, the reservoirs, long-distance paths (such as the Knightley Way, Jurassic Way and Brampton Valley Way) and the Grand Union and Oxford canals provide well-used recreation assets.

The Northamptonshire Uplands today

An area of gently rolling, rounded limestone hills and valleys capped by ironstone-bearing sandstone and clay Lias, with many long, low ridgelines and wide, long-distance views across the ridges throughout. It lacks a strong sense of identity, not least because of its very varied landform.

The area forms the 'main watershed of Middle England', with rivers radiating in all directions. At the southern end, the River Cherwell rises near Charwelton and flows south. The Avon rises on the eastern edge near Naseby flowing west and south-west, while the north-east-flowing Welland rises near Sibbertoft. The tributaries of the Tove and Ouse originate in the south-east flanks, flowing south-east. Much of the eastern side of the area forms the upper catchment of the Nene, with its major tributary, the Ise, arising in the north-east. Topographically, the Upper Nene divides the Northamptonshire Heights to the north from the Cherwell/Ouse plateau or 'Ironstone Wolds' to the south.

In the northern half of the NCA, the Northamptonshire Heights have a rolling, gently hilly landform, with long, level views criss-crossed by a regular pattern of high hedgerows with frequent mature trees. Settlement is sparse with some small villages prominently sited on hill tops, and some lying within the small, sheltered valleys, often with large stone churches with prominent steeples. The widely spaced villages and infrequent, isolated farmsteads give the area a remote, empty feel. South of Daventry, the Cherwell/Ouse plateau (known as the 'Ironstone Wolds') is hillier and the undulations are sharper and more frequent. There is less of the glacial boulder clay which dominates the northern area, settlement is more frequent and arable predominates. The two distinctly hilly areas are divided by the low, flat valley of the River Nene and surrounded to the west, east and north by wide, open, low-lying vale landscapes. The south-western corner of the NCA is designated as part of the Cotswolds AONB.

There are, however, strong unifying landscape elements across the Northamptonshire Uplands. The most historically important of these, found in the remaining pasture fields, are the extensive areas of open field systems with ridge and furrow and the earthworks of deserted and shrunken

Banbury Town Centre.

settlements. Occurring frequently throughout the NCA, they are prominent and evocative in evenings and winter, when low sun casts long shadows and they seem to dominate the landscape. Other unifying features include the high, wide, A-shaped hedgerows (associated with the strong hunting and steeple chasing traditions of the area) bounding the largely rectilinear fields with their frequent mature ash and oak trees; the many historic country houses and their associated extensive areas of designed parkland landscapes and gardens; the attractive and distinctive ironstone, cob and brick villages; and the small, scattered but prominent broadleaved woods and coverts.

Village cottages are built mostly of local ironstone and brick.

Land is mostly in agricultural use, with a mixture of arable and pasture, though around the edge of the area, reservoirs are a significant element within the landcover, and along the Nene Valley, gravel extraction has occurred. Arable is extensive on the more level ground of the ridgetops, especially south of Daventry where the highest levels of field boundary loss have occurred. Here, hedgerows can be quite sparse and low and hedgerow trees intermittent. Limestone and ironstone walls also occur in some places, such as around Lamport.

Woodland is sparse, with many scattered, small, broadleaved coverts and copses, some in prominent hill-top positions, dotted across the landscape and quite frequent in an arc in the south from Badby to Woodend. The few ancient woodlands and bluebell woods, such as Badby, take on a special value and interest where there are few other areas of semi-natural vegetation and limited wildlife interest. Flood plain grazing marsh occurs around Banbury; there is a concentration of acid grasslands west of Northampton and south of Daventry, and of lowland meadow sites in South Northamptonshire, often associated with other semi-natural features; and there are small, scattered pockets of mire, lowland meadow, calcareous grassland and lowland dry acid grassland throughout, especially along the river valleys, some designated Sites of Special Scientific Interest for their biodiversity interest. The area is also important for farmland birds. The Brampton Valley Way and the Grand Union and Oxford canals provide important wildlife corridors. Upper parts of the River Nene fall within the Nene Valley Nature Improvement Area (NIA), which seeks to improve connectivity of habitats and restore the ecological network in the Nene Valley.

The predominant field pattern, and a strong unifying factor, is Parliamentary enclosure of the 18th and early 19th centuries imposed on an 'up and down' landscape; the rectilinear pattern is frequently strongly visible, though areas

of earlier piecemeal enclosure are found in places. Straight, narrow enclosure roads with wide, grassy verges, often following ridges, add to a regular, characteristic pattern in the landscape. From the ridges, the essence of the uplands, described by W.G. Hoskins, can be seen: "In this hill country, partly isolated summits and partly high table land in places, the wind blows hard and cold... Up at Naseby next door to Cold Ashby... their voices are louder than anywhere else, they shout at each other to overcome the winter wind."

Settlements are generally small, nucleated villages with distinctive ironstone, cob and red-brick buildings with pantile, clay or thatched roofs, clustered around an ironstone church. Some villages, such as Naseby and the aptly named Cold Ashby, are on prominent hill-top sites but others lie in sheltered situations at the heads of minor valleys, often set within mature treecover, with an enclosed, intimate, sheltered character and a unity resulting from the distinctive local vernacular.

Estate farmland with typical well managed hedges, many small woods and replanting of boundary trees.

The modest village houses are a strong contrast to the nationally important great country houses with their strong character and extensive designed parklands and estates containing a great many veteran and mature open-grown trees, providing rare habitat for lichens and invertebrates. Cottesbrooke, famed for its gracious proportions and extensive parkland, has enabled the survival of extensive open field systems of ridge and furrow; Canons Ashby is built around a medieval monastery; and Althorp House has the grand Georgian elegance of Henry Holland's design. There are also many fine smaller houses, most in local stone, including Ashby St Ledgers, Stanford and Sulgrave. The estate character of the landscape is emphasised by the uniformity of buildings in the estate villages and lodges.

Around the fringes, along the Cherwell and between Rugby and Daventry, many villages have become significantly enlarged by 20th-century development which does not reflect the distinctive local vernacular. The remoteness of the central undeveloped villages is emphasised by the minor roads that serve them, providing a stark contrast to the busy strategic routes of the West Coast Main Line and Great Western Railway and the M1, M40, M45, A14, A45, A5, A508, A422 and A423 roads which cross the area.

Recreation facilities include the Grand Union Canal and Oxford Canal, Pitsford Reservoir, the many historic houses, parks and gardens open to the public and long-distance routes such as the Knightley Way, Battlefields Trail, Jurassic Way and Brampton Valley Way.

The landscape through time

The area is mainly underlain by sedimentary strata of the lower and middle Jurassic periods. The muds and limestones of the Lias Group, which outcrop in the west of the area, were laid down in a warm shallow sea which was rich in marine life including many species of ammonites. Many of the limestones and sandstones of the Northampton Sands at the base of the Inferior Oolite Group, overlying the Lias Group, are very rich in iron. They were also laid down in a shallow sea, and subsequent weathering of minerals has resulted in the formation of rocks of distinctive colours. Overlying these, the clays and sandy limestones of the Great Oolite Group outcrop in the east of the NCA, continuing in a broad swathe through the central part of the Northamptonshire Uplands. Collectively, these rocks – which belong to the Rutland Formation, Blisworth Limestone and the Blisworth Clay – were deposited near to the shore of a shallow tropical sea.

Overlying the solid geology in the east and north of the area are thick superficial deposits of Quaternary till (boulder clay), with stretches of alluvium (sands and gravels) in the main river valleys, both dating from the Wolstonian glacial cycle. While the area was not glaciated during the Pleistocene, it was affected by extreme periglacial erosion, which has influenced the drainage of rivers including the Cherwell. Soils are closely related to the underlying geology and superficial deposits; here there are mostly types of loamy and clayey soils, often seasonally wet or with impeded drainage and providing mostly Grade 3 agricultural quality land with pockets of Grade 2, good arable land in places, particularly in the river valleys and in the southern half of the NCA around Banbury.

The area forms part of the Jurassic belt of 'wolds' landscapes that stretch from the Cleveland Hills in Yorkshire to Lyme Regis in Dorset, via the neighbouring Cotswolds. In this NCA, all of the sharper features of the Jurassic scarp slope have been smoothed away by a long process of denudation. The history of the area is in many ways typical of a 'wolds' landscape. It was originally covered in thick woodland over a soil not very attractive to early cultivation. Much of the area, particularly the clay plateau to the north-east and the Lias uplands of the south-east, was cleared for grazing in the later prehistoric and Roman period. There is scattered evidence for settlement of this period, most evident around the edges of the area within the river valleys.

The early Anglo-Saxon settlements were along the river valleys but the middle Saxon period saw the farmsteads (-tons) spreading up onto higher ground, and the outstanding late 7th-century church at Brixworth in the north-east of the NCA indicates that these were sites of major significance. This is the area where the Vikings and Saxons met and the incidence of place names with suffixes of '-by' and '-thorpe' indicates the influence of the Danes and the Danelaw in this area.

By the 11th century, there was quite frequent settlement although at a lower density than the surrounding more fertile areas and the predominant pattern of nucleated settlement had already developed. Up to the mid 14th century, colonisation proceeded rapidly. Most of the woodland was cleared and nucleated villages, surrounded by a sea of open fields in ridge and furrow cultivation, dominated the landscape. The substantial churches reflect this main period of the area's expansion and colonisation, which went into decline following the disasters of the mid 14th century: the population shrank and settlements were deserted for a variety of reasons including disease, the limited potential for cereal growth and the difficulty of maintaining the fertility of these upland soils. Ambitious landlords like the Spencers were able to accumulate large areas of land for grazing; in 1577, their flocks at

Wormleighton and Althorp numbered 14,000. Gradually, arable was largely replaced by sheep farming over much of the area and, as a result of the lack of subsequent cultivation, the NCA is now one of the classic locations for deserted settlements, medieval earthworks and shrunken ends of villages, with nationally important survival of ridge and furrow reflecting the former extent of the open field system. As the population shrank in the 14th to early 16th centuries, and monastic lands were added to the estates of the wealthy and the profitability of wool production continued, the great landscape parks and country houses such as Althorp, Canons Ashby, Cottesbrooke and Holdenby were laid out, some by major designers such as Repton and Brown. The strong landlordship that often went with such parks is reflected in the distinctive common architecture of the planned estate villages and lodges. The Elizabethan and Jacobean houses, notably Holdenby, Althorp and Canons Ashby, are particularly associated with the court life of those periods, the poems of Edmund Spenser and the masques of Ben Jonson.

Tenant and freehold graziers tended to maintain or improve village farmsteads, reflected in the many surviving fine stone-built farmhouses, often with threshing barns attached, of the 16th to early 18th centuries. Many of the surviving historic houses within the villages were originally farmhouses, changing function in the 18th and 19th centuries as new, larger steadings with large barns and cattle courts were built on the fringes of settlements and in newly enclosed fields and the remaining open land was enclosed. While there are areas of irregular earlier enclosure, especially in the north, the predominant enclosure pattern in the NCA is regular Parliamentary enclosure dating from the 18th to 19th centuries.

In the 20th century, the main changes to a substantially remote, rural area were the massive loss of elm trees to Dutch elm disease during the 1970s; the building of major road routes including the M1, M40 and A14 which cross it; the widespread expansion of arable cultivation and the building of modern farm buildings, loss of permanent pasture, improvement of remaining grassland and consequent rationalisation of field boundaries, and loss of boundary trees and ridge and furrow, particularly in the southern half of the NCA; the construction of reservoirs around the edge of the area; and, more recently, the construction of telecommunications masts and large numbers of wind turbines, some within the NCA for example round Yelvertoft, but mostly in the surrounding areas.

In recent times, there has been significant development pressure in towns in surrounding NCAs such as Northampton, Rugby and Kettering as well as within the NCA in Banbury and Daventry, with much commuter-related development in nearby villages with good road and rail links to local towns and to cities such as Birmingham and London. The development and upgrading of the strategic transport road and rail routes which cross the area and subsequent associated warehouse, industrial and 'out-of-town' shopping and housing developments along these transport corridors have had a significant urbanising impact on the landscape and reduced levels of tranquillity in these areas.

The Oxford Canal, once a busy industrial waterway is now a well-used recreation resource.

Ecosystem services

The Northamptonshire Uplands 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 Northamptonshire Uplands NCA is contained in the 'Analysis' section of this document.

Many of the villages shelter within extensive amenity tree planting.

Provisioning services (food, fibre and water supply)

- **Food provision:** The area is predominantly agricultural in character, with a mix of pasture and arable crops on predominantly Grade 3 quality agricultural land. The area is important regionally for food production and the farmed landscape has changed as market conditions have changed. There has been a shift in cropping patterns in recent years, with a loss of dairy farms, a decline in mixed farms and significant reductions in grazing livestock numbers and also in glasshouse production. Arable, however, has increased significantly, especially the area growing stockfeed, reflecting an increase in intensity of remaining stock production. Recently, some miscanthus has been planted for biomass production, which, if it increases significantly, may affect the area available for food production. There are pressures on water and soil quality and issues with diffuse pollution and soil erosion in places.

- **Water availability:** Water resources from the Nene, Cherwell, Ouse and Avon are heavily exploited and are considered to be restricted, ranging from 'no water available' to 'over-abstracted', and measures are in place to monitor abstraction rates. The many reservoirs and rivers form an important part of the water supply network to surrounding large towns and to the Grand Union and Oxford canals. The planned major expansions of nearby towns – both inside and around the NCA, including Northampton, Rugby, Daventry and Banbury – will place additional pressure on local water supplies. Increasing future demand from agriculture for irrigation or stock watering could also increase pressure on supply. Climate change may have an impact on water resources, with low rainfall and drought leading to water shortages, reduced water quality and exacerbating low summer flows in rivers, and could lead to an exacerbation of diffuse pollution.

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

- **Regulating soil erosion:** Around 60 per cent of soils are erosion prone and there are four Defra priority catchments in this NCA – which cover the Upper Cherwell, Upper Avon and River Leam, River Nene and Upper Great Ouse – where soil erosion and management are identified as key issues. Employing soil management measures will improve soil structure and reduce erosion in areas most at risk such as on the ridges and sloping valley sides, and in areas with low soil organic matter levels or compaction. Increasing areas of permanent grassland and wide buffer strips of grassland alongside watercourses in arable areas would reduce erosion risk, especially where such grassland is managed under extensive grazing regimes. An increase in semi-natural habitats would increase the area of land maintained under stable soil conditions, helping to bind soils together, aiding water penetration and reducing erosion, for example through restoring and extending woodland, hedgerows, wetlands and mires.

- **Regulating water quality:** Water quality in the area is in need of improvement, particularly the ecological status, which ranges from good to poor. Pressures include land use change, loss of permanent pasture and parkland, increase in arable production, intensification of agricultural production, and high levels of nitrogen and phosphorus. The planned expansion of settlements in the area could have implications for water quality, particularly from increased phosphate from sewage and road run-off, and there is a need to ensure that sustainable water management is adequately built into urban extensions to prevent deterioration of water quality. Wider application of best practice land management (catchment sensitive farming techniques) to areas both within and outside the current priority catchment areas would significantly improve water quality. The Upper Nene also lies within the Nene Valley NIA which seeks to improve water quality. Non-native species such as Himalayan balsam and Japanese knotweed pose a threat in some areas.

- **Regulating water flow:** The NCA contains the headwaters of four major rivers – the Avon, Ouse, Nene and Cherwell – some with a history of flooding, especially the Avon around Yelvertoft, the Nene around Weedon Bec and the Cherwell around Banbury. Strategic roads including the M1, M40 and A14 can be affected in these areas. Many soils in the NCA have impeded drainage and there is a very low level of woodland cover and a loss of permanent pasture, contributing to the potential for high levels of run-off. Flood storage areas on the flood plains could reduce risk to settlements downstream and the preferred approach to flood management is to investigate flood storage options, with environmental enhancements to improve the natural state of rivers and their habitats such as the planting of riparian woodland and the restoration of permanent grassland, parkland and hedgerows to intercept water and, with their higher carbon soils, reduce run-off and minimise soil erosion. Good soil management to avoid or reduce soil compaction and increase soil organic matter could aid water infiltration rates and reduce run-off. Plans for extensive new development, particularly in flood plains around Weedon Bec and Banbury, will have an impact on flood risk and need additional management.

Cultural services (inspiration, education and wellbeing)

- **Sense of place/inspiration:** Sense of place is provided by the varied undulating hilly landform and many long, low ridgelines. A sense of inspiration is associated with the rural landscape and its visible historical associations, including the extensive ridge and furrow, open ridgelines affording long views and areas of ancient woodland. These senses are strongest in the characteristic designed parklands and estates that surround the many historic country houses. Distinctive, highly attractive, small, nucleated villages are predominantly constructed of ironstone, cob and brick and linked by straight, narrow enclosure roads with wide grassy verges, alongside strong rectilinear field patterns with tall, A-shaped hedgerows and many mature hedgerow trees. Woodland cover is sparse with coverts and spinneys associated with the area's strong hunting tradition. Navigable canals and reservoirs are an important visual component of the landscape. A small area of the NCA (less than 1 per cent) lies within the Cotswolds AONB, reflecting high levels of natural beauty in the area. Development is changing character in some areas and the open nature of the landscape means that it is vulnerable to large-scale development. Major road infrastructure developments and urban areas associated with Daventry, Banbury and the main road/rail corridors do not reflect the local vernacular character, which is becoming highly diluted in these areas. The extensive areas of parkland are characteristic in this NCA and many are at risk through neglect and lack of management of their designed landscapes and, in some cases, arable conversion.

- **Sense of history:** Sense of history is particularly strong and evident especially in the abundant and prominent ridge and furrow field systems and deserted settlements which are of national importance. There are many archaeological sites, covering all periods of occupation from the Palaeolithic to the Second World War. Scheduled Ancient Monuments include iron-age hill forts, Roman villas, medieval settlements, ridge

Canons Ashby, one of the fine country houses charateristic of the area.

and furrow, and open field systems. Large numbers of non-scheduled archaeological sites reflect the long history of settlement and good state of preservation of early features under permanent, unploughed grassland in parkland landscapes of the 18th and 19th and earlier centuries. The many manor houses such as Althorp, Canons Ashby and Cottesbrooke as well as their extensive parklands (some laid out by important designers such as Repton and Brown) are key features, many of national importance. Other important landmarks include Naseby, Edgcote and Cropredy battlefields, the Grand Union and Oxford canals, the high numbers of Listed Buildings and the large stone churches, reflecting the past wool-based wealth of the area. Most archaeological sites are small, with little or no public access, and the majority of the nationally important ridge and furrow and settlement sites have no formal protection. The main threats are from ploughing and neglect. There has been significant loss of ridge and furrow and other features through cultivation, reducing the ability to read the history of the area in the landscape and a significant loss of hedgerows and hedgerow trees and field amalgamation due to the demands of modern agricultural practice.

- **Tranquillity:** Despite a dramatic decline in tranquillity and an increase in disturbance overall, many parts of the NCA still retain a strong feeling of remoteness and tranquillity. The remaining areas of parkland and their historic country houses, the ridge and furrow and other historic features, the remaining rural areas of pastoral farmland, the canals, rivers and reservoirs, woodland and semi-natural habitats all play an important role in delivering health and wellbeing benefits to people in the NCA and surrounding area and should be conserved and enhanced. The sparse settlement pattern, narrow country lanes with their wide verges, distinctive small, attractive villages and far-reaching views are also often associated with feelings of escapism, spiritual refreshment and inspiration and should be conserved.

- **Recreation:** Rights of way crisscross the rolling landscape, including many long-distance routes offering panoramic views across the NCA and surrounding areas. There is very little publicly accessible land, but the many country houses, gardens and parks which are open to the public are popular recreation destinations, as are Pitsford Reservoir and other reservoirs, the navigable canals and country parks. Ongoing development pressure in the area will lead to further demand and pressure to increase recreation use of the area. There is scope to accommodate this, though careful green infrastructure planning, links and management would be needed to avoid conflicts between users or adverse effects on remaining areas of high tranquillity, biodiversity, archaeological or historic importance, or on soil or water quality. There are also opportunities to increase people's understanding and enjoyment of the special qualities of the area, particularly its strong sense of history.

- **Biodiversity:** There are nationally important sites for winter wildfowl, woodland, parkland and lowland acid, neutral and flood plain meadows present in the NCA as well as areas of importance for farmland birds and arable plants. While current areas important for biodiversity are small in extent, these remaining areas take on an increased significance for permeability in the countryside.

Statements of Environmental Opportunity

SEO 1: Protect, manage and promote the historic and archaeological features, designed landscapes and field patterns – including the parkland, battlefield sites, canals, ridge and furrow and settlement sites, and distinctive high hedgerows with their many trees – to ensure that these key features for sense of place and history are conserved, people's enjoyment and understanding is increased, and recreation opportunities are enhanced.

For example, by:

- Protecting and conserving and, where appropriate, restoring designated historic assets – including Scheduled Ancient Monuments, Registered Parks and Gardens, registered battlefield sites and Listed Buildings, especially those which are considered 'at risk' – and encouraging sensitive management of the outstanding features, including the nationally important open field systems, ridge and furrow and deserted medieval settlements and shrunken ends of villages, protecting archaeological assets from damaging activities such as ploughing, animal burrowing and tree growth, and developing a co-ordinated approach to their management by conservation organisations and farming and landowning interests.
- Protecting, conserving, restoring and enhancing the extensive non-designated historic parklands, their settings, their veteran and ancient trees, and rare fauna and flora, including lichens, invertebrates and bats, to protect their heritage, landscape and biodiversity interest, encouraging the development of comprehensive management plans which respect the historic integrity of parkland design and features, as well as taking into account the needs of their biodiversity, archaeology and modern farming practice.
- Encouraging the surveying, protection, conservation, appropriate management and interpretation of non-designated historic sites, including those on the Historic Environment Record, as well as field patterns and boundaries; and researching and raising awareness of the history and time-depth of the area, improving protection and management of the area's heritage and people's enjoyment and understanding of historic assets which contribute to the strong senses of place and history.
- Conserving small-scale vernacular features which no longer serve their original purpose, such as water troughs and ponds, but which reflect the past cultural history of the area and contribute to the strong senses of place and history.
- Maintaining field patterns, hedgerows and limestone and ironstone drystone walls (where they are in good condition) and restoring or re-creating both hedgerows and walls using local ironstone and limestone and the Midlands style of hedge-laying, and maintaining the distinctive A-shaped, high, thick hedgerows with their many standard trees, where condition has declined or where they have been replaced by fencing, to maintain and increase habitat connectivity and the cultural influence of farming patterns in the landscape.
- Providing easily accessible sites of archaeological, historical and cultural interest for both educational and public use and encouraging appropriate interpretation of the qualities of the landscape and the importance of its historic buildings, parkland, battlefield sites and archaeological features, to improve understanding and enjoyment of the historic environment.

SEO 2: Conserve, enhance, expand and restore the semi-natural and farmed features of the area – including the mix of agricultural production, particularly the pasture and meadows, patches of semi-natural habitats, and veteran and ancient trees – to enhance biodiversity and landscape character and to safeguard the continued sustainable provision of food.

For example, by:

- Expanding, restoring and managing the remaining semi-natural habitats – especially remnant hay meadows, species-rich pasture and meadows, parkland, acid and calcareous grassland, purple moor-grass, lowland heath, reedbeds, flood plain grazing marsh, hedgerow and woodland habitats – through appropriate grazing and management, to increase diversity of habitat mosaics and encourage a wide structural diversity and a variety of flowering plants that can provide both feeding and breeding sites for pollinators and pest regulators and increase connectivity through creating corridors, buffers and stepping stones of habitats important for insects and other biodiversity.
- Encouraging sustainable farming methods which produce a wide range of crops, safeguarding food supplies into the future and ensuring the future viability of farms in the area without compromising delivery of other ecosystem services such as water and soil quality, soil erosion and biodiversity.
- Seeking to balance efficient farming production with conservation of the historic environment and biodiversity, promoting farming systems which also maintain and restore the farmed landscape and range of habitats, field boundaries, areas of parkland and woodlands, encouraging retention of remaining permanent pasture, reversion of arable to pasture, (particularly in ex-parkland sites), managing grazing of grassland habitats and neighbouring areas at levels that will encourage good ecological condition and extending the influence of remaining high-quality patches of unimproved grassland by developing links to increase connectivity, improve habitat condition, encourage species diversity, protect soil quality and carbon storage, and increase resilience to climate change.
- Encouraging re-introduction of previously declining traditional cattle breeds such as Hereford and Dairy Shorthorn to diversify the grazing regime, maintain the genetic diversity of agricultural animals against future threats and conserve the agricultural heritage of the area; and encouraging the promotion of local brand meats to try to increase the viability of traditional breeds.
- Encouraging the agricultural practice of hay-making to maintain and enhance the remaining species-rich meadows, and encourage restoration of hay-making to suitable meadows to increase biodiversity and connectivity of the remnant hay meadows and to encourage a variety of flowering plants that can provide both feeding and breeding sites for pollinators and pest regulators which contribute to food provision services.
- Conserving and managing ancient and veteran trees in both parkland and hedgerows to benefit invertebrate fauna and encourage selection

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and management of future veteran and ancient trees from the current mature stock, to ensure continuity of this rare resource.

- Surveying the road verges of the National Character Area (NCA) to map the location of species-rich verges and to establish whether current verge management is appropriate; and encouraging appropriate management regimes of such verges to ensure that these local features are retained in the landscape, contributing to the semi-natural grassland resource, and maintaining and enhancing species diversity and insect populations.
- Managing arable cropping patterns and arable cultivation, encouraging winter stubbles and wide field margins to encourage priority species such as rare arable plants and the full range of farmland birds and mammals and, where possible, seeking a reduction in the use of pesticides, herbicides and nutrients, to enhance biodiversity and reduce diffuse pollution.
- Encouraging biomass production including miscanthus and short rotation coppice in areas of high yield potential which do not suffer from soil erosion or conflict with food production, important sites for biodiversity, archaeology, historic landscape or views from the ridgelines and avoiding planting biomass crops in fields which are crossed by rights of way or adjacent to popular routes to avoid conflicts with recreation and enjoyment of the countryside.
- Encouraging good hedgerow management in areas of biomass planting, protecting and restoring the traditional Midlands hedgerow style with its high, A-shape and many hedgerow trees in order to mitigate the landscape impacts of biomass crops.
- Encouraging best practice and minimisation of the use of pesticides and herbicides where possible, to minimise impact on pollinators and reduce impacts on water quality, encouraging management of arable land to maximise use of natural pest control methods through beetle banks, grass margins and headlands in fields.
- Developing interpretation of the key features and assets of the area, particularly its geology, farming practices, habitats and biodiversity and providing easily accessible and 'access for all' sites of wildlife, historical and geological interest for both educational and public use.
- Encouraging volunteers to undertake tasks such as surveying and conserving the wildlife, historical, cultural and geological interest to increase knowledge and understanding.

Narrow lanes with wide grassy verges bordered by high, thick hedges occur throughout the area.

SEO 3: Conserve, manage and enhance the river catchments and reservoirs, improving water quality and flow management and benefiting biodiversity and recreation through managing soils, diffuse pollution and run-off, reconnecting flood plains and extending natural habitats.

For example, by:

- Enhancing and managing the quality of the watercourses, to maintain them as distinctive features in the landscape and enhance their riparian habitats and wildlife interest, restoring, expanding and linking riparian semi-natural habitats such as wet woodland, valley mires, reedbeds and grazing marsh along watercourses in the valleys; and reconnecting rivers with their flood plain watermeadows to slow run-off and improve water storage capacity, while reducing flood risk and soil erosion, and improving water quality, climate regulation, habitat networks, resilience to climate change and recreation opportunities.
- Promoting sustainable use of local water resources and use of water efficiency measures by commercial, agricultural and domestic users to reduce consumption where possible, especially in new developments, ensuring that any further abstraction is carefully monitored and controlled to avoid having an impact on water flow in the rivers.
- Managing river and reservoir banks, flood plains and riparian habitats to ensure a robust cover of semi-natural vegetation, and ensuring river engineering works are carried out in an ecologically sensitive manner to naturally filter the water, reduce soil erosion and sedimentation, and reduce poaching by stock through wide buffer strips, fencing, broadleaved woodland and scrub and controlling invasive non-native species which threaten the stability of river banks.
- Working with land managers and authorities in nearby NCAs to address water flow issues at a catchment scale, including implementation of the River Nene Catchment Flood Management Plan[4].
- Encouraging implementation of the vision and objectives of the Nene Valley Nature Improvement Area, including tackling water resource and flow issues and encouraging uptake of advice and grants available through the Catchment Sensitive Farming Schemes targeted on the area to manage watercourses to prevent diffuse water pollution, allow water tables to rise where appropriate, and to promote good soil management in the priority catchments.
- Encouraging best practice in soil management, adopting Defra's Code of Good Practice (2009) and the Environment Agency's 'Think Soils' initiative (2008), to ensure continued sustainable food production which does not compromise other ecosystem services.
- Ensuring that farm infrastructure is able to reduce rates of point and diffuse pollution generated in and around the farms through improved, roofed silage, slurry and manure storage, grey water separation, rainwater storage, improvements to storm overflows and good handling facilities.
- Reducing soil erosion through provision of livestock drinking troughs, sediment ponds and traps, swales with check dams, piped culverts in ditches, resurfacing of gateways, livestock and machinery tracks, watercourse

[4] River Nene Catchment Flood Management Plan, Summary Report, Environment Agency (December 2009)

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crossings, gate relocation and hard bases for drinkers and feeders, while ensuring their sensitive design in this high-quality landscape.

- Managing non-riparian woodland, parkland and hedgerows and creating new native woodland to increase water infiltration, slow flows, reduce soil erosion, act as wind breaks, improve soil quality through increased organic matter and soil fauna, and bind soil in proximity, avoiding sites of biodiversity or archaeological interest.
- Promoting extensive grazing of pasture where possible, protecting wet soils from heavy grazing, poaching and compaction, applying light applications of farmyard manure rather than artificial fertilisers to encourage build-up of soil organic matter to increase carbon storage/retention and drought tolerance of crops; and encouraging techniques such as direct drilling, inclusion of break crops and retention of winter stubble to protect soil.
- Working with the farming community to promote good nutrient and pesticide management, managing applications of pesticides, slurry and manure to maximise uptake and reduce run-off where possible, by avoiding manure spreading in winter on frozen, hard ground or very wet ground, or when there is no grass growth, and use of biobeds.
- Seeking to plan cultivation timings carefully and, where possible, minimising machinery and stock movements in wet conditions and avoiding using heavy machinery on wet soils to avoid damage to and compaction of topsoils and improve water infiltration, reducing surface run-off, increasing resilience to drought and encouraging the use of minimum tillage techniques such as direct drilling to reduce soil exposure and break-up.

The Northamptonshire Uplands near Newnham showing an example of the extensive ridge and furrow which orrurs frequently on permanent pasture throughout the area.

SEO 4: Conserve, maintain and promote local building styles and materials and plan strategic growth, infrastructure development and mineral extraction to ensure they protect remaining areas of high tranquillity, strengthen local sense of place and biodiversity, and increase adaptation for climate change through multifunctional green infrastructure networks, building on existing resources such as canals, rivers and access routes, creating strong ecological and recreation networks.

For example, by:

- Protecting the remaining areas with a strong sense of rural remoteness and tranquillity, their gently rolling, rounded hills with their many long, low ridgelines, the great variety of landform and the many wide, far-reaching views into and out from the NCA, from tall, vertical or large-scale developments.
- In the part of the NCA which lies in the Cotswolds Area of Outstanding Natural Beauty (AONB), conserving and enhancing natural beauty and supporting forms of quiet open-air recreation that do not conflict with the purpose of designation and which value the high-quality landscape and natural environment in this area; and encouraging use of the finer-grained information in the Cotswolds AONB Management Plan and the Cotswolds AONB Landscape Strategy and Guidelines, ensuring that landscape opportunities are maximised in ways which do not conflict with the purpose of designation.
- Maintaining the integrity of historic settlement patterns, houses and historic farm building types and layouts, encouraging use of best practice and traditional techniques and materials in the conservation, maintenance, restoration and repair of listed and other historic buildings, including the use of ironstone, cob and brick with thatch, pantile or clay tile roofs.
- Encouraging sympathetic conversions of historic buildings and new developments in the towns of Banbury and Daventry and in nearby villages which respect the particular character, vernacular styles and materials of each.
- Retaining the distinctive, quiet, rural character of the farmland, villages and farms where it still persists, through maintaining the nucleated settlement pattern and rural lanes, restricting development primarily to the main settlements and ensuring it is appropriate in scale and reflects local vernacular styles and materials.
- Planning a strong landscape framework as a context to potential development expansion around Daventry, Banbury and the main transport corridors, ensuring that new development and infrastructure does not have a negative impact on landscape character; considering the visual impact of modern development, particularly urban intrusion and loss of tranquillity; and managing improvements to minor roads to maintain the existing character of the rural road network with its narrow lanes and wide grassy verges.
- Protecting areas of existing green infrastructure in developed areas, especially parks and urban tree planting, and encouraging their restoration, expansion and replacement.

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- Encouraging green infrastructure planning and provision and urban tree planting in new development which link with surrounding rural areas and recreation provision, reducing the heat island effect, and which reflect and reinforce existing landscape character and integrate new development into the area without challenging the existing strong pattern of settlement and enclosure, or the vernacular styles and materials.
- Encouraging multifunctional restoration and enhancement of gravel extraction sites along the Nene Valley and planning to restore new extraction sites once extraction is complete, to conservation end uses; and creating new wetland habitats and providing access and recreational opportunities.
- Encouraging new development and extensions, where proved necessary, and repair work to existing historic buildings that reflect the local building styles, materials and detailing, and maintain heritage significance, and ensuring that on-farm developments respect the original form, style and materials of adjacent farmsteads, retaining and encouraging sympathetic restoration or conversion of redundant buildings which respects their particular local character, vernacular styles and materials.
- Protecting the remaining strong senses of remoteness and tranquillity in areas away from the main settlements and transport corridors, by controlling development and use of night-time lighting, especially on the higher ground.
- Managing and replanting the areas of mature amenity tree planting which shelter many of the villages, using a wide range of species to build in resistance to new tree diseases and to ensure retention of this distinctive local feature.
- Controlling lighting in new developments and conversions, for example by using down-lighters, timers and sensors, to minimise light pollution.
- Avoiding inappropriate development in flood risk areas and minimising run-off from new development, promoting use of sustainable drainage systems (SuDS) in urban areas to help mitigate the impact of flooding; designing new off-mains developments in rural areas to include sustainable drainage systems to improve water infiltration and protect the aquifers; and promoting best practice to prevent effluent leakage from existing septic tanks.
- Maintaining and expanding public access, including the many long-distance walking routes, encouraging provision of new areas of open access, seeking opportunities to improve and expand the rights of way network, and creating additional multi-user paths.
- Encouraging recreational activities which respect the special qualities of the area and finding ways to manage access, visitor pressure and demand, to prevent conflict between different users or adverse effects on the natural or historic environment.

Additional opportunity

1: Conserve, enhance, expand, connect and manage the many, often visually prominent, small, broadleaved woodlands and coverts, areas of wood pasture, sheltering planting around settlements and parkland to enhance biodiversity and landscape character, provide timber and wood products, and assist with regulation of water quality, soil quality and soil erosion.

For example, by:

- Restoring and encouraging management of the existing small, broadleaved and remaining ancient woods, parkland, wood pasture and areas of amenity tree planting around villages, for local timber use and wood fuel, to restore structural diversity, increase woodland connectivity and biodiversity, reduce soil erosion, improve water quality and landscape interest, encourage woodland species of birds and retain the benefits to climate regulation of high soil carbon and active carbon sequestration associated with woodland.
- Re-introducing active coppice management where this will enhance woodland habitat and wildlife interest, strengthening hedgerow networks, particularly where hedgerows connect areas of woodland, and encouraging the planting of a wide range of tree species to increase resilience to climate change and new diseases.
- Encouraging new small-scale planting and expansion of existing broadleaved woodland for timber production and to enhance landscape and biodiversity, in appropriate locations where it can be accommodated without compromising key features of the area such as the views from the ridgelines, the open landscape character with prominent scattered small hill-top woods, parkland, archaeological features or priority habitats while respecting the shape and scale of existing woodlands.
- Encouraging sympathetic management of the existing coniferous blocks through thinning, selective felling and reshaping, to develop open glades and softer edges which follow the landform, and increase the proportion of broadleaved species and enhance the ground flora.
- Encouraging planting and management for local timber production of the hedgerow and waterside trees to maintain a well-wooded appearance on enclosed land and along rivers.
- Encouraging the creation of new woodland and tree planting in association with new developments to break up their impact on the landscape, reflecting the existing sheltering planting patterns around some villages in the area, which contribute strongly to their sense of place.
- Encouraging the use of a wide range of tree species in new planting to maximise resilience to climate change and novel diseases, and to reduce reliance on oak and ash.
- Encouraging landowners, farmers, authorities and interest groups to survey and monitor for tree disease and to seek to identify and propagate locally resistant strains of ash and oak.
- Encouraging local and regional markets for biomass and wood fuel to support sustainable woodland management.

Supporting document 1: Key facts and data

Northamptonshire Uplands National Character Area (NCA): 101,141 ha

1. Landscape and nature conservation designations

Cotswolds Area of Outstanding Natural Beauty (AONB) intrudes into the south-western corner of the Northamptonshire Uplands NCA. 1,094 ha of the AONB covers 1 per cent of the NCA.

Management plans for the protected landscape can be found at:

- www.cotswoldsaonb.org.uk/

Source: Natural England (2011)

1.1 Designated nature conservation sites

The NCA includes the following statutory nature conservation designations:

Tier	Designation	Designated site(s)	Area (ha)	% of NCA
International	n/a	n/a	0	0
European	Special Protection Area (SPA)	n/a	0	0
	Special Area of Conservation (SAC)	n/a	0	0
National	National Nature Reserve (NNR)	n/a	0	0
National	Site of Special Scientific Interest (SSSI)	A total of 14 sites wholly or partly within the NCA	583	<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.

There are 314 local sites in the Northamptonshire Uplands NCA covering 2,842 ha, which is 3 per cent of the NCA.

Source: Natural England (2011)

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

1.1.1 Condition of designated sites

Condition category	Area (ha)	% of SSSI land in category condition
Unfavourable declining	n/a	n/a
Favourable	457	78
Unfavourable no change	14	2
Unfavourable recovering	113	19

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

In the central section, the NCA rises to the high points of Arbury Hill, Charwelton Hill and Naseby, all at or slightly above 200 m. Land to the south of Daventry is noted as being hilly, the undulations are sharper and more frequent.

Source: Natural England (2010)

2.2 Landform and process

Rounded undulating hills with many long, low ridgelines. Great variety of landform with distinctive local features, such as Hemplow Hills.

Source: Northamptonshire Uplands Countryside Character Area Description, Midlands Clay Pastures Natural Area Profile

2.3 Bedrock geology

The area is mainly underlain by middle Jurassic limestones and clays of the Lias, capped locally by the iron-stone bearing Marlstone and Northampton Sands. Rocks exposed include clays, silts, iron-rich limestones and oolitic limestones of the Inferior Oolite. Physically, the area is dominated by the Jurassic scarp slope. The area was not glaciated during Pleistocene times but was affected by extreme periglacial erosion influencing the local drainage of rivers such as the Cherwell. Mineral exploitation of ironstone, limestone and gravel has produced many man made exposures, but many of these have subsequently been filled as part of waste disposal schemes. The Whitby Mudstone formation clays (Upper Lias) form the second most extensive geology in the county and are exposed on the uplands. An area of Great Oolitic Limestone outcrops at south-west of the NCA.

Source: Northamptonshire Uplands Countryside Character Area, Midlands Clay Pastures Natural Area Profile

2.4 Superficial deposits

Glacial boulder clay dominates much of the central area. The dominant drift geology is the glacially deposited boulder clay. Large sheets of this generally chalk till remain from the Wolstonian glaciations and cover the earlier solid geologies. Further drift geologies include the sand and gravels laid down during the periglacial activity. Clays of the Lias are capped locally by the iron-stone bearing Marlstone and Northampton Sands, and with a thick mantle of boulder clay (glacial till).

Source: Northamptonshire Uplands Countryside Character Area

The flat valley of the River Nene divides the Northamtonshire Uplands in two, here near Weedon Bec.

2.5 Designated geological sites

Designation	Number
Geological Site of Special Scientific Interest (SSSI)	3
Mixed interest SSSI	0

There are 23 Local Geological Sites within the NCA.

Source: Natural England 2011

Outfarms, which are small groups of agricultural buildings away from the farmhouse and once common in the area, are now a rare sight.

- 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 soils that have developed are closely related to the underlying solid geology and superficial deposits. Iron-rich sandy limestones have been worked for use in the Northamptonshire and Banbury iron and steel industry until recent times.

Source: Northamptonshire Uplands Countryside Character Area Description, Midlands Clay Pastures

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)	% of NCA
Grade 1	0	0
Grade 2	11,239	11
Grade 3	82,805	82
Grade 4	4,898	5
Grade 5	0	0
Non-agricultural	445	<1
Urban	1,753	2

Source: Natural England (2010)

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

3. Key water bodies 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)
Grand Union Canal	54
Oxford Canal	38
River Cherwell	26
River Nene	11
River Avon	6
River Welland	3
Sor Brook	2

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 101,141 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 at: http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=_e

The Oxford Canal, once a busy industrial waterway is now a well-used recreation resource .

4. Trees and woodlands

4.1 Total woodland cover

The NCA contains 3,966 ha of woodland (4 per cent of the total area), of which 432 ha is ancient woodland (<1 per cent of the NCA).

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

4.2 Distribution and size of woodland and trees in the landscape

Woodland cover in this NCA is sparse, but there are some prominent woods in the south in an arc from Badby to Woodend. The few blocks of ancient woodland like Badby are particularly important in a locality where there are few areas of semi-natural vegetation and limited wildlife interest. Most of the tree and shrub cover, other than the hedgerows, is given by the spinneys dotted across the landscape, often on the higher ground. The greatest variety of land cover, from the uniform pattern of pasture and arable within Tudor and parliamentary enclosure hedges, is given by the landscape parks. Small broadleaf woodlands, copses and shelterbelts, combined with hedgerow trees create an impression of a well-treed landscape, although overall woodland cover is relatively limited. Woodlands are concentrated along streams and steeper slopes, with many prominent hilltop copses.

Source: Midlands Clay Pastures Natural Area Profile

Ancient woodland with Bluebells at Badby, one of the many small but prominent hill-top woods.

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)	% of NCA
Broadleaved	2,749	3
Coniferous	679	1
Mixed	79	<1
Other	456	<1

Source: Forestry Commission (2011)

Area and proportion of Ancient Woodland and Planted Ancient Woodland within the NCA:

Type	Area (ha)	% of NCA
Ancient semi-natural woodland	272	<1
Ancient re-planted woodland (PAWS)	159	<1

Source: Natural England (2004)

5. Boundary features and patterns

5.1 Boundary features

In the central section, there is a regular pattern of hedgerows with frequent ash trees. Arable cultivation has led to the reduction in size and number of hedges and the loss of hedgerow trees. Open arable contrasts with pasture enclosed by good hedges with frequent hedgerow trees. To the south of Daventry the fields are generally smaller. Intensification on the land most appropriate for arable has led to removal and reduction of hedges and loss of hedgerow trees.

Source: Northamptonshire Uplands Countryside Character Area Description; Countryside Quality Counts (2003)

5.2 Field patterns

The predominant field pattern is that of parliamentary enclosure imposed on an 'up and down' landscape, where the rectilinear pattern is frequently strongly visible. The straight, wide enclosure roads which often follow ridges are also part of this planned character. The area is of outstanding interest for its ridge and furrow and deserted settlements. Intensification for arable in areas where this is appropriate, has led to removal and reduction of hedges and loss of hedgerow trees. To the south of Daventry the fields are generally smaller and settlement is more frequent. Arable cultivation has led to the reduction in size and number of hedges and the loss of hedgerow trees. In the central area, the fields are generally smaller and settlement more frequent.

Source: Northamptonshire Uplands Countryside Character Area Description; Countryside Quality Counts (2003)

Fawsley Park, one of the many areas of estate parkland which are a defining characteristic of the area.

6. Agriculture

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

6.1 Farm type

The number of farm types in all categories had reduced from 1,057 commercial holdings in 2000 to 1,008 in 2009, a change of 5 per cent. The largest change was a reduction in the number of diary holdings of 56 per cent to 14 holdings. The second largest change was an increase of 50 per cent in the number of specialist poultry holdings to 9.

Source: Agricultural Census, Defra (2010)

6.2 Farm size

In 2009 there were 122 land holdings in the less than 5 ha size bracket covering an area of 206 ha, and 266 holdings in the >100 ha size category covering an area of 62,991 ha. In all size categories the largest change between 2000 and 2009 was a 16 per cent decrease in the number of commercial holdings in the less than 5 ha size bracket, from 140 in 2000 to 122 in 2009. The land area within this size category, however, increased by 22 per cent between 2000 and 2009.

Source: Agricultural Census, Defra (2010)

6.3 Farm ownership

2009: Total farm area = 84,845 ha; owned land = 57,200 ha
2000: Total farm area = 88,692 ha; owned land = 60,820 ha

Source: Agricultural Census, Defra (2010)

6.4 Land use

The land area of glasshouses decreased by 80 per cent, from 5 ha in 2000 to 1 ha in 2009. The land area growing stockfeed increased from 119 ha to 350 ha between 2000 and 2009, an increase of 194 per cent. Between 2000 and 2009, the land area growing cash roots increased by 60 per cent from 210 ha to 336 ha, and the land area growing vegetables decreased by 69 per cent from 82 ha to 25 ha. The land area supporting hardy nursery stock and bulb or flowers grown in the open decreased by 60 per cent to 12 ha.

Source: Agricultural Census, Defra (2010)

6.5 Livestock numbers

The number of specialist pig commercial holdings increased from less than 5 to 8 between 2000 and 2009. Numbers of specialist poultry commercial holdings increased by 50 per cent, to 9, during the same period. Diary commercial holdings reduced by 56 per cent, to 14. The number of commercial holdings with grazing livestock decreased by <1 per cent to 300. Mixed farms decreased by 24 per cent to 82. Cattle numbers decreased by 17 per cent to 38,600, sheep numbers by 26 per cent to 193,800 and pigs by 20 per cent to 17,400.

Source: Agricultural Census, Defra (2010)

6.6 Farm labour

Between 2000 and 2009 the number of full-time workers decreased by 30 per cent to 252, and the number of principal farmers decreased by 6 per cent to 1,328. Salaried farmers increased by 18 per cent to 71, part-time workers increased by 27 per cent to 219 and casual workers increased by 3 per cent to 164.

Source: Agricultural Census, Defra (2010)

Please note: (i) Some of the Census data is estimated by Defra so will not be accurate for every holding (ii) Data refers to Commercial Holdings only (iii) Data includes land outside of the NCA belonging to holdings whose centre point is within the NCA listed.

7. Key habitats and species

7.1 Habitat distribution/coverage

Woodland is generally sparse but there are some prominent woods in the south. The few blocks of ancient woodland like Badby take on a special value and interest in a locality where there are few areas of semi-natural vegetation and limited wildlife interest. Broadleaved woodland on acid soil typically have a canopy of pedunculate oak, silver birch, downy birch and ash with a shrub layer dominated by hazel with smaller amounts of hawthorn, holly and Midland hawthorn. Very locally small-leaved lime and sessile oak dominate the canopy. Woodlands on base rich soils typically have a canopy of pedunculate oak and ash, with smaller amounts of field maple, small-leaved lime and elm over a shrub layer dominated by hazel and hawthorn. Around the edges of the area, reservoirs are a significant element within the land cover but the greatest variety, from the uniform pattern of pasture and arable within Tudor and parliamentary enclosure hedges, is given by the landscape parks. The flood plain grazing marsh is located primarily in the south of the NCA around Banbury. The small, fragmented sites with lowland meadow and calcareous grassland are scattered throughout the NCA.

Source: Natural England 2011

7.2 Priority habitats

The Government's new strategy for biodiversity in England, Biodiversity 2020, replaces the previous Biodiversity Action Plan (BAP) led approach. Priority habitats and species are identified in Biodiversity 2020, but references to BAP priority habitats and species, and previous national targets have been removed. Biodiversity Action Plans remain a useful source of guidance and information. More information about Biodiversity 2020 can be found at; **http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/englandsbiodiversitystrategy2011.aspx**

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

Priority habitat	Area (ha)	% of NCA
Broadleaved broad woodland habitat	1,349	1
Flood plain grazing marsh	925	1
Lowland meadow	394	1
Lowland calcareous grassland	247	1
Lowland dry acid grassland	69	<1
Purple moor grass and rush pasture	56	<1
Reedbed	21	<1
Lowland heathland	2	<1

Source: Natural England (2011)

Maps showing locations of priority habitats are available at

- **http://magic.defra.gov.uk/website/magic/** select 'Habitat Inventories'

7.3 Key species and assemblages of species

- Maps showing locations of priority habitats are available at: **http://magic.defra.gov.uk/website/magic/**
- Maps showing locations of S41 species are available at: **http://data.nbn.org.uk/**

8. Settlement and development patterns

8.1 Settlement pattern

Many of the villages are small, clustered around an ironstone church, some with the earthworks of abandoned dwellings at their edges. Some are on prominent hilltop sites while others lie in sheltered situations at the heads of minor valleys. Around the edges of the NCA, along the Cherwell valley and to the north between Rugby and Daventry, the villages have become significantly enlarged by 20th century development. Settlements close to the urban areas of Daventry and Rugby and along strategic routes such as the M1, the A14 and the A425 have significant commuter development. There has been pressure for sand and gravel extraction along the area of the M1 corridor.

Source: Northamptonshire Uplands Countryside Character Area Description; Countryside Quality Counts (2003)

8.2 Main settlements

The main settlements within the Northamptonshire Uplands NCA are Banbury and Daventry. The total estimated population for this NCA (derived from ONS 2001 census data) is 154,775.

Source: Northamptonshire Uplands Countryside Character Area Description; Countryside Quality Counts (2003)

8.3 Local vernacular and building materials

The main settlements of the area are small villages with red brick or ironstone buildings clustered around an ironstone church, although creamy-grey limestone is used in the north. The local ironstone has a distinctive orangey-brown colour and is used in combination with red brick, creamy-grey limestone and cob in traditional buildings throughout the area. There are scattered buildings in cob, which was largely replaced by brick in the 19th century. Pantile and tile roofs predominate throughout the area. Some of the country houses are buildings of great character. For example, Cottesbrooke is famed for its gracious proportions. There are also fine buildings on a smaller scale, almost always in local stone, such as the manor houses at Ashby St Ledge and Sulgrave. In some cases the estate character of the landscape is emphasised by estate villages and lodges.

Source: Northamptonshire Uplands Countryside Character Area Description; Countryside Quality Counts (2003)

Typical thatched ironstone cottages and village pond at Wroxton, features which contribute strongly to the area's senses of place and history.

9. Key historic sites and features

9.1 Origin of historic features

Deserted settlements and ridge and furrow, overlaid by a mixture of Tudor and parliamentary enclosure hedges, with much of the tree cover lost. The area is of outstanding interest for its ridge and furrow and deserted settlements and these are vulnerable to damage throughout this area. The landscape parks and country houses were laid out as the population shrunk, for example, Althorp, Canons Ashby, Cottesbrooke, Harlestone and Holdenby, some by major designers such as Repton and Brown. In the 18th and 19th centuries the remaining open land was enclosed. In the 20th century the main changes have been the development of the major transport corridors of the M1, A14 and M40 which cross the area as well as the expansion of arable cultivation and modern farm buildings. The historic parklands are vulnerable, and loss to arable intensification and recreational uses remains a concern.

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 1,841 ha.
- 2 Registered Battlefields covering 452 ha.
- 85 Scheduled Monuments.
- 3,067 Listed Buildings.

Source: Natural England (2010)

- More information is available at the following address: **www.english-heritage.org.uk/caring/heritage-at-risk/**
- **www.english-heritage.org.uk/professional/protection/process/national-heritage-list-for-england/**

Stanford Hall, one of many significant country houses in the area.

10. Recreation and access

10.1 Public access

- 0.6 per cent of the Northamptonshire Uplands NCA (573 ha) is classified as being publically accessible.
- There are 1,336 km of public rights of way at a density of 1.3 km per km2.
- There are no National Trails within the Northamptonshire Uplands NCA.

Source: Natural England (2010)

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

Access designation	Area (ha)	% of NCA
National Trust (accessible all year)	573	<1
Common Land	0	0
Country Parks	88	<1
CROW Access Land (Section 4 and 16)	100	<1
CROW Section 15	0	0
Village Greens	21	<1
Doorstep Greens	0	0
Forestry Commission Walkers Welcome Grants	73	<1
Local Nature Reserves (LNR)	6	<1
Millennium Greens	2	<1
Accessible National Nature Reserves (NNR)	0	0
Agri-environment Scheme Access	218	<1
Woods for People	272	<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.

Public rights of way provide panoramic views across the Northamptonshire Upands, as here, from the Knightly Way.

11. Experiential qualities

11.1 Tranquillity

Based on the CPRE map of tranquillity (2006) the area of the NCA which is least tranquil is in and around Daventry in the central area. Other less tranquil areas include the road corridors of the M1, M40 and A14. The most tranquil area is centred on Moreton Pinkery, in the east of the NCA. The area in between Daventry in the north-west, Northampton in the north-east, Banbury in the south-west and Brackley in the south-east, to the east of the NCA, is the most tranquil.

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

Category of tranquillity	Score
Highest	41
Lowest	-81
Mean	-2

Sources: CPRE (2006)

More information is available at the following address: **www.cpre.org.uk/what-we-do/countryside/tranquil-places/in-depth/item/1688-how-we-mapped-tranquillity**

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 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 areas around main towns and the motorway corridors including Banbury and the M40 (the south of the NCA), Daventry and the M1 corridor (in the centre of the NCA) and the area around the north of Northampton which just overlaps with this NCA on its north-east boundary are the most disturbed areas of land, including the A14 boundary which passes across the north of the NCA. A breakdown of intrusion values for this NCA is detailed in the following table.

Intrusion category	1960s (%)	1990s (%)	2007 (%)	Percentage change (1960s-2007)
Disturbed	17	40	47	30
Undisturbed	81	58	51	-30
Urban	2	2	2	0

Sources: CPRE (2007)

Notable trends from the 1960s to 2007 are that the area of disturbed land in this NCA has almost trebled, the area of undisturbed land has decreased by just over one third and the area of urban land has increased by almost one third but remains small.

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

Rolling hills with an open character and hilltop woodland, near Little Preston.

12. Data sources

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

Please note all figures contained within the report have been rounded to the nearest unit. For this reason proportion figures will not (in all) cases add up to 100 per cent. 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 some significant new woodland planting in recent years, which has raised levels of woodland cover by around 1,000 ha; however, although trees and small woodlands are a visually significant feature in this NCA, woodland cover still remains sparse and fragmented, at around 4 per cent.

- There has been an increase in the proportion of existing woodland under management, but the majority remains unmanaged, resulting in a lack of younger trees and an unsustainable age structure, a thick canopy, invasion by non-native species such as sycamore and a loss of ground flora.

- Parkland restoration, largely funded through agri-environment schemes, has been undertaken recently on some of the important historic estates including replanting of parkland trees and restoration of other features, but in many places there has been significant loss of parkland features through arable conversion and loss of mature and veteran trees which have not been replaced.

Boundary features

- While still a key feature, the distinctively tall, thick, A-shaped hedgerows and the Midlands hedge-laying style of the area (associated with the strong hunting traditions of the area) are becoming less common, and some remaining hedgerows are in declining condition, with most hedgerows managed entirely mechanically with less incentive to keep them in good condition where arable conversion has occurred.

- There has been recent hedgerow laying and hedgerow replanting in some areas, including planting of hedgerow trees, particularly through agri-environment schemes between 2002 and 2010. By March 2011, nearly 2,000 km of boundary features were under Stewardship boundary options. However, many hedgerows, especially in the south of the NCA in the main arable areas, for example around Towcester, are losing their distinctive height and close structure and becoming sparse through over trimming.

Field enlargement and loss of hedgerows through removal and lack of management in an arable area South of Daventry .

Agriculture

- Agricultural intensification has continued, in particular the shift from permanent pasture to intensive arable to produce cash roots, cereals and oilseed rape and there has been an increase in large new farm buildings, often poorly integrated into the landscape, leading to some homogenisation of landscape character and loss of small-scale features in some areas, particularly in the arable areas in the south of the NCA. These changes include an increase in field sizes, decline in the condition of hedgerows and hedgerow trees, fragmentation and loss of semi-natural habitats, particularly grassland, and damage to historic features, particularly to the important open field systems of ridge and furrow.

- Between 2000 and 2009 farm sizes increased; the proportion of land under arable cultivation increased significantly at a cost to permanent pasture, the number of dairy farms reduced significantly, and numbers of specialist poultry holdings and pig commercial holdings increased slightly. Stock numbers of all types reduced by around 20 per cent.

- The keeping of horses, particularly in the vicinity of some settlements such as Naseby, has led to subtle changes in sense of place through the development of fenced paddocks and stables and a lack of boundary management.

- There has been some reversion of parkland from arable to grassland to restore the integrity of parkland settings of the country houses.

- In some places, plantings of miscanthus are having an increasing local landscape impact and resulting in changes to the colours and textures of the landscape, notably around Coton.

Farm diversification is occuring in some areas, here into farming alpacas.

Settlement and development

- Recently constructed wind farms and telecommunications masts, especially immediately outside the northern half of the NCA, but also within it around Yelvertoft, locally dominate the landscape, including the settings of some historic parklands and have brought an industrial influence to the, until recently, extremely rural, undeveloped feel of much of the area.

Wind turbine near Boddington Reservoir.

- The construction of significant new road infrastructure such as the M40 and A14 and upgrading of existing strategic roads and use of modern highways design, together with subsequent recent extensive warehouse and industrial development has led to a significant loss of rural character and increasing suburbanisation in some areas along the main transport corridors within the NCA and on the fringes of the NCA alongside the M6/M1 interchange.

- Large-scale expansion of the two main settlements, Daventry and Banbury, including ring roads, extensive late 20th-century housing estates, industrial estates, out-of-town shopping centres and huge warehouse buildings, reflecting the good freight road links.

- Changing character and pattern of smaller settlements with good road and rail links for commuters, with extensive high density modern housing development on the fringes of traditional vernacular villages which does not often reflect local scale, styles or materials.

Semi-natural habitat

- Loss of semi-natural habitats has continued in recent decades and the remaining areas have become highly fragmented owing to a range of land use changes including development, conversion of permanent pasture to arable, new roads, agricultural intensification, and lack of management and, along the M1 corridor, to gravel extraction. Rates of loss have slowed in recent years and there is some evidence of reversal as restoration opportunities become available through agri-environmental schemes and new initiatives such as the Nene Valley Nature Improvement Area seek to restore semi-natural habitats.

- Stewardship uptake for annual area features has been consistently above the national average, under Countryside Stewardship the majority of options were for lowland pastures on neutral/acid soils (3,076 ha), regeneration of grassland/semi-natural vegetation (414 ha) and lowland hay meadows (306 ha).

Historic features

- There is no hard data on recent changes in historic features, either of condition or extent apart from for boundary features (see above)

- The area is of outstanding national importance for its extensive areas of open field remains with ridge and furrow, deserted villages and also for shrunken ends to settlements. Most of these features have no statutory protection and much has been lost to arable conversion and the re-seeding of previously permanent pasture during the last 20 years, though recently rates of loss have slowed and levels of archaeological features under agri-environment options have increased.

- There has been significant loss of parkland. In 1918 about 3 per cent of the NCA was recorded as historic parkland, but by 1995 about 42 per cent of this had been lost, mainly through arable conversion and intensification and lack of management. Mature and veteran trees have been lost together with distinctive park features such as deer lawns, deer leaps and park walls and banks. Some areas of parkland have been subdivided using fencing. Recently there has been considerable effort to restore some parkland and parkland features through tree planting and arable reversion options under agri-environment schemes.

- While efforts have been made to restore the important Registered Parks and Gardens, much of the non-registered parkland, parkland type planting and wood pasture associated with the many small manors and country houses is increasingly becoming derelict or lost.

- About 80 per cent of historic listed farm buildings remain unconverted. Many of the mid 19th-century farm buildings are in a state of disrepair, although the majority are still structurally sound. There has been widespread loss of the once typical outfarms, with small ranges of buildings away from the farmhouse, as they lost their original uses.

Rivers and canals

- Changes affecting rivers have included river engineering, siltation, eutrophication, diffuse pollution from agricultural cultivation, fertiliser, herbicide and pesticide applications, spread of invasive species, road building and an increase in run-off from new developments.

- The Grand Union and Oxford canals have undergone eutrophication from both agriculture and recreation use, including boating and fishing with associated dredging and management.

Minerals

- There has been widespread in-filling of past mineral extraction sites, particularly ironstone. Sand and gravel have been extensively excavated along the M1 corridor between Kilsby and Northampton, with some restored as wetlands. Sand and gravel extraction is ongoing and pressures have increased, as large towns such as Northampton and Rugby, Daventry and Banbury have expanded and major roads such as the M40 and A14 have been constructed or upgraded, in recent years.

Drivers of change

Climate change

- Evidence suggests that over the coming century the climate is expected, on average, to become warmer and wetter in winter and hotter and drier in summer and there will be an increase in frequency of extreme events (storms, floods and droughts).

- Plant communities in the remaining woods, parkland, meadows and pastures may change slowly, possibly losing some species, and gaining others which are more drought-resistant.

- Semi-natural habitats, including woodland will need to be expanded and linked to increase resilience to climate change impacts. Connecting of habitats will be needed to enable movement of mobile species through the landscape in response to climate change.

- Existing novel and invasive non-native species may spread, potentially affecting habitats and species, with trees at particular risk. Warmer winters may allow pathogens and their vectors to increase their range, resulting in new pests and diseases becoming a potential threat.

- Increased numbers and severity of storms may affect historic parkland, hedgerow trees, woodland and amenity planting, including increased risk of loss of mature and veteran trees.

- Freshwater habitats may be affected by low flows. Increasing water temperatures and low flows may also result in deterioration of water quality, including increasing concentration of nutrients and algal blooms and some rivers and streams may become unsuitable for certain species of fish. Deteriorations in water quality include increasing colour and sediment load in any water abstracted for public and private supply.

- Stream flows may peak earlier in spring owing to warmer temperatures and higher rainfall, and low stream flows begin earlier in the summer and last longer into the autumn. These changes may stress aquatic animals and plants adapted to specific flow conditions.

- An increase in summer temperatures may result in increased drought stress in crops.

- More frequent and extreme weather events are likely to increase rates of erosion of soils, river banks and the wider catchment, with particular impacts on arable land, increased downstream flood risk, unseasonable flooding of meadows, affecting cropping patterns and increased siltation of river habitats on flatter land around the edge of the NCA.

- Increases in extreme storm events are already changing flood risk assessments, requiring increased flood risk management for settlements, and away from management of water courses to reduce flood risk to farmland.

- Farming practice may change with new climate conditions, for example a longer growing season, the ability to grow new crops and changing water availability.

Other key drivers

- The general shift from pastoral farming to arable may continue if pressure to maximise food production and yields and to increase food self-sufficiency continues, putting pressure on remaining areas of semi-natural grassland and other semi-natural habitats.
- Continuing pressure for conversion of pasture to arable and further intensification on the land most appropriate for arable may lead to further rationalisation and loss of hedgerows and loss of hedgerow trees.
- The lack of a market value or stock sheltering role for hedgerow trees leading to a lack of succession planting/selection of replacement trees and furthering the continuing general declines in hedgerow trees, both numbers and condition, particularly in arable areas where close-ploughing can damage roots, causing loss of condition.
- Lack of an incentive to sensitively manage parkland and parkland features and further fragmentation in ownership, leading to an ongoing decline in quality or loss of parkland features and trees, or conversion to more intensive agriculture such as arable.
- The continuing lack of management of woodlands, coverts and copses and amenity tree planting around settlements, will lead to their decline, which may be exacerbated by novel diseases such as ash die-back, oak sudden death and chestnut canker disease which pose a significant risk to these key landscape features.
- Continued lack of monitoring and management of unscheduled archaeological features could lead to further losses in local landscape character, particularly the ridge and furrow and deserted settlements, as these are vulnerable to ploughing and unthinking damage, with much already having been lost to arable conversion in recent years.
- Increasing demands for complex communications networks such as 4G and continuing pressure for onshore wind development will continue to have an impact on the remote, rural character of the landscape, leading to a significant urbanising influence and loss of tranquillity. the
- Growth area status of surrounding towns such as Rugby and Northampton, leading to increased development pressure and urbanising influences in surrounding villages.
- Banbury and Daventry are both earmarked for substantial growth, with greater housing and industrial provision, including through urban extensions.
- There is ongoing pressure for new sand and gravel extraction in the area of the M1 corridor. Sites have been allocated for future glacial sand and gravel extraction at Dodford, near Daventry, and for pre-glacial sand and gravel (known as Milton Sand) at Nether Heyford, to meet objectives in the currently adopted Northamptonshire Minerals and Wastes Development Framework 2006–2026.[5]

[5] Northamptonshire Minerals and Waste Development Framework Partial review: Local Aggregates Assessment (June 2012; URL: www.northamptonshire.gov.uk/en/councilservices/environ/planning/policy/minerals/pages/minerals-waste-development-framework.aspx

- Upgrading of strategic road and rail routes leading to increasing domination of parts of the area by transport infrastructure and design styles and increased noise pollution.

- The High Speed 2 railway line is now in its project development phase and would cross the NCA, bringing further major transport infrastructure and loss of tranquillity to southern parts of the NCA along its route. The most recent proposed route would affect the villages of Lower Boddington, Aston le Walls, Chipping Warden, Thorpe Mandeville, Greatworth and Radstone, as well as the newly registered battlefield site of the 1469 Battle of Edgcote.

- Projects within the Nene Valley Nature Improvement Area will continue with the aim of reversing the decline in biodiversity and restoring the ecological networks in the Nene Valley.

- Reform of EU Common Agricultural Policy and Rural Development Programme for England in 2014 may offer reduced resources for funding environmentally sensitive farming practices and reduce the breadth of features that can be conserved and enhanced.

- An increasing requirement for renewable energy generation could result in increased pressure for wind power, hydro power, wood fuel and biomass crops.

- Farming may cease to be attractive to future generations with increasing capital costs.

- Increasing numbers of people visit the area for outdoor recreation, notably canal barges, boating, walking, cycling and horse riding, and future increases would require management to avoid conflict or damage to habitats and species vulnerable to disturbance.

Plantings of miscanthus for biomass production are a new feature in the landscape in some 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.

Small but prominent hilltop woods and coverts are a key feature associated with the active hunting tradition of the area.

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
SEO 1: Protect, manage and promote the historic and archaeological features, designed landscapes and field patterns – including the parkland, battlefield sites, canals, ridge and furrow and settlement sites, and distinctive high hedgerows with their many trees – to ensure that these key features for sense of place and history are conserved, people's enjoyment and understanding is increased, and recreation opportunities are enhanced.	↔ ***	↔ **	↗ **	↗ **	↗ ***	↗ **	↗ **	↗ **	↗ ***	↗ ***	↗ ***	↗ ***	n/a	↑ ***	↑ ***	↗ **	↑ ***	↗ **	↗ **
SEO 2: Conserve, enhance, expand and restore the semi-natural and farmed features of the area – including the mix of agricultural production, particularly the pasture and meadows, patches of semi-natural habitats, and veteran and ancient trees – to enhance biodiversity and landscape character and to safeguard the continued sustainable provision of food.	↗ ***	↑ ***	↗ **	↑ *	↑ **	↑ ***	↗ **	↗ **	↗ **	↗ ***	↗ *	↗ *	n/a	↑ ***	↑ ***	↑ ***	↑ ***	↑ ***	↗ ***
SEO 3: Conserve, manage and enhance the river catchments and reservoirs, improving water quality and flow management and benefiting biodiversity and recreation through managing soils, diffuse pollution and run-off, reconnecting flood plains and extending natural habitats.	↑ **	↗ ***	↑ ***	↗ *	↗ **	↑ ***	↑ ***	↑ ***	↑ ***	↑ ***	↗ *	↗ *	n/a	↗ **	↔ **	↗ **	↗ **	↑ **	↗ *
SEO 4: Conserve, maintain and promote local building styles and materials and plan strategic growth, infrastructure development and mineral extraction to ensure they protect remaining areas of high tranquillity, strengthen local sense of place and biodiversity, and increase adaptation for climate change through multifunctional green infrastructure networks, building on existing resources such as canals, rivers and access routes, creating strong ecological and recreation networks.	↔ **	↗ **	↑ **	↗ *	↔ **	↑ ***	↑ **	↑ **	↔ **	↑ **	↗ *	↗ *	n/a	↗ **	↔ **	↘ **	↗ **	↗ *	↔ *

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.

National Importance; Regional Importance; Local Importance

Landscape attributes

Landscape attribute	Justification for selection
Gently rolling rounded, undulating hills and valleys with many long, low ridgelines and variety of landform.	■ Wide, far-reaching, uninterrupted views are available from many places both within the NCA, from one ridgetop to the next, and in many places across to surrounding low-lying clay vale areas in Northamptonshire and Leicestershire. ■ A small area is designated as part of the Cotswolds Area of Outstanding Natural Beauty (AONB).
Dominant Jurassic scarp slope of limestone and Lias clay hills capped locally with ironstone-bearing Marlstone and Northampton Sands. Glacial boulder clay covers the northern area with sands and gravels along river valleys.	■ The underlying geology of limestone and Lias and the superficial deposits of boulder clay give the area its smooth, gentle undulating character. ■ The distinctive yellow-orange coloured ironstone, historically quarried locally, gives the settlements their highly distinctive character and allows the geology to be read, making a major contribution to the sense of place. ■ The sands and gravels along the valley of the River Nene have been heavily exploited and offer opportunities for wetland restoration. ■ The variable soils are derived from the underlying geology and have influenced local land use, particularly agriculture and woodland cover.
Rivers rise and flow outwards in all directions forming the main watershed of Middle England. The Upper Nene Valley, with flat flood plains and gravel terraces divides the Northamptonshire Heights to the north from the Cherwell/ Ouse plateaux, the 'Ironstone Wolds' to the south.	■ The many river valleys separating the ridges include the headwaters of four major rivers, the Cherwell, Avon, Leam and Nene, and main tributaries and smaller rivers such as Ise, Brampton, Welland, Tove, and Ouse. Water resources are heavily exploited, including for use in the two major canals (the Grand Union and Oxford canals). ■ The rivers are important visually in the landscape, with their meadows and flood plains. ■ Sand and gravel are exploited along the Nene Valley, often on land previously used as flood meadows. ■ The rivers supply several major reservoirs, including Pitsford, Rutland, Hollowell, Ravensthorpe, Daventry, Naseby, Sulby and Stanford reservoirs which form a key part of the landcover in some areas. ■ The whole of the NCA is classified as a nitrate vulnerable zone, with measures in place to reduce phosphate and nitrate inputs to the watercourses in order to improve water quality.

Landscape attribute	Justification for selection
Sparse woodland cover, but with scattered, visually prominent small broadleaved woods, copses and coverts, particularly on higher ground.	■ Woodland cover is sparse with 3,966 ha giving around 4 per cent cover, though many areas give the impression of being well-wooded as a result of the combination of the many small woods, the tall hedgerows with their frequent mature hedgerow trees and the extensive parkland areas with their large numbers of open-grown trees and copses. Together these form a discontinuous woodland network. ■ The small area of ancient woodland (272 ha), some of which is designated as Sites of Special Scientific Interest (SSSI), is particularly important in an area with little other semi-natural vegetation. Some woods support large stands of bluebells, adding to their visual interest. ■ Dutch elm disease had a major visual impact on woodland and hedgerow trees and there are opportunities to replace lost trees with other species. ■ Many of the woods are highly visually prominent, located on top of hills or slopes, and they are more frequent in an arc from Badby to Woodend in the south of the NCA. ■ The distinctive small woods, coverts and copses derive from the strong cultural tradition of hunting in the area, which is still actively pursued by such well known hunts as the Pytchley and the Grafton.
A mixed agricultural landscape: open arable contrasting with permanent pasture with large, mostly rectangular enclosed field patterns surrounded by distinctive, high, often A-shaped hedgerows mostly of hawthorn and blackthorn, and many mature hedgerow trees, mostly ash and oak. Drystone walls of ironstone and limestone are common in some areas.	■ The predominant pattern is of Parliamentary enclosure with large rectilinear fields imposed on an up and down landscape with some areas of earlier piecemeal irregular enclosure. ■ The high, mature, A-shaped hedgerows derive their distinctive character from the strong hunting tradition of the area, allowing this strong cultural tradition to be read in the landscape. The majority of hedgerows are in good condition, but in some areas, notably where arable farming predominates, there is evidence of declining condition and loss of both hedgerows and hedgerow trees. ■ Soils are variable but the area is predominantly classed as Grade 3 agricultural land with some Grade 2 particularly in the river valleys. This enables a wide range of cops to be grown. Grass is still the most frequent landcover, with cereals, rape, root crops and cash crops on arable land. Arable is more common in the southern half of the NCA. Sheep are the main livestock, with cattle, including a recent localised increase in native breeds such as Hereford and Dairy Shorthorn in some areas. ■ Miscanthus is a new feature in some areas, altering the colour and texture of the landscape. ■ Small remnants of unimproved grassland remain and other areas of semi-improved grassland occur along the wide road verges bordering the numerous small lanes, providing valuable habitat and connectivity for species within the landscape. ■ Farmland birds add movement and biodiversity interest, particularly in the south-west of the NCA where nationally important concentrations occur.

Landscape attribute	Justification for selection
Small pockets of semi-natural vegetation with small scattered broadleaved woodlands, mires and areas of lowland meadow, flood plain grazing marsh, calcareous grassland and lowland dry acid grassland. Bluebell woods occur in places.	■ The small remaining areas of priority habitat and semi-natural vegetation provide visual interest and a variety of colours and textures in the landscape and there is scope for expansion to increase connectivity and resilience to climate change, in particular of the range of grassland habitats. ■ There are many very small SSSI designated for their biodiversity interest, but these are highly fragmented and isolated. ■ Overwintering wildfowl are an important feature of interest on the reservoirs.
Abundant and visually prominent open field systems with ridge and furrow, and frequent deserted and shrunken settlements and other archaeological features and industrial archaeology, including canals.	■ The open field systems and associated ridge and furrow and the many deserted or shrunken settlements are of national importance and are one of the most distinctive visual features of the area. ■ The area supports a wide range of both scheduled and non-scheduled features which contribute significantly to the sense of place, and has important cultural associations with the Civil War and the Wars of the Roses, with 85 Scheduled Ancient Monuments of national importance and three registered battlefield sites. ■ As well as the outstanding ridge and furrow and many medieval settlement sites, there is a wealth of sites from all periods, from Neolithic barrows, iron-age hill forts and camps, Roman villas and a Roman road (Watling Street), motte-and-bailey castles, abbeys and granges. ■ The Grand Union and Oxford canals travel the length of the NCA contributing to a strong sense of transport heritage and providing a well-used recreation asset. ■ There are areas of early piecemeal, irregular enclosure, providing variety among the more frequent 18th- to 19th-century Parliamentary enclosure patterns.
Several large historic country estates such as Cottesbrooke Hall and Althorp and many small country estates, with extensive parkland containing a great many mature and veteran trees.	■ The area contains a great many country houses and their associated parklands, gardens and estates, 15 of which are considered nationally important and are on the Register of Parks and Gardens. ■ Parkland is a key feature in the landscape in the area and the houses and park features are often built of local stone and reflect the history of the area. The historic designed parks and gardens associated with many of the houses, including some by important designers, contribute to the high level of natural beauty of much of the area but many are in declining condition. ■ The parklands and wider estates contain a great many mature and veteran trees which provide rare habitat for lichens and invertebrates and need careful management and succession planning. ■ Those houses and estates which are open to the public, such as Upton House and Canons Ashby attract large numbers of visitors, providing a popular recreation resource.

Landscape attribute	Justification for selection
Sparse settlement of distinctive nucleated villages often on hill tops or at valley heads. Cob, ironstone and limestone in older buildings with some remaining thatch, but mostly pantile and slate roofs. Brick buildings in some villages. Extensive new developments in villages along main transport corridors and in the two towns.	■ The area has a very high level of survival of historic houses of great character, especially of 17th- to 19th-century gentry houses and farmhouses in the small villages, with more than 3,000 Listed Buildings. ■ The local styles of architecture are highly distinctive and make a very strong contribution to both sense of place and levels of natural beauty, particularly the use of local stone and cob, pantile and thatch. ■ Many recent developments have failed to reflect local building styles, materials and patterns resulting in a dilution of the distinctive settlements. There are significant opportunities to strengthen the influence of traditional styles and materials and scale of buildings in new developments, both in the villages and in the main settlements, to better reflect the local vernacular and the nucleated pattern of settlement.
A dense network of narrow lanes with wide grassy verges, often following ridges.	■ The undeveloped nature of the network of minor roads contributes to the remote rural feel of much of the area and its associated tranquillity. ■ The wide verges provide areas of semi-natural grassland; habitat for plant species and insects, which have declined elsewhere, and provide valuable connectivity with remaining areas of biodiversity value. ■ The new strategic road infrastructure developments and road upgrades have not reflected local road character resulting in a diminution of their rural nature. There are significant opportunities to ensure that any future transport developments better reflect the characteristics and scale of the area in road and rail design and mitigation.
High levels of tranquillity and an undisturbed rural character across much of the area, though it is crossed by locally visually dominant strategic road and rail corridors and recent development in the towns has reduced these attributes locally.	■ The CPRE map of tranquillity (2006) shows that away from the fringes and main transport corridors, the area still has high levels of tranquillity and these areas provide an increasingly rare opportunity to 'get away from it all' in this increasingly urbanised part of England. ■ The CPRE intrusion map (2007) shows that 51 per cent is still classified as undisturbed, having an undisturbed, remote, rural feel, with only 2 per cent classed as urban (the two main settlements of Daventry and Banbury) and with the 47 per cent disturbed land adjacent to the towns and the three main transport corridors which cross the area and house the M1, M45, M40, A14, A508, A45, A5, A422, A423, A425, West Coast Main Line, Great Western Railway and the Oxford and Grand Union canals, with their areas of associated industrial, warehouse and housing development. ■ Away from the disturbed areas, the NCA still has relatively dark night skies compared with the surrounding urban areas.
Little publicly accessible land but a wide range of other opportunities for recreation.	■ Only 0.6 per cent of the NCA is classed as publicly accessible with very little open access land. ■ Many named long distance walking routes and a network of rights of way for walking, cycling and horse riding. ■ Award-winning country parks such as Brixworth and Daventry. ■ A large number of historic houses, gardens and estates are open to the public offering high quality visitor experiences to enjoy the history of the area, visit gardens and walk in the grounds. ■ Two historic canals offer opportunities for enjoying industrial heritage, boating, walking, fishing and wildlife watching. ■ Pitsford and other reservoirs offer wildlife watching, fishing and boating. ■ A small part of the NCA lies within the Cotswolds AONB offering opportunities to enjoy the high level of natural beauty.

Landscape opportunities

- Protect the gently rolling, rounded, undulating hills with their many long, low ridgelines and the great variety of landform, varied geodiversity and heritage features, its fragile but valuable parkland, woodland and hedgerow mosaic and the high quality long-distance views.
- Conserve, restore and enhance the extensive areas of remnant historic parkland, both registered and non-registered and their veteran and mature trees, to protect their heritage, landscape and biodiversity interest, encouraging a co-ordinated approach between conservation organisations and farming organisations to ensure that plans respect the historic integrity of parkland design as well as the biodiversity opportunities and the needs of farming practice.
- Protect both scheduled and non-scheduled archaeological features where known, and encourage appropriate management of the outstanding features including the open field systems, ridge and furrow, deserted settlements and shrunken ends of villages.
- Protect, manage, enhance and expand the network of broadleaved and ancient woodlands and wood pasture, restoring structural diversity, re-introducing active coppice management, where this will enhance woodland habitat and wildlife interest, strengthening hedgerow networks, particularly where hedgerows connect areas of woodland, and encouraging the planting of a wide range of tree species to increase resilience to climate change and novel diseases.
- Maintain restore and recreate hedgerows and ironstone or limestone walls using local stone and the Midlands style of hedge-laying, and maintaining the distinctive A-shaped, high, thick hedgerows with their many standard trees, to maintain habitat connectivity and cultural influence of farming patterns in the landscape.
- Protect the mixed farming regime and encourage the retention of remaining pasture and reversion to pasture in parkland, enhancing the remaining areas of high quality unimproved grassland by linking and buffering them with lowland pasture, hay meadows and grass margins, and manage lowland grassland to prevent fragmentation.
- Encourage appropriate management of the wide, grassy road verges to ensure these local features are retained in the landscape and encourage volunteer surveys to establish whether management is appropriate.
- Manage arable cropping patterns and arable cultivation to encourage rare arable plants and the range of farmland birds and mammals.
- Encourage the retention or use of traditional grazing stock such as the Hereford and Dairy Shorthorn, which contribute to landscape character and the ability to read the farming heritage of the area in the landscape.

- Manage and enhance the network of streams and rivers, to maintain them as distinctive features in the landscape and enhance their riparian habitats and wildlife interest, while restoring, expanding and re-linking wetland habitats, and bringing rivers back into continuity with their flood plains.

- Enhance the old workings of gravel extraction sites along the Nene Valley and plan to restore new extraction sites once exhausted, creating new wetland habitats and providing access and recreational opportunities.

- Plan a strong landscape framework as a context to potential modern development and expansion around Daventry and Banbury and the main transport corridors, ensuring that new development does not have a negative impact on landscape character. Consider the visual impact of modern development, particularly from urban intrusion, and manage road improvements where possible to maintain the existing character of the rural road network.

- Encourage new development and extensions where proved necessary and repair work to existing historic buildings that reflect the local building styles, materials and detailing and maintain heritage significance.

- Ensure on-farm developments respect the original form, style and materials of adjacent farmsteads, retaining and encouraging sympathetic restoration or conversion of redundant buildings which respects their particular local character, vernacular styles and materials.

- Protect the remaining strong senses of remoteness and tranquillity in areas away from the main settlements and transport corridors, by controlling development and use of night-time lighting, especially on the higher ground.

- Manage and replant the areas of mature, amenity tree planting sheltering villages, using a wide range of species to build in resistance to novel tree diseases and to ensure retention of these elements of the landscape.

- Provide easily accessible sites of wildlife, historical and geological interest for both educational and public use and encourage appropriate interpretation of the qualities of the landscape, the importance of its historic buildings and parkland and archaeological features to improve people's understanding and enjoyment of the history and time-depth of the area.

- Encourage volunteers to undertake tasks such as surveying and conserving the wildlife, historical and cultural interest of the area to increase enjoyment and understanding of its qualities.

- Within the area of the NCA which lies in the Cotswolds AONB, encourage the use of the finer grained information in the Cotswolds AONB Management Plan and the Cotswolds AONB Landscape Strategy and Guidelines to ensure that landscape opportunities are maximised in ways that do not conflict with the purposes of designation.

Ecosystem service analysis

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Food provision	Mixed farming Soils Watercourses	The area is important regionally for food production and the farmed landscape has changed as market conditions have changed. Over 80 per cent of the area is classed as Grade 3 agricultural land with 11 per cent Grade 2 and 5 per cent Grade 4, reflecting the underlying geology and superficial deposits. Farming is mixed though grassland is still the predominant landcover, with a wide range of arable crops grown on the better land, including rape, maize, wheat, barley, field beans and winter beet.	Regional	There has been a shift in cropping patterns in recent years, with a 50 per cent loss of dairy farms, a 24 per cent decline in mixed farms and significant reductions of around 20 per cent in grazing livestock numbers and also in glasshouse production. Numbers of specialist pig and poultry producers have increased slightly, though numbers are low. The arable area has increased significantly, with a 194 per cent increase in the area growing stockfeed, reflecting an increase in the intensity of remaining stock production. Levels of other arable crops vary from year to year, the area of cash roots has increased significantly by 60 per cent to 336 ha and rape has also increased significantly. Farm sizes have increased and are mostly large, at over 100 ha, and there has been a 5 per cent reduction in overall farm numbers as farms have merged. Intensively managed soils can be vulnerable to loss of carbon, compaction and erosion. It will be important to maintain soil carbon levels and good soil structure to ensure future productivity. Pressures in the area include loss of remaining permanent pasture to arable, re-seeding of permanent pasture, the landscape impact of novel crops such as miscanthus, the potential impact of growth of energy crops on future food production and the potential effects of diffuse pollution from fertiliser, herbicides and pesticides on the watercourses. Pressure for the extraction of sand and gravel along the Nene Valley and development pressures around the main settlements and the transport corridors continue to affect some of the better quality agricultural land in the area. Balance is required between these competing land uses.	Manage soils to ensure continued sustainable food production which does not compromise other ecosystem services, increasing soil carbon and water infiltration, and seeking to avoid soil compaction, erosion and diffuse pollution through good soil management. Encourage techniques such as inclusion of break crops and retention of winter stubble to manage the land and protect soil. Encourage sustainable, mixed grazing particularly on parkland and semi-improved grassland by grazing hardy beef cattle with sheep to ensure good ecological condition. In areas that are important for arable plants and farmland birds and mammals, seek to balance efficient production with uptake of agri-environment options to encourage biodiversity. Encourage the uptake of agri-environment schemes to support sustainable livestock production, including management of meadows to produce hay; to protect remaining hay meadows and to enhance the species-richness of neighbouring meadows and pastures; and increasing connectivity of this highly fragmented habitat. Promote best practice in food production and farm waste management to reduce impacts on the natural environment, soils and water resources.	**Food provision** **Regulating soil quality** **Regulating water quality** **Regulating soil erosion** **Sense of place/ inspiration** **Water availability** **Genetic diversity** **Biodiversity**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Timber provision	Small broadleaved woods Conifer plantations Soils	Woodland cover is sparse at around 4 per cent and is mostly in the form of small scattered woods, often on hill-top sites. Around 70 per cent of the 3,966 ha of woodland is broadleaved (with a mix of species, but predominantly oak and ash), with 17 per cent conifer (a mix of Douglas fir, Scots pine and Sitka spruce) and only 2 per cent mixed. Only 272 ha is ancient woodland and 159 ha of conifers planted on ancient woodland sites. With woodland so restricted, there is no significant commercial forestry industry and current timber provision is low. There is scope to re-introduce coppicing in some woods and in new plantations to produce small section timber for local use, with additional potential biodiversity benefits.	Local	There has been little management of much of the existing woodland resource, but with around 1,000 ha net increase in woodland due to new planting in recent years, there has been a significant increase in woodland cover of more than 25 per cent, though overall cover is still only around 4 per cent. The existing woodland, parkland and many hedgerow trees could be managed more effectively to produce some limited timber for local use. There is scope for low grade woodland products in the short to medium term, and for higher value timber products in the longer term if active woodland management is pursued. A significant increase in timber production would be possible and the Forestry Commission has calculated a potential to double existing cover. However, while this could have significant benefits for climate change regulation, soil and water protection, these need to be balanced against the continued need for food production, landscape and biodiversity and in particular the need to protect the important historic parkland and the Area of Outstanding Natural Beauty. With climate change species composition may change in existing woodland, including ancient woodland and novel tree diseases including sudden oak death and ash die-back will pose a significant threat to the two currently dominant species in the same way that Dutch elm disease did during the 1970s.	Restore and encourage management of the many small broadleaved and remaining ancient woods, the many areas of parkland trees, wood pasture and areas of amenity and shelter tree planting around villages, for local timber use and wood fuel. Encourage new small-scale planting for timber production in appropriate locations where it can be accommodated without compromising key features of the area such as the prominent, scattered, small hill-top woods, parkland or open landscape character and away from features of archaeological, historical, geological or biodiversity interest. Encourage planting and management for local timber production of the many hedgerow and waterside trees to maintain a well-wooded appearance on enclosed land and along rivers. Encourage sympathetic management of the existing conifer blocks, through thinning, selective felling and re-shaping, to develop open glades and softer edges that follow the landform, and increase the proportion of broadleaved species and enhance the ground flora.	**Timber provision** **Biomass energy** **Regulating soil erosion** **Regulating soil quality** **Climate regulation** **Sense of place/ inspiration** **Biodiversity**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Water availability	Rivers Canals Reservoirs Semi-natural habitat	The headwaters of a number of major rivers rise within the NCA, the Avon, Leam, Cherwell, Welland and Nene, plus major tributaries of the Ouse, Nene, Brampton and Ise. Water resources are heavily exploited and are considered to be restricted, ranging from 'no water available' to 'over-abstracted', and measures are in place to monitor abstraction rates. The Grand Union and Oxford canals traverse the full length of the NCA, totalling 92 km in length. Small portions of the eastern boundary of the NCA overlay the edge of a major limestone aquifer. There are a few minor groundwater abstractions from the aquifer east of Daventry. There are several large reservoirs in the north of the NCA, the largest being Pitsford Reservoir, covering more than 300 ha. Pitsford as well as Hollowell and Ravensthorpe reservoirs lie along the Brampton branch of the River Nene and provide public water supply. The Naseby, Sulby, and Stanford reservoirs lie along the River Avon. The Daventry Reservoir impounds winter run-off from surrounding tributaries in order to release water to the Grand Union Canal in the summer.	Regional	The Avon and Cherwell are 'over-abstracted' within the NCA. The River Leam suffers from low flows during summer months and is heavily abstracted for public water supply and currently 'over-licensed' The Nene is an important source of water for public water supply from Pitsford and Rutland reservoirs (the latter lying to the north-east of this NCA). There is 'no water available' from the River Nene or its Brampton branch, worsening to 'over-licensed' near Northampton. The Cherwell is 'over-abstracted' within the NCA and there is concern that the flows are unnaturally low due to abstractions at Banbury and those used to support the Oxford Canal. The reservoirs form an important part of the water supply network to surrounding large towns and to the two canals. The planned major expansions of nearby towns, both inside and around the NCA, including Northampton, Rugby, Daventry and Banbury, will place additional pressure on local water supplies. Increasing future demand from agriculture for irrigation or stock watering could also increase pressure on supply. Climate change may have an impact on water resources, with low rainfall and drought leading to water shortages, reduced water quality and exacerbating low summer flows in rivers and could lead to an exacerbation of diffuse pollution. Heavier winter rain could exacerbate flooding in some areas. The ability of the catchments to maintain a constant flow rather than experience episodes of flood and drought is enhanced by measures to maintain good soil structure and either grassland or woodland cover, both of which aid rainwater infiltration. The upper reaches of the Nene Valley Nature Improvement Area (NIA) lie in this NCA. The NIA Partnership has a vision to create a resilient ecological network and improve ecosystem service provision in the Nene Valley. Measures to ensure re-charge of the aquifer should be maximised through good soil management to maximise infiltration.	Ensure any further water abstraction, whether by existing users or by granting of new licences, is carefully monitored and controlled to avoid adverse impact on flow in the rivers. Promote sustainable use of local water resources and use of water efficiency measures by commercial, agricultural and domestic users to reduce consumption where possible, especially in new developments. Encourage the restoration of semi-natural habitats, such as wet woodland and grazing marsh, and the reconnection of flood plain watermeadows to improve water storage capacity and aquifer recharge, while reducing downstream flood risk and soil erosion, improving water quality, climate regulation, habitat networks and resilience to climate change. Encourage implementation of the vision and objectives of the Nene Valley NIA, including tackling water resource and flow issues. Through catchment sensitive farming and agri-environment schemes encourage the management of watercourses to prevent diffuse water pollution and allow water tables to rise where appropriate.	**Water availability** **Regulating water quality** **Regulating water flow** **Regulating soil erosion** **Sense of place/ inspiration** **Biodiversity**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Genetic diversity	Hereford and Dairy Shorthorn cattle Arable weeds	Numbers of cattle reduced by 17 per cent between 2000 and 2009, down to 38,600 animals. Increases in the number of native breed cattle traditionally associated with the area, such as Hereford and Dairy Shorthorn, correspond with their use for conservation grazing.	Local	The advent of agri-environment stewardship schemes and encouragement to sustainably graze areas of remaining semi-natural habitats and grassland and arable reversion to pasture on parkland for biodiversity, landscape and historic environment interest have led to a resurgence in interest in native breeds of cattle which used to be common in the area, such as Hereford and Dairy Shorthorn, but which had undergone declines in popularity in the 20th century. Promotion of these could be used to support a sustainable local food economy by encouraging local produce from traditional breeds.	Encourage the re-introduction of previously declining traditional cattle breeds such as Hereford and Dairy Shorthorn where possible, to diversify the grazing regime and to maintain the genetic diversity of agricultural animals against future threats. Encourage the promotion and development of supply chains and markets for high-quality local produce from traditional breeds, encouraging a food economy that supports local tourism.	**Genetic diversity** **Biodiversity.** **Food provision** **Sense of place/ inspiration**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Biomass energy	Existing woodland Biomass planting	As of 2014 there were five wood fuel boilers installed in the area with a generating capacity of 970 kWth. The area has a generally high yield potential for short rotation coppice, though this decreases to medium toward the south and west of the NCA (around Banbury and Upper and Lower Boddington). There has been an increase in planting of miscanthus in recent years, particularly around Coton. There has also been an overall increase in woodland cover in recent years owing to new planting.	Local	There are opportunities for sensitively sited energy crop planting. There is a medium potential yield for miscanthus throughout most of the NCA, rising to a high yield potential along the western boundary of the NCA. There is a high potential yield for short rotation coppice throughout, although this decreases to medium towards the south and west of the NCA around Banbury and Upper and Lower Boddington. Small-scale planting of energy crops makes little structural change to the landscape when positioned on lower slopes in these undulating landscapes, particularly where the tall hedgerows remain in good condition. However, on ridgelines or where the hedgerow network is weaker, the landscape effects are more significant and should be carefully considered. New plantings need careful siting to avoid impacts on sites of biodiversity, historical, archaeological or landscape importance and especially in or near the areas of parkland, the Area of Outstanding Natural Beauty, ridgelines or open field systems, ridge and furrow or deserted settlements. There is scope for biomass production for local or regional use from managing existing woodland and from recently planted woods, with potential for improved biodiversity, climate regulation and development of local wood fuel supply.	Encourage management of broadleaved and coniferous woodlands, wood pasture and shelterbelts and the planting of new broadleaved woodland in suitable locations which do not interfere with the views from the ridges or the special qualities of the AONB, to increase production of biomass/wood fuel for local use. Encourage biomass production including miscanthus and short rotation coppice in areas of high yield potential which do not suffer from soil erosion or conflict with the needs of food production, or important sites for biodiversity, archaeology, historic landscape or areas of parkland or the ridgeline views. Encourage good hedgerow management in areas of biomass planting, protecting and restoring the traditional Midlands hedging style with its high A-shape and many hedgerow trees in order to mitigate landscape impacts. Ensure that plantings of biomass crops avoid fields that are crossed by rights of way or are adjacent to popular routes, to avoid conflicts with recreation and enjoyment of the countryside. Encourage local and regional markets for biomass and wood fuel to support sustainable woodland management.	**Biomass energy** **Climate regulation** **Biodiversity** **Timber provision**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Climate regulation	Soils Woodland Parkland Hedgerows Hedgerow and riverside trees Urban trees and greenspace-networks including parks Grassland Reedbeds	The majority of the soils of the NCA have low soil carbon content of 0–5 per cent, particularly where under continuous arable cultivation. However, in the north-west of the NCA, carbon content appears to increase marginally to 5–10 per cent. Carbon content is likely to be higher under woodland cover within the NCA, as well as under the almost 850 ha of flood plain grazing marsh, permanent grassland, fen and heathland.	Local	Carbon sequestration could be increased by improving soil structure, increasing organic matter inputs and by reducing the frequency and area of cultivation. An increase in the low levels of woodland cover would also assist with carbon sequestration. Soil carbon and soil storage will also be higher under the remaining areas of permanent pasture, reedbeds and grazing marsh. While the area classified as urban is small at 4 per cent, in these areas the urban heat effect (where urban fabric absorbs and retains heat, raising temperatures over that in surrounding rural areas) could be mitigated by ensuring that trees are planted in urban areas and that green infrastructure is retained and enhanced.	Encourage well-designed expansion of woodland and shelterbelts, particularly around villages and settlements and encourage tree planting within settlements and urban areas, avoiding sensitive areas such as the open ridges and any areas of geological, biodiversity or archaeological interest. Encourage woodland management in existing woodland to retain the benefits to climate regulation of high soil carbon and active carbon sequestration, through maintenance of a wide age structure. Encourage use of a wide range of tree species in new planting to maximise resilience to climate change and novel diseases. Protect areas of green infrastructure in developed areas, especially parks and river valleys, encouraging restoration where necessary and include new areas of green infrastructure and urban tree planting in developments to reduce the heat island effect. Encourage extensive grazing where possible and the retention of permanent pasture where this still exists and seek opportunities to extend areas of semi-natural habitats under low-input management, including permanent grassland, reedbeds and flood plain grazing marsh to protect soil structure and carbon storage. Encourage a reduction in ploughing to increase soil organic matter, carbon storage/retention and drought tolerance of crops. Encourage retention and management of hedgerows, hedgerow trees, wood pasture and parkland, all of which contribute to carbon storage.	**Climate regulation** **Regulating soil quality** **Regulating soil erosion** **Regulating water flow** **Timber provision** **Biomass energy** **Biodiversity**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating water quality *Continued on next page*	Rivers and streams Woodlands Hedgerows Parkland Wetlands Permanent grassland Soils	Water quality in the area is in need of improvement, with significant issues with nitrogen, phosphate, pesticide and sediment levels and particularly with the ecological status or potential of surface waters in the NCA, which ranges from good to poor. The ecological potential of the River Nene and its tributaries is generally 'moderate'.[6] In the north-west of the NCA (between approximately Swinford, Naseby and Husbands Bosworth) there are significant opportunities to improve the condition of vulnerable wetland habitats by addressing sources of diffuse agricultural pollution adjacent to the Grand Union Canal and River Avon.[7] Overall the River Avon has a 'moderate' ecological potential from its headwaters to where it crosses the Grand Union Canal, improving to 'good' as it flows toward the NCA's western boundary. The headwaters of the River Leam have a 'poor' ecological status.[8] In the south, the ecological potential of the River Cherwell is generally 'good';[9] however, sedimentation due to soil erosion from surrounding agricultural land is recognised as an issue.[10] The ecological potential of the	Regional	Pressures affecting water quality include land use change, loss of permanent pasture and parkland, increased arable production, intensification of agricultural production, high levels of phosphorus from sewage works and road run-off. Wider application of best practice land management (catchment sensitive farming techniques) to areas both within and outside the current priority catchment areas would significantly improve water quality. Priority actions include reductions in pesticide, sediment and nutrient run-off, a reduction in pathways for soil wash, pesticides and nutrients to enter ditches and watercourses, better soil and manure management, improved drainage-water and dirty-water management on farmyards, reduction of soil poaching by stock gathering at gateways, feeders and troughs and a reduction in damage from stock or machinery movement. The Nene Valley NIA has key objectives to 'improve the ecological status of the river and enhance ecosystems services' and also 'through effective engagement with farmers and landowners to maintain, restore and create BAP habitats and implement sustainable land management practices to strengthen the ecological network'. A desk study of watercourses has identified that siltation of the riverbed, disconnection of the river from its flood plain channelisation and habitat discontinuity are the key issues to address.	Ensure appropriate grazing levels on grassland and manage river and reservoir banks to encourage a well-vegetated sward to reduce run-off rates, soil erosion, sedimentation and poaching of river banks by stock, through use of wide buffer strips and planting woodland. Control invasive non-native species which threaten the stability of river banks and encourage use of break crops on arable land. Work with the farming community to promote good nutrient and pesticide management, managing applications of pesticides, slurry and manure to maximise uptake and reduce run-off, by avoiding manure spreading in winter on frozen, hard ground or very wet ground, or when there is no grass growth, and through the use of biobeds. Ensure that farm infrastructure is able to reduce rates of point and diffuse pollution generated in and around farmsteads through improved and roofed silage, slurry and manure storage, grey water separation, rainwater storage tanks, improvements to storm water overflows and good handling facilities, encourage the provision of livestock drinking troughs, sediment ponds and traps, swales with check dams, piped culverts in ditches, resurfacing of	**Regulating water quality** **Regulating soil erosion** **Regulating soil quality** **Regulating water flow** **Water availability** **Biodiversity** **Recreation**

6 Anglian River Basin Management Plan, Annex A: Current state of waters, Environment Agency (December 2009)
7 HLS Target Area Statement EM14: Stanford, Loddington and Melton Target Area Statement, Natural England (2008)
8 Severn River Basin Management Plan, Annex A: Current state of waters, Environment Agency (December 2009)
9 Thames River Basin Management Plan, Annex A: Current state of waters, Environment Agency (December 2009)
10 HLS Target Area Statement EM01: Daventry and Banbury Target Area, Natural England (2008)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating water quality *Continued from previous page*		Grand Union Canal is generally 'good',[11, 12] although, again sedimentation due to soil erosion from agricultural land around Daventry and Banbury is recognised as an issue.[13] The chemical status of surface waterbodies in the NCA is generally 'good' or 'does not require assessment'. [14] The chemical status of groundwater throughout the NCA is 'good', where groundwater sources exist. In the south of the NCA, three areas – around Braunston, Moreton Pinkey, and Upper Boddington to Chipping Warden – are a priority for reducing soil erosion from adjacent farmland to improve water quality in the Grand Union Canal and the River Cherwell.[15] The NCA includes land which falls within four Defra priority catchments designated under Defra's Catchment Sensitive Farming initiative, which cover the Upper Cherwell, Upper Avon and River Leam, River Nene, and Upper Great Ouse. The Upper Nene also lies within the Nene Valley Nature Improvement Area (NIA).	Regional	Water quality in the NCA could be further enhanced by ensuring that buffers of semi-natural vegetation, riparian woodland or reedbeds are encouraged and managed to ensure high levels of vegetative cover alongside watercourses, filtering run-off and enhancing water quality and biodiversity. Non-native species such as Himalayan balsam and Japanese knotweed pose a threat in some areas as the lack of winter vegetation beneath them can lead to increased siltation and soil erosion on river banks. In some arable areas, loss of hedgerows through field amalgamation and decline in condition of remaining hedgerows has reduced their ability to slow run-off or act as filters. There is significant planned expansion of major settlements in and around the area which could potentially have further implications for water quality, particularly from increased phosphate from sewage, and a need to ensure sustainable water management is adequately built into urban extensions to prevent deterioration of water quality. More extreme rainfall events as a result of climate change are likely to increase the risk of sediment and nutrient run-off, which could cause increased hydraulic scour and eutrophication effects. Warmer summers may raise water temperatures causing greater incidences of algal blooms and concentration of pollutants, thus affecting fish populations and other freshwater organisms.	gateways, livestock and machinery tracks, watercourse crossings, gate relocation and hard bases for drinkers and feeders, though these all require sensitive design in this high-quality landscape. Promote the Catchment Sensitive Farming scheme to farmers and landowners, encouraging uptake of advice and grants to improve water quality and reduce soil erosion. Promote delivery of the the Nene Valley Nature Improvement Area's vision and objectives to domestic, agricultural and industrial stakeholders to improve water quality. Ensure river engineering works are carried out in an ecologically sensitive manner, enhancing opportunities for conservation and habitat management. Design new off-mains developments to include sustainable drainage systems to improve water infiltration and protect the aquifers and promote best practice to prevent effluent leakage from existing septic tanks. Identify urban pollution pathways and introduce green infrastructure where possible to improve downstream water quality.	

[11] Severn River Basin Management Plan, Annex A: Current state of waters, Environment Agency (December 2009)
[12] Thames River Basin Management Plan, Annex A: Current state of waters, Environment Agency (December 2009)
[13] HLS Target Area Statement EM01: Daventry and Banbury Target Area, Natural England (2008)
[14] Anglian River Basin Management Plan, Annex A: Current state of waters, Environment Agency (December 2009)
[15] HLS Target Area Statement EM01: Daventry and Banbury Target Area, Natural England (2008)

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating water flow	Rivers Avon, Cherwell, Nene, Ouse, Leam, Bampton and Ise Grand Union and Oxford canals Wetlands Woodland Soils Semi-natural habitats Grassland Parkland Flood plain grazing marsh Green infrastructure around urban areas	This NCA contains the headwaters of four major rivers – the Avon, Ouse, Nene and Cherwell – and many of their tributaries, some with a history of flooding. Many of the soils in the NCA have impeded drainage; there is a very low level of woodland cover and a loss of permanent pasture, all of which contribute to the potential for high levels of run-off from heavy rainfall events. Some areas of flood plain grazing marsh along the River Nene have been lost to a combination of development and gravel extraction. In the north-west of the NCA, there are areas of flood risk from the River Avon and the Oxford Canal within, west and north of Yelvertoft, , which affects Yelvertoft as well as the A5, M1, and A14 roads. In the north-east of the NCA, there is a low risk of flooding. In Daventry there is no significant risk of fluvial flooding but there is a notable fluvial flood risk at Weeden Bec and eastward (largely outside of the NCA) associated with the River Nene, and affecting the A5 and M1. In the south of the NCA there is generally a low risk of flooding; however, there is a risk of fluvial flooding north of and through the centre of Banbury, associated with the River Cherwell.[16]	Regional	Climate change could increase the duration and severity of rainfall events, exacerbating flood risk in the future. Flood storage areas on the flood plains could reduce risk to settlements downstream, both within and outside the NCA. The Environment Agency preferred approach to flood management is to investigate flood storage options, combined with environmental enhancements to improve the natural state of rivers and their associated habitats. There are opportunities to develop water storage and wetland habitats in old gravel extraction sites to help balance water flows as well as enhancing biodiversity and recreation. Planting of riparian woodland can help to slow water flow and should be encouraged in appropriate locations. Existing woodland, parkland, permanent grassland and hedgerows all help to intercept water, and with their rougher surfaces and better soil structure also reduce run-off and minimise soil erosion. Good soil management to avoid or reduce soil compaction and increase soil organic matter can aid water infiltration rates and reduce run-off. Plans for extensive new development, particularly in flood plains around Weedon Bec and Banbury, will have an impact on flood risk and will need additional management. In the north-west of the NCA, the Environment Agency aims to reduce dependence on raised flood defences by taking opportunities to restore the natural storage of floodwater on undeveloped flood plain to benefit Yelvertoft, as well as communities outside this area (including Rugby and Leamington Spa, outside of the NCA).[17] In the north-east, the Environment Agency aims to reduce overall flood risk management activities in this area, and to reduce bank and channel maintenance in some locations, which will help naturalise rivers and improve the flow between the river and its flood plain.[18] Around Banbury planned flood defences are expected to reduce the probability of flooding locally.[19]	Manage grassland to encourage good ecological condition and high levels of vegetation cover to improve infiltration and reduce evapotranspiration, improve resilience to drought conditions and to slow flows due to increased surface roughness. Reduce flood risk downstream by managing soils to reduce soil compaction and enhance soil organic matter to increase their permeability, and subsequent infiltration rates, through the use of extensive grazing systems. Manage woodland, parkland and hedgerows and create new native woodland, avoiding sites of existing biodiversity or archaeological interest, to increase water infiltration and to slow flows. Encourage restoration and extension of valley mires and reedbeds, grazing marsh, parkland and wet woodland along watercourses in the valleys to slow run-off and increase storage capacity. Work with land managers and public authorities in nearby NCAs to address water flow issues at a catchment scale, including the implementation of the River Nene Catchment Flood Management Plan. Promote green infrastructure and use of sustainable drainage systems (SuDS) in urban areas to help mitigate the impact of flooding. Avoid inappropriate development in flood risk areas and minimise run-off from new development.	**Regulating water flow** **Regulating water quality** **Regulating soil quality** **Regulating soil erosion** **Climate regulation** **Biodiversity**

[16] Environment Agency, Risk of Flooding from Rivers and Sea, URL: http://maps.environment-agency.gov.uk/ wiyby/wiybyController ?x=531500. o&y=181500.o&topic =floodmap&ep=map&scale=3&location=London, per cent20City per cent20of per cent20London&lang=_e&layerGroups=default&textonly=off (accessed January 2011)
[17] River Severn Catchment Flood Management Plan, Summary Report, Environment Agency (December 2009)
[18] River Nene Catchment Flood Management Plan, Summary Report, Environment Agency (December 2009)
[19] Thames Catchment Flood Management Plan, Summary Report, Environment Agency (December 2009)

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating soil quality	Geology and drift deposits Soils Woodland Parkland Permanent grassland Semi-natural habitats	There are six main soil types in the NCA: ■ Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils (covering 56 per cent of the NCA). ■ Freely draining slightly acid but base-rich soils (21 per cent). ■ Slightly acid loamy and clayey soils with impeded drainage (11 per cent). ■ Lime-rich loamy and clayey soils with impeded drainage (6 per cent). ■ Loamy and clayey flood plain soils with naturally high groundwater (3 per cent). ■ Freely draining slightly acid loamy soils (2 per cent).	Local	Maintaining good structural conditions will aid water infiltration, reduce impacts of climate change such as drought, aid aquifer re-charge and prevent pollution of groundwater. The slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils may suffer compaction and/or capping as they are easily damaged when wet, leading to increasingly poor water infiltration and diffuse pollution as a result of surface water run-off. Management measures that increase soil organic matter levels such as minimum tillage through direct drilling can help reduce these problems, as can extensive grazing and careful timing of cultivations, stock movement and machinery movements. In the areas with freely draining slightly acid but base-rich soils, where the calcareous layers are near the surface, these help to provide some natural resilience and enhanced workability. Some component soils are at risk from topsoil compaction and poaching and require careful management of weak topsoil (for example through minimum tillage and improved organic matter content) to maintain good soil structure. Development of iron pans can occur in some soils. The slightly acid loamy and clayey soils with impeded drainage are easily poached and compacted when the soil is wet, with weak topsoil structures being easily damaged, requiring careful timing of activities to reduce the likelihood of soil compaction.	Encourage best practice in soil management, adopting Defra's Code of Good Practice (2009) and the Environment Agency's 'Think Soils' initiative (2008) and improve structure and quality of the soils where possible by encouraging extensive grazing management and using low pressure machinery and managing stock and machinery movements, particularly in wet conditions to avoid compaction and poaching. Encourage minimal tillage techniques such as direct drilling to reduce soil disturbance and encourage the use of break crops such as rape or beans which break up the soil. On freely draining soils return organic matter and manure to the soils to maintain fertility, encourage a build-up of organic matter and reduce reliance on artificial fertilisers. When re-seeding, plan cultivation timings carefully and avoid using heavy machinery on wet soils to avoid damage to and compaction of topsoil. This will also improve water infiltration, reduce surface run-off and increase resilience to drought. Encourage new tree planting, areas of semi-natural habitat or permanent grassland to stabilise soil and improve soil quality through increased organic matter and soil fauna.	**Regulating soil quality** **Regulating soil erosion** **Regulating water quality** **Regulating water flow** **Biodiversity** **Water availability** **Food provision**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating soil erosion	Soils Landform Woodland Parkland Hedgerows Pasture Semi-natural habitats Rivers and streams	Sixty per cent of soils are prone to erosion, associated mostly with the slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils and the loamy and clayey flood plain soils with naturally high groundwater. A few of the component soils of the freely draining slightly acid soils (2 per cent of the NCA) have enhanced risk of soil erosion on moderately steeply sloping land where cultivated or bare soil is exposed, exacerbated where organic matter levels are low following continuous arable cultivation or where soils are compacted. There is the potential for wind erosion on some coarse textured cultivated variants. Natural England recognises that arable land in the south of the NCA, around Upper Boddington, Chipping Warden and Moreton Pinkney, poses a risk to the adjacent River Cherwell and Grand Union Canal from soil erosion, as does soil erosion around Daventry and Banbury affecting the Grand Union Canal, requiring specific measures to target erosion reduction.[20] Semi-natural habitats, including woodland, hedgerows, permanent pasture and parkland, provide areas of greater soil stability.	Regional	There are four Priority Catchments in this NCA designated under Defra's Catchment Sensitive Farming Initiative, which cover the Upper Cherwell, the Upper Avon and River Leam, the River Nene and the Upper Great Ouse, where sedimentation is identified as a key issue. Employing soil management measures will improve soil structure and reduce erosion in areas most at risk, such as arable cultivation on the ridges and sloping valley sides and in areas with low soil organic matter levels or high levels of compaction. Measures could include well-timed cultivations, arable reversion, use of low pressure machinery and use of minimum tillage techniques. Increasing areas of permanent grassland and wide buffer strips of grassland alongside watercourses in arable areas, and through arable reversion would also reduce erosion risk through the maintenance of good vegetative cover especially where such grassland is managed under extensive grazing regimes. An increase in the area of semi-natural habitats would increase the area of land maintained under stable conditions, reducing risk of soil erosion, particularly along watercourses, helping to bind soils together, aiding water penetration and reducing erosion, for example through restoring and extending woodland, hedgerows, wetlands and mires.	Manage river and reservoir banks, grassland, flood plain meadows and riparian habitats to encourage a well-vegetated sward and provide wide buffer strips of permanent, unfertilised grassland in cultivated areas to reduce soil erosion, run-off rates and sedimentation. Where possible encourage extensive agricultural practices which retain water in-situ and avoid poaching or damage from large numbers of livestock and mechanised activities to reduce soil erosion and damage to soil structure. Encourage the use of minimum tillage techniques, such as direct drilling, to reduce soil exposure and break up. Increase the area of native broadleaved woodland and scrub and hedgerows, targeted at areas of high risk of soil erosion but avoiding areas of existing biodiversity or archaeological interest, to act as wind breaks and to bind soil. Where possible minimise machinery and stock movements in wet conditions, encourage well-timed cultivations, provide watering points and prevent livestock access to watercourses to minimise sedimentation and run-off. Encourage uptake of Catchment Sensitive Farming Initiative advice and grants to promote good soil management in priority catchments.	**Regulating soil erosion** **Regulating soil quality** **Regulating water quality** **Regulating water flow** **Water availability** **Food provision** **Biodiversity**

[20] HLS Target Statement EM01: Daventry and Banbury Target Area, Natural England (2008)

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Pollination	Unimproved semi-natural grasslands Road verges Hedgerows Woodland	Areas of priority habitat such as flood plain grazing marsh, lowland meadow, lowland calcareous grassland, lowland dry acid grassland, purple moor-grass and rush pasture, lowland heath and woodland are very low (each less than 1 per cent of the NCA area), providing only limited nectar sources for pollinating insects. There are remaining small examples of species-rich unimproved meadows, designated as SSSI, that support rich assemblages of species, including species important for insects such as knapweed, ox-eye daisy, devil's bit scabious, betony, buttercup, lady's bedstraw, cowslip and meadowsweet. The hedgerows often have wide, grassy margins and the roads have wide verges, both of which support species not present in the more intensively managed fields.	Local	The extensive areas of rape and field bean planting rely on insect pollination for crop production, but there are relatively few areas of semi-natural habitat to support pollinating insects. The grassland, parkland, verges, woodlands and hedgerows provide good corridors between areas of semi-natural habitat for pollinators so their appropriate management is a priority for this service. There is potential, through appropriate management, to increase habitat diversity, extent and connectivity, particularly of grassland types, hedgerows, verges and woodland and to enhance species diversity and thus to enhance this service. Changes in temperature, humidity and soil moisture as a result of climate change may decouple the phenologies of pollinators from their host plants, change exposure to pollinator pathogens and increase exposure to pesticides if summer rainfall declines. These potential impacts highlight the need for greater connectivity of habitats to allow species to shift and adapt.	Encourage restoration and expansion of remnant hay meadows, species-rich pasture and meadows and species-rich road verges. Encourage appropriate management of existing grassland, parkland, lowland heath, hedgerows and woodland habitats through appropriate grazing/ management to maintain and enhance species and structural diversity and maximise floral resources to increase provision of feeding and breeding sites for pollinators. Increase connectivity of semi-natural habitats by creating corridors, buffers and stepping stones. Survey the road verges of the NCA to map locations of species-rich verges and encourage appropriate management regimes of such verges to maintain floristic diversity. Encourage best practise and minimise the use of pesticides and herbicides to reduce impacts on pollinators.	**Pollination** **Biodiversity** **Food provision** **Pest regulation** **Sense of place/ inspiration**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Pest regulation	Broadleaved woodland Parkland Unimproved semi-natural grassland Road verges Hedgerows Arable margins	The remaining semi-natural habitats in the area, particularly areas of long grass, support a wide variety of predatory species such as beetles, which can contribute to pest regulation. Ancient, semi-natural woodland, wood pasture and parkland support a wide variety of predatory invertebrates, birds and mammals. Many of the small broadleaved woods, copses and shelter plantings around settlements contain largely ash and oak. The majority of mature hedgerow trees are also ash and oak and they also form a key component of the parkland trees.	Local	Semi-natural habitats can support a wide range of predatory species which can assist with the regulation of pests that adversely affect food and energy crops. The current fragmentation and poor connectivity of such habitats limits delivery of this service in the NCA. Improving the diversity, complexity and connectivity of semi-natural habitats will increase the predator and parasitoid numbers and species that are likely to be supported. Ash and oak are now key species in this NCA, since the loss of the previously dominant English elm after Dutch elm disease in the 1970s. They are important for sense of place, landscape character and biodiversity and are both at risk from novel tree diseases including ash die-back and sudden oak death. There is a clear need to plan for the spread of these and future diseases by increasing the species diversity of trees to maximise resilience and reduce the possibility of losing a key characteristic of the NCA.	Expand, restore and manage the remaining semi-natural habitats, especially woodland, parkland, grassland, hedgerows and road verges, to increase the potential to deliver a pest regulation service in the area, through increasing structural diversity and species diversity. Encourage management of arable land to maximise the potential to use natural pest control methods for example through the development of networks of beetle banks, grass margins and headlands in fields. Encourage woodland management and establishment techniques that favour the use of a wide range of tree species to reduce reliance on oak and ash. Encourage landowners, farmers, public authorities and interest groups to survey and monitor for tree disease and to seek to identify and propagate locally resistant strains of ash and oak.	**Pest regulation** **Biodiversity** **Pollination** **Food provision** **Timber provision** **Sense of place/ inspiration**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Sense of place/ inspiration *Continued on next page*	Gently rolling hills Wide views Mixed farming Parkland Many country houses and estates Tall hedgerows and many hedgerow trees Hill-top woods and copses Ironstone and brick settlements Ridge and furrow Reservoirs Narrow roads with wide verges Tranquillity	Sense of place is provided by the varied undulating landform of rounded hills and many long, low ridgelines that provide extensive views over the lower land, most noticeably supported by the abundant and prominent ridge-and-furrow field systems and frequent deserted and shrunken settlements, along with the characteristic parklands and estates that surround the many manor houses. The small, nucleated villages are predominantly constructed of cob, ironstone and brick (with purer limestone a feature in the north) roofed in pantiles, thatch or clay tiles, and have large stone churches, often with prominent steeples. These are linked by straight, narrow, enclosure roads with wide verges, many following the ridges, with strong rectilinear field patterns and tall, A-shaped hedgerows with a great many mature hedgerow trees, with ironstone and limestone drystone walls in places. The central area around Arbury and Charwelton has a well-wooded character due to the intricate pattern of hedgerows, frequent ash trees and small copses, while around Badby the landscape is particularly distinctive with dense hedgerows and woodland. Elsewhere the woodland cover is sparse; limited to coverts and spinneys	Regional	The south-west corner of the NCA (less than 1 per cent) lies within the Cotswolds AONB, reflecting the high quality of natural beauty in the area. The AONB is subject to a statutory management plan the aim of which is to conserve and enhance the landscape's natural beauty. The landscape of the rest of the NCA has no formal protection, although there are many scattered, small, individual sites which are protected as SSSI, Scheduled Ancient Monuments, Conservation Areas or Registered Parks and Gardens, though these lack an integrated management plan taking into account the wider landscape. The main features of the area are all associated with feelings of escapism, spiritual refreshment and inspiration which are increasingly rarely to be found in this densely populated island. The sparse settlement pattern contributes to the feeling of remoteness that can be found in the rural parts of the NCA. The vernacular styles and materials are highly distinctive, contributing strongly to the sense of place and allow the geology to be 'read' in the landscape. Development is changing character in some areas, making topography and landform less legible. The open nature of the landscape means it is vulnerable to the effects of large-scale development which can compete with the small-scale nucleated settlement pattern. Major road infrastructure developments and urban areas associated with Daventry and Banbury and the enlarged commuter villages near	Protect views into and out from the NCA and the senses of rural remoteness and tranquillity, where these still remain strong, from tall, vertical or large-scale developments. Promote farming systems that maintain and restore the farmed landscape and range of habitats, including the traditional grazing practices, field boundary management, and areas of parkland and woodlands. Maintain, restore and recreate the patterns of hedgerows and many hedgerow trees, ensuring succession planning for the trees. Where they occur, maintain and restore the ironstone and limestone drystone walls. Encourage sensitive conservation and restoration of the remaining areas of both registered and non-registered historic parkland, including designed aspects of the landscape as well as the trees, which are central to the character of the area.	**Sense of place/ inspiration** **Geodiversity** **Sense of history** **Recreation** **Biodiversity** **Food provision** **Tranquillity**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Sense of place/ inspiration *Continued from previous page*		associated with the area's strong hunting traditions. Navigable canals are an important visual component of the landscape, as are the area's numerous and prominent reservoirs. Inspiration is provided by the area's distinctive manor houses and parklands, some designed by Repton and Brown, with the Elizabethan and Jacobean houses (notably Althorp, Holdenby and Canons Ashby) particularly associated with the court life of that period, the poems of Spenser and the masques of Ben Jonson. A sense of inspiration is further associated with the rural landscape and its visible historical associations, with ridge and furrow on green slopes most prominent and evocative in the evenings and winter when the low sun casts long shadows. Inspiration and escapism may also be found along the open ridgelines that afford long views, as well as the areas of ancient woodland around Badby. There has been significant urban development including housing, out-of-town shopping, warehousing and industrial areas) on the edges of the two towns and associated with the many strategic transport routes that cross the area, especially the M40, M1, A14 and other A roads, which can be intrusive in the wide river valleys and in views from the higher ground.		the main road and rail corridors do not reflect the local vernacular, which is becoming highly diluted in these areas. Planned major urban expansion and transport infrastructure could reinforce the suburbanisation and industrial feel of these areas and will increase the area of the NCA affected by noise. Parkland is at risk through lack of management of designed features, lack of succession planting and in some cases from arable conversion and enclosure and is considered further under sense of history. The wide and far-reaching views available in many places both within and out of the NCA are a key feature and at risk from tall, vertical or large-scale development. The tall mature, wide A-shaped hedgerows with their many mature trees are highly distinctive; they need careful management to conserve their characteristics and succession planting of hedgerow trees. Hedgerow condition is declining in places and trees have been lost, particularly in the arable areas, leading to a decline in the overall structure of the landscape. Loss of elm during the 1970s had a major effect on the numbers of mature hedgerow and parkland trees and those that remain are largely ash and oak, both of which are now threatened by diseases including ash die-back and sudden death oak. Conserving and enhancing the key landscape features will have a beneficial effect on biodiversity in the area.	Maintain the historical integrity of settlements and farmsteads, encouraging the retention, conservation and restoration of local vernacular styles and features, such as the use of ironstone, cob and brick and thatched, pantile or clay tile roofs, as well as surviving historic farm building types and layouts. Encourage the use of green infrastructure planning in new development that reflects and reinforces existing landscape character and integrates new development into the area without challenging the existing strong pattern of settlement and enclosure or the vernacular styles and materials. Where appropriate provide access to and interpretation of sites of wildlife, geological, artistic, archaeological, historical or cultural interest; to encourage people of all levels of ability and mobility to better understand and be inspired by the landscape of the area.	

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Sense of history *Continued on next page*	Scheduled Ancient Monuments Registered Park and Gardens Listed Buildings Conservation Areas Historic houses, parkland, estates and estate villages Ridge and furrow, deserted settlements and other unscheduled archaeological remains Enclosure patterns and hedgerows and walls Ironstone, cob and brick settlements Large churches and prominent steeples Grand Union and Oxford canals	The sense of history is particularly strong and evident in this NCA and is especially visible in the abundant and prominent ridge-and-furrow open field systems and deserted settlements, which are considered nationally important. There are a great many archaeological sites, covering all periods from the Palaeolithic to the Second World War. The Scheduled Ancient Monuments include features such as iron-age hill forts, Roman villas, motte-and-bailey castles, tithe barns, settlements, abbeys, granges, ridge and furrow and open field systems. There are also large numbers of non-scheduled sites on the Historic Environment Records held by the county councils, reflecting the long settlement history and particularly the good state of preservation of early features under the permanent, unploughed grassland of the park landscapes of the 18th and 19th centuries. Key historic features of the NCA are the many manor houses such as Althorp, Canons Ashby and Cottesbrooke, and their associated parklands, (some laid out by important designers such as Repton and Brown) and estate villages with their distinctive architectural character. Registered battlefields, including Naseby, Edgcote and Cropredy, are important heritage landmark features from the Civil War and the Wars of the Roses.	National	Most of the Scheduled Ancient Monument sites are very small with little or no public access and the majority of the nationally important ridge and furrow and settlement sites have no formal protection. There has been a significant loss of ridge and furrow and other features through arable conversion and re-seeding of permanent pasture, reducing the ability to read the history of the area in the landscape. Threats to archaeological sites in the area are arable cultivation, particularly deep ploughing, and neglect, leading to damage through tree growth and by burrowing animals. Sites at risk through ploughing include Roman Bannaventa, motte-and-bailey castles, hill forts and bowl barrows and those considered vulnerable include settlement sites such as Flecknoe, Hodnell Manor and Faxton. While the NCA contains a large number of Registered Parks and Gardens, most parkland is not on the Register of Historic Parks and Gardens, so has no formal protection and much is in declining condition as its historical, archaeological and landscape significance has been under recognised. Some has become separated from the house which once supported it and divided ownership is resulting in the loss of cohesive conservation of historic designs and loss of parkland character and trees. Some have been converted to arable or re-seeded and are losing their designed features. There has been some parkland	Protect, conserve, sensitively manage and where appropriate, restore all Scheduled Ancient Monuments, Registered Parks and Gardens, registered battlefield sites and Listed Buildings, especially those designated sites and Listed Buildings which are considered 'at risk'. Protect, conserve and enhance the remaining areas of parkland and their settings and encourage development of comprehensive conservation management plans for both Registered and non-registered parks and gardens that take into account the designed landscapes and features as well as their biodiversity and archaeology value and the needs of agriculture. Encourage the conservation and sensitive management of non-scheduled archaeological features, including from damaging activities such as ploughing, animal burrowing and tree growth. Encourage surveying, conservation and interpretation of non-designated sites, especially those on the Historic Environment Records, to research and raise awareness of the history and time-depth of the area and to improve enjoyment and understanding of heritage assets.	**Sense of history** **Sense of place/ inspiration** **Tranquillity** **Biodiversity** **Recreation**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Sense of history *Continued from previous page*		The local vernacular contributes strongly to the sense of history as do the Grand Union and Oxford canals and a great many villages have Conservation Area status. There are more than 3,000 Listed Buildings in the NCA, including the large stone churches, a very high number for the size of the NCA, reflecting the past wool-based wealth of the area. There is a low level of survival of pre-1740 farm buildings, mostly barns, although there are many fine stone-built former farmhouses of 16th to 17th-century date, often as coherent farmstead groups within the villages or on their fringes. There are also significant survivals of good examples of cob and thatched agricultural buildings. The sense of history is supported by variations in field pattern, including irregular 16th and 17th century enclosure such as near the Charwelton Hills, east of Banbury and either side of the A14 around Cold Ashby and Holdenby, as well as the more dominant pattern of regular Parliamentary enclosure.		restoration in recent years, particularly through agri-environment schemes, but there remains scope for far more. The setting of some historic houses and parks is increasingly affected by wind energy developments. The site of the battle of Edgcote (1469) has recently been added to the register of battlefield sites and is now at risk from the proposed route for HS2. Many of the prominent stone churches are in need or structural repair and some are recorded as being at risk, including Daventry, Naseby and Aston-le-Walls. The high number of Listed Buildings contributes strongly to the sense of place. They require sensitive conservation and maintenance to conserve their historic character. Conservation Areas associated with the Grand Union and Oxford canals are a feature in and around Daventry and Banbury, though part of the Grand Union Canal bank at Weedon Bec is on the Heritage at Risk register. Post-1950 boundary loss is concentrated across the undulating hills south of Daventry and combined with holding re-organisation around new roads, such as the A14, across the area north of Northampton and along the M40 corridor south of Banbury.	Conserve and restore, and where appropriate convert barns and other farm buildings, especially those of cob and thatch, using appropriate local materials. Conserve small-scale vernacular features, which no longer serve their original purpose, along with historic settlement and farmstead forms and field patterns that reflect the past cultural history of the farming industry and its distinctive practices. Encourage use of best practice and traditional techniques and materials in the maintenance and repair of Listed and other historic buildings. Encourage sympathetic conversions of buildings and new developments in the towns of Banbury and Daventry and in nearby villages which respect particular character, vernacular styles and materials. Maintain and restore hedgerows and walls and encourage a reduction in levels of replacement by fencing to maintain the cultural influence of farming patterns in the landscape.	

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Tranquillity	Quiet rural valleys and hills Parkland Historic features Woodland Reservoirs Rivers Long-distance views Dispersed and sparse settlements High levels of tranquillity Quiet rural lanes with wide verges Areas of semi-natural habitats	The 2006 CPRE tranquillity map shows that the most tranquil area is centred round Moreton Pinkney in the east of the NCA, running from Daventry in the west to Northampton in the south-east, Brackley in the east and Banbury in the south-west. Around 50 per cent of the NCA is still classified as 'undisturbed' according to CPRE 2007 data, although this represents a decline from 80 per cent since the 1960s. The main 'undisturbed' areas are found between Daventry and Banbury, away from these two major settlements and away from the main road corridors of the M1, M40 and A14, which have had a significant impact upon tranquillity across wide areas in the past 50 years. Wind farms have been recently built around the NCA and within it, particularly around Yelvertoft and are having a cumulative impact on levels of tranquillity in these areas, introducing large, industrial, moving structures into some of the remaining tranquil rural areas.	Regional	Tranquil landscapes are important in delivering health and wellbeing benefits to people, with close contact with natural features also providing good sensory environments for relaxation, which has a calming and restorative effect on mental wellbeing for both visitors and residents. Despite a dramatic decline in tranquillity and an increase in disturbance overall, much of the NCA still retains a feeling of remoteness and tranquillity. The remaining areas of parkland and their historic country houses, the extensive areas of ridge and furrow and other historic features, the rural areas of pastoral farmland, the canals, rivers and reservoirs, woodland and semi-natural habitats all play an important role in delivering this service to people in the NCA and surrounding area. The sparse settlement pattern, narrow rural country lanes with their wide verges, distinctive, small, attractive villages and far-reaching views are also often associated with feelings of escapism, spiritual refreshment and inspiration. HS2 would further contribute to the erosion of tranquillity which has occurred, with the current proposed route due to cut through some of the most undisturbed and tranquil parts of the NCA.	Protect the panoramic, uninterrupted views from the NCA over surrounding lowland areas and protect the remaining areas with a strong sense of remoteness and tranquillity from tall, vertical or large-scale development and use of night-time lighting. Retain the distinctive, quiet, rural character of the farmland, villages and farms where it still persists, through maintaining the nucleated settlement pattern and rural lanes, restricting development primarily to the main settlements and ensuring it is appropriate in scale and reflects local vernacular styles and materials. Control lighting in new developments and conversions, for example by using down-lighters, timers and sensors, to minimise light pollution. Encourage quiet recreational activities which respect the special qualities of the area. Encourage interpretation of factors contributing to tranquillity to increase people's enjoyment and understanding of the area.	**Tranquillity** **Sense of place/ inspiration** **Recreation** **Sense of history** **Biodiversity**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Recreation	Rights of way Historic houses, estates, designed parkland and estate villages Woodland Canals Reservoirs Country Parks Registered battlefield sites Historic features Distinctive villages Areas of high tranquillity	The rights-of-way network crisscrosses the rolling hill and valley landscapes and extends to 1,335 km (at a density of 1.32 km per km^2), including long distance routes such as the Jurassic Way, Knightley Way, Midshires Way, Brampton Valley Way and Macmillan Way, many of which offer superb panoramic views across the NCA and into surrounding areas. There is very little publically accessible land (only 1.3 per cent in total), of which the largest area (573 ha) is National Trust land, with only 100 ha of CRoW Access land, 88 ha of country park, 73 ha of Forestry Commission 'Walkers Welcome' land and 272 ha of 'Woods for People' land. The many country houses, gardens and parks which are open to the public are popular recreation destinations, especially Coton Manor, Althorp, Canons Ashby, Kelmarsh, Cottesbrooke and Upton House. Pitsford Reservoir provides not only a valuable recreational resource for fishing, boating, sailing, birdwatching and picnics, but also an important wildlife habitat, in particular for birdlife and especially wildfowl. Ravensthorpe Reservoir is a valuable habitat for many wintering birds and summer breeding birds, while several other reservoirs also offer recreational opportunities within the area. The two navigable canals (Grand Union and Oxford) provide further recreational assets, while the distinctive wooded landscape around Badby is a popular area for walking. The Brampton Valley Way provides accessible walking, cycling and horse riding along a disused railway.	Regional	With ongoing development pressure in the area, there is likely to be demand to further increase recreation use of the area. There is scope to accommodate this, though careful planning would be needed to avoid conflicts between users or adverse effects on the remaining areas of high tranquillity, areas of biodiversity value, archaeological or historic importance, or on soil or water quality. There are opportunities to link with and encourage use of the area by people in the large towns surrounding the NCA, especially through increased green infrastructure links. The Nene Valley Nature Improvement Area seeks to "enhance awareness of, access to and benefits from the Nene Valley for growing local communities in a sustainable and sympathetic way, while ensuring that the designated sites at the core are brought into/remain in favourable condition". Management of country parks and major visitor venues should seek to minimise or mitigate any effects of increased recreation on tranquillity, biodiversity or historic features. There are also opportunities to increase people's understanding and enjoyment of the special qualities of the area, particularly its strong historic heritage. There is scope to encourage the restoration of existing and future gravel extraction sites as wetland sites which include provision of access and recreation facilities.	Conserve, restore and enhance the historic parkland and designed landscapes and country houses and, where appropriate, increase and enhance public access to and understanding of these sites. Maintain and expand public access in the area, including the many long distance routes and encourage provision of new areas of open access, seeking opportunities to improve and expand the rights-of-way network and creating additional multi-user paths. Seek ways to manage access, recreation, visitor pressure and demand at key sites to prevent or mitigate conflict between different users or adverse effects on the natural environment. Encourage development of green infrastructure that links with surrounding rural areas and recreation provision, especially in new developments. Enhance the quality of the watercourses so they provide habitats and features and opportunities for fishing and wildlife watching. Encourage multifunctional restoration of gravel extraction sites along the Nene Valley, to deliver a wide range of services including biodiversity and recreation. In the part of the NCA which lies in the Cotswolds AONB, support forms of quiet open-air recreation that do not conflict with the purpose of designation and which benefit from and value the high quality of the landscape and natural environment. Develop interpretation of the features and assets of the area, particularly its important historic and designed landscapes, geology, habitats, archaeological and cultural heritage, and distinctive vernacular architecture.	**Recreation** **Sense of place/ inspiration** **Sense of history** **Tranquillity** **Biodiversity** **Regulating water quality** **Regulating soil quality**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Biodiversity *Continued on next page*	SSSI Local sites Parkland Woodland Semi-natural grasslands Reservoirs Arable plants Farmland birds	Only around 1 per cent (1,365 ha) of the NCA area is covered by priority habitats, primarily wet woodland, flood plain grazing marsh, lowland meadow and lowland calcareous grassland, with small areas of lowland dry acid grassland, purple moor-grass, reedbed and lowland heathland. There are no internationally designated sites. There are 14 SSSI, totalling less than 1 per cent of the NCA area. There are 314 local sites scattered across the area covering nearly 3,000 ha; around 3 per cent of the NCA. In the south-west (between Banbury and Priors Marston), an area dominated by arable and improved pasture (that extends further west outside of the NCA) supports nationally important concentrations of farmland birds, important areas of lowland meadow and calcareous grassland and is a nationally important area for rare arable plants.[21] Around Upper and Lower Boddington there is a nationally important area for arable farmland birds.[22] The few areas of ancient woodland and the parkland are particularly important, forming the most extensive stands of semi-natural habitats and providing important	Regional	The scattered, highly fragmented, small SSSI include meadows and pasture, marsh, parkland, the Upper Cherwell river, woodland and Pitsford Reservoir and the majority, 78 per cent, in favourable condition, with 19 per cent in unfavourable recovering condition and only 2 per cent in unfavourable condition. Remaining semi-natural habitats are also mostly small, fragmented sites. The majority are scattered small broadleaved woods, some ancient such as Badby, with some small areas of lowland meadow, lowland calcareous and dry acid grasslands, purple moor-grass and rush pasture, reedbeds, and lowland heath scattered throughout the NCA, with strips of flood plain grazing marsh around Banbury. There are many pressures on the remaining biodiversity of the area. Pressure for development around Daventry and Banbury and for new or improved transport infrastructure is significant, including plans for HS2, which will cross the southern half of the NCA. There are opportunities to ensure future development takes into account the needs of biodiversity in green infrastructure planning. In recent years, diffuse and point pollution of watercourses by pesticides, herbicides and nutrients, as well as soil erosion have become significant issues in the area. The entire NCA is a nitrate vulnerable zone and Catchment Sensitive Farming schemes have been developed to address these issues. Climate change may well cause fluctuation in water levels, temperatures, periods of drought and changes in current plant and animal communities.	Conserve and enhance the historic parkland and designed landscapes, ensuring succession planning for ancient and veteran trees and the species they support including lichens, invertebrates and bats. Manage arable land to increase biodiversity, including the nationally important arable plants and farmland bird species. Restore, expand and encourage management of broadleaved woodlands and wood pasture away from areas of biodiversity importance and historic features, using a range of species to reduce threats from novel diseases. Restore, recreate or maintain hedgerows using the local Midland hedging style, especially where condition has declined or where they have been replaced by fencing. Maintain and enhance the quality of the watercourses, canals and reservoirs, including through control of invasive species and ensure that water abstraction and poor water quality do not affect wetland habitats, so they continue to provide quality habitats and opportunities for fishing and wildlife watching. Restore, manage extend and enhance grassland and wetland habitats alongside the Upper River Nene, encouraging delivery of the NIA objectives, using the Nene Valley Habitat Opportunity Mapping. Encourage the agricultural practice of hay-making to maintain and restore species-rich meadows.	**Biodiversity** **Sense of place/ inspiration** **Recreation** **Tranquillity** **Climate regulation** **Regulating water quality** **Regulating water flow** **Regulating soil erosion**

[21] HLS Target Area Statement WM15: South East Warwickshire Target Area, Natural England (2008)
[22] HLS Target Area Statement EM01: Daventry and Banbury Target Area, Natural England (2008)

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Biodiversity *Continued from previous page*		habitat for both woodland plants, lichens invertebrates, butterflies and mammals, including bats, for example Stanford Park, which supports the richest assemblage of lichens in Leicestershire. There are concentrations of acid grassland west of Northampton and south of Daventry, and of lowland meadow sites in south Northamptonshire, often associated with other semi-natural features. The remaining areas of lowland meadow and calcareous grassland are tiny, fragmented, isolated and widely scattered throughout the NCA, with poor connectivity, apart from through the network of hedgerows. They support a wide range of wildflowers, grasses and sedges and notable species including broadleaved helleborine, meadow saxifrage and adder's tongue fern. The many reservoirs form an important resource for wintering birds, especially wildfowl. Pitsford Reservoir supports wintering birds such as shoveller and breeding birds such as great crested and little grebes, teal, kingfisher and reed warbler. The Brampton Valley Way and Grand Union and Oxford canals provide important wildlife corridors.		There have been some improvements in habitat condition in some areas in recent years. Uptake of agri-environment schemes has been above the national average, primarily for lowland pasture on neutral/acid soils and regeneration of grassland/ semi-natural vegetation. There has been significant restoration of historic parkland, where agri-environment scheme support for tree planting and arable reversion to permanent pasture have reversed declining condition, including biodiversity locally. There remain significant opportunities for more parkland restoration. Succession planning for the many veteran and ancient trees is also required to ensure future habitat continuity for the important lichen and deadwood invertebrates the parkland supports. There has been significant uptake of the Woodland Grant Scheme for both new planting and woodland management. This, combined with the significant amount of hedgerow restoration and new hedgerow tree planting, is having a positive effect on biodiversity and landscape condition. There remains significant scope to increase woodland cover in appropriate places. The hedgerows and wide road verges connect the widely scattered areas of remaining biodiversity interest and require conservation, restoration and enhancement and succession planning with planting for hedgerow trees. The Nene Valley Nature Improvement Area seeks to restore, recreate and reconnect biodiversity networks and improve delivery of ecosystems services along the Nene Valley and has undertaken habitat opportunity mapping of the NIA area.	Conserve, enhance, restore and appropriately manage species-rich verges to ensure these local features are retained in the landscape and encourage volunteer surveys to establish whether management remains appropriate. Manage grazing of grassland habitats and neighbouring areas at levels that will encourage restoration of good ecological condition, to increase connectivity of the grassland network. Restore, conserve, expand and enhance areas of acid grassland on suitable geology to west of Northampton and south of Daventry to increase connectivity of remaining concentrations of acid grassland. Manage, conserve, expand and enhance purple moor-grass pastures, reedbeds and lowland heath and, where conditions are appropriate, increase the extent and connectivity of these fragmented habitats. Encourage sustainable farming practices such as the use of winter stubbles and wide field margins and where possible seek a reduction in the use of pesticides, herbicides and nutrients to enhance biodiversity and improve water and soil quality. Seek ways to manage recreation and visitor pressure to avoid or mitigate any damage to biodiversity through trampling or disturbance while offering people opportunities to engage with the natural environment and learn more about it through interpretation.	

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Geodiversity	Jurassic limestone and Lias geology Glacial till Sands and gravels Soils Landform/ elevation above surrounding areas Ironstone buildings	There are three important geological SSSI and 24 Local Geological Sites in the NCA, two demonstrating underfit streams on the Rivers Cherwell and Itchen and one quarry site at Napton Hill, which exposes important Middle Lias fossil suites. The area is mainly underlain by the sedimentary strata of the Lower and Middle Jurassic periods. Muds and limestones of the Lias Group are found in the west and limestones and sandstones of the Northampton Sands at the base of the Inferior Oolite Group overlay the Lias Group in the east of the area. These are very rich in iron, resulting in the formation of rocks of distinctive colours. In the far east of the NCA, the clays and sandy limestones of the Great Oolite Group outcrop, continuing outside the NCA in a broad swathe through the central part of Northamptonshire. Overlying the solid geology in the east and north of the area are thick superficial deposits of Quaternary till (boulder clay), with stretches of alluvium (sands and gravels) in the main river valleys, both dating from the Wolstonian glacial cycle. While the area was not glaciated during the Pleistocene, it was affected by extreme periglacial erosion, which has influenced the drainage of rivers including the Cherwell. The soils of the area are variable and relate to their underlying geology and superficial deposits, mostly types of loamy and clayey soils, often seasonally wet or with impeded drainage.	Regional	It is important to protect the features of geological interest, ensuring that appropriate exposures and important features of the underfit streams remain accessible for study. The underlying geology and soils give the area many of its characteristic landscape features, including the ridges and undulating hills and valleys, drainage patterns, land use and settlement patterns, contributing strongly to the sense of place and to the wide, far-reaching views across surrounding lowland vales. This contribution of geology to sense of place is further reinforced by the ability to read the geology in the characteristic use of locally quarried ironstone and limestone in the farmsteads, churches, settlements and drystone walls of the area. The sand and gravel deposits found in the Nene Valley are exploited commercially. The geological resource also provides a record of past environmental change, helping us to understand and plan for future environmental change and the impacts it may have on landscapes and biodiversity. There are opportunities to raise awareness of the importance of geology and geomorphology to the landscape, history and biodiversity of the area, through increased interpretation.	Conserve, manage and enhance geological SSSI, Local Geological Sites and other non-designated local geological features. Retain and encourage restoration, using appropriate local materials, of historic houses and settlements, barns and other farm buildings and ironstone and limestone drystone field walls that reflect the geology of the area and its cultural history. Encourage sympathetic conversions of buildings and new development in Daventry and Banbury and surrounding villages that respects the particular character, vernacular styles and materials of each, to ensure local geology remains visible in settlements. Encourage greater understanding of the importance of the area's geology through improved access to exposures and quarries, where appropriate ensuring appropriate sections of SSSI rock exposures remain free of vegetation and debris. Encourage community involvement in conserving geodiversity and developing interpretation of the impact geodiversity has on the landscape, food provision, soils, water flow and biodiversity to increase knowledge and understanding. Encourage research to understand past environmental change and support future climate change adaptation and mitigation. Ensure the commercially useful reserves of sands and gravels are exploited in a way that maximises their potential and that extraction sites are restored in ways that maximise the services such sites can deliver for biodiversity, regulation of water flow and recreation.	**Geodiversity** **Sense of place/ inspiration** **Sense of history** **Biodiversity** **Food provision** **Recreation** **Regulating water flow** **Regulating water quality** **Regulating soil quality** **Regulating soil erosion**

Photo credits

Cover photo: The Northamptonshire Uplands near Newnham: typical features including rounded hills, mixed farming, high hedges, a nucleated village with its stone church and prominent steeple and ridge and furrow on permanent pasture. © Susannah England/Natural England

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