National Character Area profile:

Area 91: Yardley Whittlewood Ridge

Supporting documents

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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.

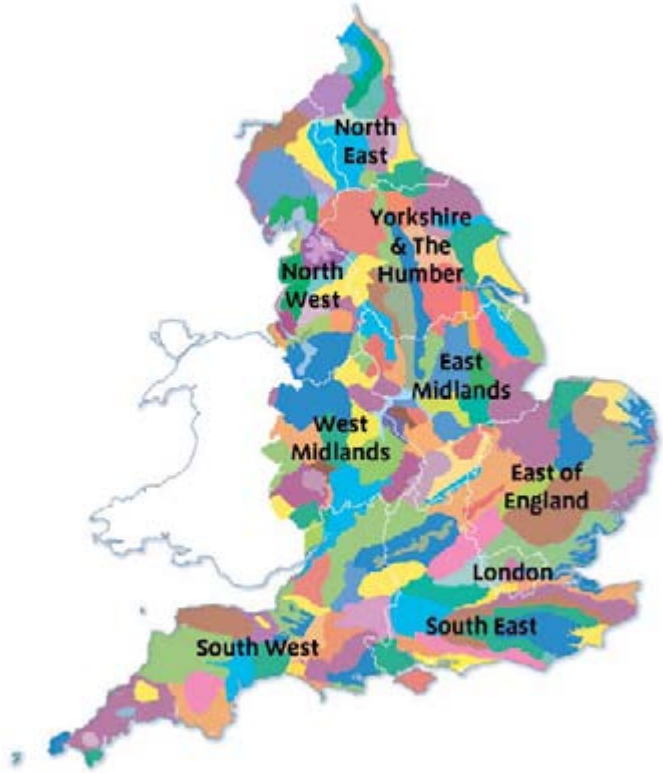
NCA profiles are guidance documents which can help communities to inform their decision-making about the places that they live in and care for. The information they contain will support the planning of conservation initiatives at a landscape scale, inform the delivery of Nature Improvement Areas and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



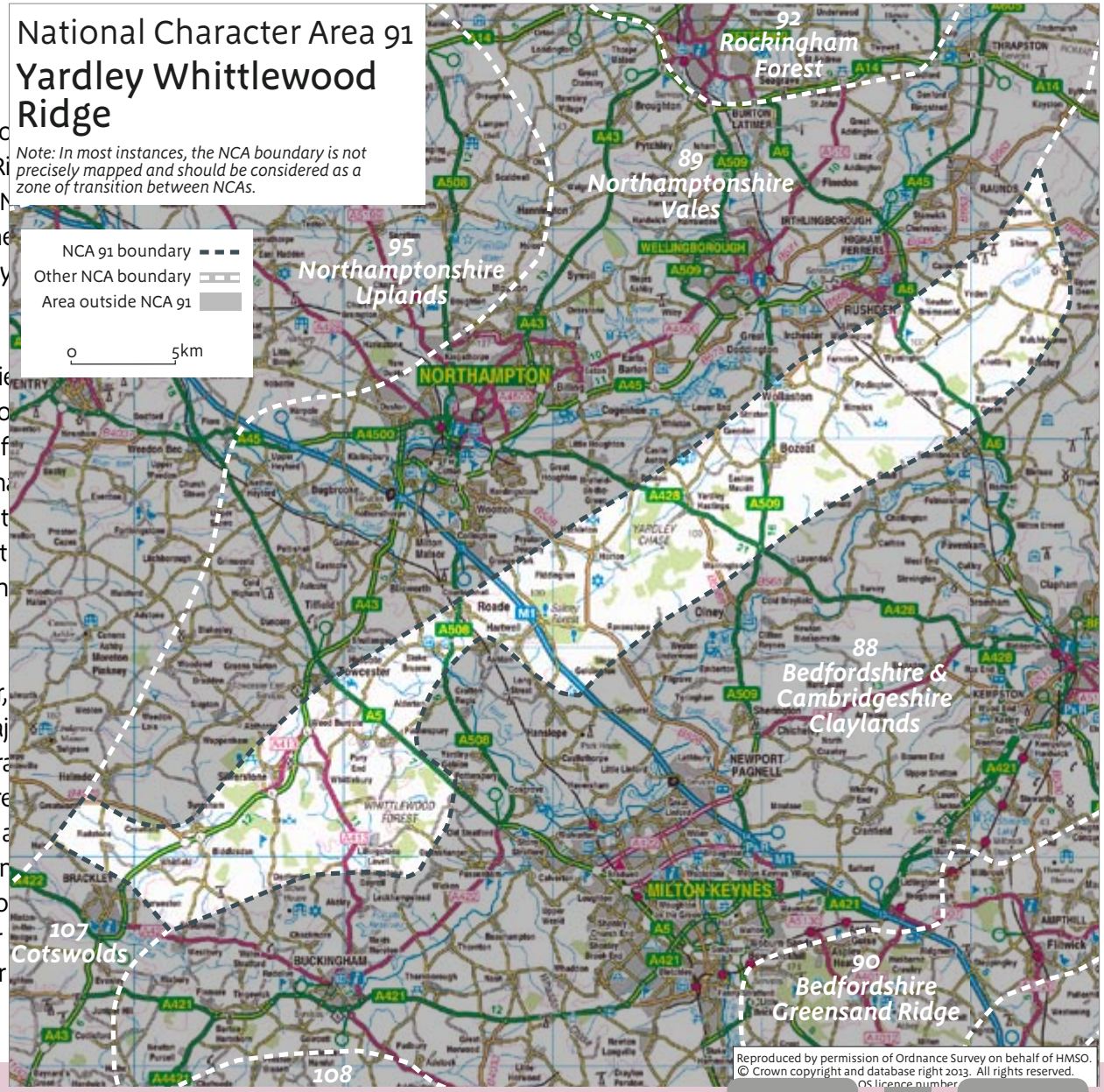
[1] The Natural Choice: Securing the Value of Nature, Defra (2011; URL: www.official-documents.gov.uk/document/cm80/8082/8082.pdf)
[2] Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services, Defra (2011; URL: www.defra.gov.uk/publications/files/pb13583-biodiversity-strategy-2020-111111.pdf)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

Summary

The Yardley Whittlewood Ridge National Character Area (NCA) is a lo
undulating limestone plateau commonly referred to locally as the Ri
a south-west to north-east direction between the nearby towns of N
and Milton Keynes. The Ridge is more distinct in the south-west whe
the adjacent low-lying claylands. From the top, the land slopes away
directions, giving long views over the surrounding countryside.

The Ridge contains a variety of semi-natural habitats, including ancie
wood pasture and parkland, hedgerows, lowland meadow and floo
marsh. It is a well-wooded landscape with a historic feel stemming f
former Royal Hunting Forests of the 13th century around Yardley Cha
Whittlewood forests. The Ridge retains a high proportion of ancient
national importance designated as Sites of Special Scientific Interest
a wide range of species, particularly scarce species of butterfly such
admiral and wood white.

Despite being close to Northampton, Milton Keynes and Towcester,
retains a rural character due to its sparse population and lack of maj
suburban feel is brought to some parts of the NCA by transport infra
as the M1, communication masts on higher ground and formal recre
such as Silverstone Circuit and Santa Pod Raceway which have had a
on tranquillity. However, the large number of historic houses, design
landscapes and use of local limestone in village buildings give a stro
both place and history. The area offers numerous opportunities for
quiet recreation, with the parkland and woodland sites in particular
destinations for local communities and visitors from further afield.



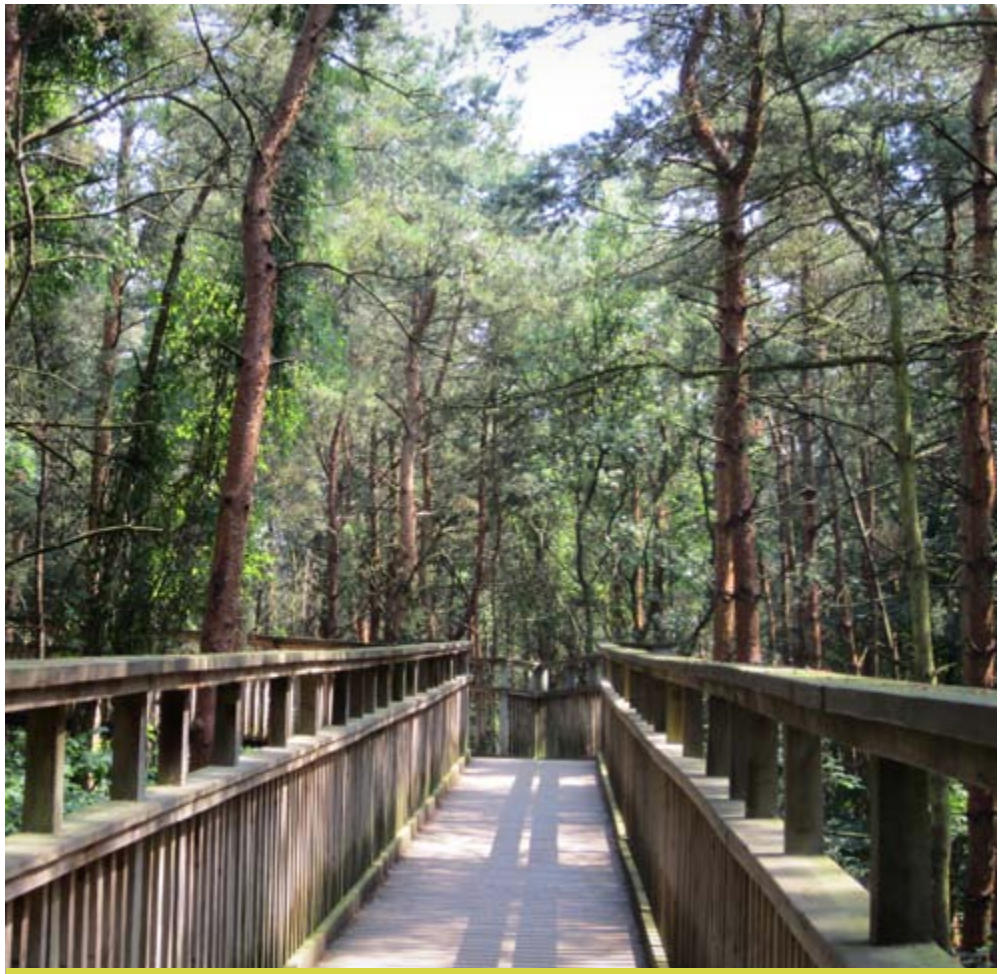
Statements of Environmental Opportunity

SEO 1: Manage, enhance and extend the woodland resource around Salcey, Yardley Chase and Whittlewood, to support a strong sense of place and history, reduce soil erosion and flood risk, improve water quality, benefit biodiversity, support timber and biomass production and aid in climate regulation.

SEO 2: Protect, manage and promote the historic features and designed landscapes, including the registered parks and gardens, remnant Royal Hunting Forest and Grand Union Canal, to ensure that local distinctiveness is preserved, a sense of place and history is maintained and to provide improved interpretation and educational opportunities to increase people's understanding and enjoyment.

SEO 3: Manage and plan for the recreational use of the area's woodlands, parkland and visitor attractions, and conserve the overall tranquillity of the area, including strategic views from the elevated landform of the Ridge over the surrounding landscape. Enhance access connections for people and wildlife by putting in place multi-functional green infrastructure networks, building on existing resources such as the Grand Union Canal and numerous cycle and walking routes to create strong access and ecological networks.

SEO 4: Manage agricultural practices and strengthen semi-natural habitats, particularly those near the Oolite aquifer and along watercourses, to protect and improve soil quality, reduce erosion, regulate water flow and improve water quality both in the aquifer and in watercourses and to help climate regulation.



Salcey Forest Treetop walk: a popular visitor attraction in the area.

Description

Physical and functional links to other National Character Areas

The Yardley Whittlewood Ridge National Character Area (NCA) is a broad, low and gently undulating limestone plateau that is elevated above the lower lying Bedfordshire and Cambridgeshire Claylands NCA to the south and east, and the Northamptonshire Vales NCA along its north-westerly extent. It abuts the Northamptonshire Uplands and Cotswolds NCAs in the south-west.

The elevated topography creates a physical boundary between the catchments of the River Nene to the north and the River Great Ouse to the south. Water is shed into the main watercourses of the rivers Til, Tove and Kym before reaching the Nene and Great Ouse where it travels through the Northamptonshire Vales, the Bedfordshire and Cambridgeshire Claylands and The Fens NCAs and out into the Wash estuary. The River Great Ouse rises in this NCA, near Brackley, and the River Kym/Til rises near Wymington (Bedfordshire). An aquifer supplying water for public, agricultural, horticultural and industrial use within this and in adjacent NCAs lies under the limestone in the western part of the NCA. The Grand Union Canal cuts through where the River Tove dissects the ridge, functionally linking it to the Northamptonshire Vales and the Bedfordshire and Cambridgeshire Claylands NCAs.

The gently sloping land offers views of both the NCA itself and adjacent NCAs. Good views of the Ridge and its well-wooded character can be seen from the A509 near Olney and in the Tove river valley. The Ridge lies between the major towns of Northampton and Milton Keynes and is crossed by numerous roads.

A well wooded landscape with good views of the surrounding countryside.

Major transport routes run north–south through this NCA, including the M1 and the A5, and the West Coast and Midlands main line railways. The NCA offers numerous recreational opportunities for nearby urban communities, including two National Cycle Routes and an extensive rights-of-way network.

Key characteristics

- A broad, low and gently undulating limestone plateau, more distinctly elevated in the west, rising above adjacent claylands and more commonly referred to as 'the Ridge' locally.
- Limestone overlain by irregular drifts of boulder clay gives rise to variable soils (free-draining chalky soils to less permeable clay). Deposits of silt, sand and gravel are present in the river valleys.
- Watercourses include short sections of the rivers Til, Tove, Great Ouse and Kym as they flow across and out of the NCA. The Grand Union Canal utilises the valley cut by the River Tove dissecting the ridge at Stoke Bruerne.
- Well wooded with blocks of semi-natural ancient woodland, wood pasture and historic parkland including Royal Hunting Forests around Yardley Chase, Salcey Forest and Whittlewood Forest, although many areas have been supplemented with conifer plantations.
- Fields are medium sized with mature, species-rich hedgerows and numerous hedgerow trees, usually oak or ash. Pasture and mixed farming dominate in the west, giving way to an increasingly arable landscape further east towards the claylands.
- A diverse variety of semi-natural habitats, including ancient and lowland mixed deciduous woodland, wood pasture and parkland, hedgerows, veteran trees, lowland meadow, flood plain grazing marsh, fens and reedbeds which support a range of rare species of butterflies including white admiral and wood white, as well as dormouse, barbastelle and noctule bats, and numerous scarce moths and specialist beetles.
- Rural, tranquil and sparsely populated with a scattering of small nucleated settlements and attractive limestone villages. There are several large well-managed estates with historic country houses and associated parkland and veteran trees providing opportunities for quiet recreation.
- Locally quarried limestone is commonly used as building material in villages, particularly for churches. Thatch, red bricks and pantiles are also used.
- Transport corridors include the M1, A5, West Coast and Midlands main line railways and the Grand Union Canal. Numerous recreational assets include Salcey Forest and its Tree Top Way, Castle Ashby, the Silverstone Circuit, the Santa Pod Raceway (drag racing), Stoke Bruerne Canal Museum and nearby Towcester Racecourse.

Wide species-rich road verges offer opportunities to improve habitat connectivity in the landscape for pollinators.

Yardley Whittlewood Ridge today

The Yardley Whittlewood Ridge is a limestone plateau, which is more noticeable in the south-west as it rises steadily from the adjacent low-lying claylands. From its gently undulating top, the land slopes away in most directions giving long views over the surrounding countryside. This gives a feeling of being elevated, of openness and expansiveness. The views are frequently interrupted by the large blocks of woodland which are a characteristic and distinctive feature of the area.

The underlying geology and subsequent drifts of boulder clay deposited after the last ice age give rise to soils that are variable and shallow and range from a free-draining chalky till to less permeable clay. The east and west sides of the Ridge have particularly heavy clay soils, mostly neutral but occasionally acidic and more calcareous in nature. The soils in the river valley are generally more waterlogged. Agricultural development has historically been constrained so that much of the area remained wooded and most of the non-arable land is of low quality and supports pasture.

The Ridge is a generally well-wooded landscape throughout with a patchwork of deciduous and coniferous woodland, mature species-rich hedgerows, veteran trees, wood pasture and parkland that stem from the former Royal Hunting Forests of the 13th century. The planting of conifers has formed dense plantations in some areas, but a sense of history is maintained by the still extensive ancient semi-natural broadleaved woodland, which has networks of rides and occasional open grasslands ('forest lawns'), containing typical species such as oak, ash and field maple, with birch and aspen present locally.

The area contains many nationally important sites for nature conservation and Sites of Special Scientific Interest (SSSI), for example Odell Great Wood, Yardley

An arable landscape with medium sized fields bounded by mature hedgerows.

Chase and Salcey Forest. These are designated for their rich ancient woodland flora and species of breeding woodland birds, bats, scarce species of butterfly, such as the white admiral, wood white, purple emperor and white-letter hairstreak, moths such as the four-spotted and specialist deadwood beetles. There are also remaining scattered examples of lowland meadow and flood plain grazing marsh, both reduced and fragmented habitats nationally and locally, such as Yelden Meadows and Dungee Corner Meadow. These support rich assemblages of flora, including green-winged orchids, and are supplemented by other areas of

unimproved grassland that occur as discrete agricultural fields, along woodland rides, roadside verges and green lanes that are particularly characteristic of north Bedfordshire. The minor roads are bounded by mature hedgerows and wide verges which are often species rich. The hedges themselves are generally species rich with suckering elms and hedgerow trees of mature oak and ash.

This well-wooded, mature landscape is predominantly used for agriculture with a mix of arable, mixed and pastoral farming in medium-sized fields bounded by mature hedgerows. It supports a wide range of farmland birds. Pasture and livestock (cows and sheep) are visible in the west with cereals such as wheat more prevalent in the east.

Remnant parkland and golf course in Whittlewood Forest.

The Ridge forms a low watershed between the catchments of the River Nene to the north and the River Great Ouse to the south. There is an aquifer supplying water for public, agricultural, horticultural and industrial use under the limestone in the western part of the NCA. The absence of major watercourses along the ridge results in wetland habitats being largely restricted to the river valleys and around the Grand Union Canal. The rivers of the NCA are in their upper reaches, gently meandering and generally of good quality. The upper River Great Ouse and its tributaries the Tove and Til/Kym have a characteristic pool and riffle nature supporting species both of fast flowing water and those of deeper, slower water. Further downstream the River Great Ouse is a typical lowland river, slow flowing and clear. The catchment is known for its flood potential following intense rainfall due to impermeable clay soils.

The Ridge has a high feeling of tranquillity due to its sparse population, a lack of major settlements and the minor roads network which contribute to its rural character. The NCA has a number of Listed Buildings and Scheduled Ancient Monuments that add to its sense of place and history. For example, Yielden (or Yelden) Castle, a motte-and-bailey site, is one of the finest examples in Bedfordshire. The high number of large, well-managed estates with historic country houses and associated parkland landscapes, for example Castle Ashby, Stoke Park and Hinwick House, also give a sense of a well-managed, mature historic landscape. The remaining areas of wood pasture and parkland not only give a sense of place and history, they support specialist species of invertebrates and lower plants that rely on mature and veteran trees. Yardley Chase, for example, has the largest number of veteran oak trees anywhere in Northamptonshire and some of the veteran oaks in Salcey are believed to be over 500 years old.

The Yardley Whittlewood Ridge NCA is sparsely populated and has relatively few small settlements, mostly along the edges of the Ridge. Towcester, a busy small town, lies on the north-west edge of the area and Brackley, a rapidly expanding town, lies to the west. A strong sense of place is reinforced by the use of locally quarried limestone for local buildings, especially churches. The soft local oolitic limestone, ranging in colour from warm greys to subdued ochres, is frequently used with grey slate or red pantile roofing, resulting in a number of attractive limestone villages with a unified built character. Steep thatched roofs also occur, more frequently towards the east of the NCA, and mixtures of materials are also present including red-brick houses with limestone frontages.

A more suburban feel in parts of the NCA is the result of facilities catering for occasional large numbers of visitors, such as Silverstone and Santa Pod racetracks, as well as other recreational facilities such as golf courses, parks and museums. While the majority of roads are minor, there are major transport routes (both road and rail dissect the area) and communication masts on higher ground, and land use changes around villages to accommodate horse paddocks. All of this has affected the tranquillity of the area.

Quiet recreation is generally associated with historic houses, parkland and woodland sites such as Salcey and Whittlewood forests. There is one National Nature Reserve – Buckingham Thick Copse is privately owned and managed under a nature reserve agreement. Access is by permit only. There is an extensive right-of-way network and two National Cycle Routes (Route 6 connects London to the Lake District and a branch of Route 5 connects Reading to Birmingham via Chester).

The popular Canal Museum at Stoke Bruerne.

The landscape through time

The underlying geology consists of sedimentary rocks from the Jurassic Period, overlain by drifts of sands, gravels and till (boulder clay) varying in thickness deposited during the ice age (Quaternary Period). The Ridge, formed of limestone from the Great Oolite Group, is tilted gently to the south-east. It is more elevated and distinct in the west, reaching 150 metres, than in the east where it dips to 80 metres. It is approximately 10 km wide at its widest point, 2.5 km at its narrowest. The oldest rocks belong to the Lower Jurassic Lias Group and are comprised of marine clays, limestones and sandstones, exposed where rivers and streams have cut through the overlying limestone, for example near Towcester. Overlying this is limestone and clay from the Middle Jurassic that forms the Inferior and Great Oolite. The clays and sandy limestone of the Great Oolite occur as a broad swathe through the central part of Northamptonshire, creating the elevated undulating landscape. In the east, small areas of Cornbrash Formation (a term used to refer to the upper portion of the Great Oolite) occur, overlain by Kellaways and Oxford Clay formations. The extensive areas of drift material soften the landform and influence soil type.

The soils are variable and shallow, ranging from a free-draining chalky till to less permeable clay. Slowly permeable, slightly acid loamy and clayey soils are dominant in the west, dictating the distribution of arable and pasture. The east and west sides of the Ridge have particularly heavy clay soils. On steeper slopes and in wetter areas bordering streams and rivers, remnant woodland, improved and semi-improved pastures and unimproved species-rich grassland are found. On gently undulating and sloping land, cereal cultivation is notable. The nature of the soils has deterred widespread woodland clearance and constrained agricultural development so that much of the area remains wooded. Where the Ridge is dissected by the River Tove, the river has eroded the boulder clay and deposited alluvium (clay, silt and sand). Limestone has been quarried locally and used in buildings, especially churches, and where sand and gravel are found, near Bozeat, they are being extracted.

Typical village buildings constructed out of local limestone.

Evidence of prehistoric settlement exists at Salcey Forest where ringworks, possibly of iron-age origin, can be found and there are a number of moated sites also indicating early settlement. Roman influences are linked to major routes

crossing the Ridge which ran through two Roman settlements to the north of the area. Watling Street (now the A5) ran from London to Towcester and another route passed through Irchester northwards. A Roman villa is thought to exist south-east of Stokegap Lodge near Stoke Bruerne. Early settlement patterns persist through the continued use of these Roman roads and settlement locations.

In the 13th century, the establishment of Royal Forests laid the foundation for the nucleated settlement patterns which survives today. The woodlands of Whittlewood, Salcey and Yardley Chase provided important sources of fuel and building materials as well as hunting grounds for the nobility. Consequently, the area avoided the intensive clearance of woodland seen elsewhere. Small 'forest villages' located on the edge of the forest were established, with residents having limited woodland rights to access the forest for grazing and fuel. Limited fragments of ridge and furrow remain and in many of the woodlands the old woodbanks and ditches are well preserved.

Pasture is still commonplace in the west of the NCA.

Areas of the Royal Forest were subsequently taken into the estates of the Dukes of Grafton around the 16th century and suffered piecemeal clearance, with some areas removed entirely. Numerous historic houses, estates and associated parklands such as Castle Ashby, Stoke Park and Hinwick House were established and remain to date. Woodland clearance accelerated with the Parliamentary Enclosure Acts in the late 18th century and became more rapid in the early 19th century, particularly in the south-east between Brackley and Whittlewood Forest, and north of Whittlewood between the A5 and the M1. Estate farmsteads, either isolated or adjacent to villages, relate to these later periods of enclosure. References to large forests around Melchbourne, Odell and Knotting are historic, as large-scale woodland clearance resulted in isolated woodland blocks, loss of hedgerows and larger arable fields.

The poet and hymn writer William Cowper lived at Olney in the 18th century. He walked the woods and changed the direction of nature poetry by writing about everyday life and the English countryside. Wordsworth particularly admired his poem 'Yardley Oak', a tribute to a veteran landmark tree on Yardley Chase.

The First and Second World Wars saw forestry production change to create a strategic reserve of timber, with many areas of deciduous woodland replanted or supplemented with conifers. Numerous examples exist, but Yardley Chase in particular had large areas of woodland replanted. It also contains numerous

redundant concrete military ammunition bunkers surrounded by water-filled moats and earthbanks that were used to store bombs during the Second World War. The ponds are now important for great crested and palmate newts. The site was connected by a branch of the Northampton–Bedford railway line, evidence of which remains. Parts of the site are still used by Army, Navy and Air cadets, as well as the Territorial Army, for training and it is closed to the public.

A shift from pasture to arable since the Second World War has resulted in the loss or fragmentation of lowland meadows. Similarly, areas of flood plain grazing marsh have been drained for agricultural improvement. Semi-improved grasslands show a long-term decline and while there has been some shift from cereals to livestock, implying a less intensively farmed landscape, a growing dominance of arable production has led to some hedgerows being removed to increase field size for modern agricultural equipment. Dutch elm disease resulted in the widespread loss of hedgerow trees, although many now have suckering elm. Areas of dense conifer plantations are undergoing restoration and many areas, especially those owned and managed by the Forestry Commission, are being managed for multiple social, economic and environmental benefits.

Due to its elevation, the Ridge is a chosen location for telecommunications masts with several visible in the landscape. The area's proximity to Northampton and Milton Keynes has led to development pressure in the villages and nearby towns. There has also been an increase in demand for leisure and recreational opportunities. Recreational use of the area, such as walking, cycling and riding in the woodlands, along the Grand Union Canal and at fixed venues such as at Silverstone Circuit and Santa Pod Raceway, is high, and has led to improvements in the road infrastructure (A43 and M1 upgrades) and visitor facilities and to subtle land use changes adjacent to settlements as pasture is converted to paddocks.

Recreational use of the area is high particularly in forested areas.

Ecosystem services

The Yardley Whittlewood Ridge 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 Yardley Whittlewood Ridge NCA is contained in the 'Analysis' section of this document.

Provisioning services (food, fibre and water supply)

- **Food provision:** The Ridge is predominantly agricultural in character, supporting mixed, pastoral and arable farming. The majority of the agricultural land is classified as Grade 3. Statistics indicate that there has been a decrease in the farmed area, cropping and number of livestock since 2000 and the area under grass shows a long-term decline. The area is locally important for food production and multiple benefits can be gained by maintaining levels of food production, preserving historic character and enhancing biodiversity, but there are pressures on water and soil quality.

- **Timber provision:** Existing woodland cover in the NCA is high; however, the proportion of conifers is low and much of it dates from the First and Second World Wars and is on ancient woodland sites. Conifer removal is likely to produce a one-off timber resource in the short to medium term. As woodland forms a significant component of the landscape in this NCA, the ongoing restoration of replanted ancient woodland sites would be in keeping with its character and help towards a stimulation of local markets in wood products, timber and fuel over the long term.

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

- **Climate regulation:** This NCA has a significant role in regulating atmospheric carbon dioxide through its mosaic of semi-natural habitats, extensive woodland cover and other permanent land cover; these are important for the sequestration and storage of carbon, especially where woodland is under active management. Despite the low carbon content of the main soil types in the NCA, there is potential for increasing carbon sequestration by increasing the organic matter inputs and by reducing the frequency and/or areas of cultivation.

Cultural services (inspiration, education and wellbeing)

- **Sense of history:** The NCA has a strong sense of history and place created by its well-wooded character, high number of large, well-managed estates, historic country houses and associated parkland landscapes, its settlement patterns and the use of local limestone in village buildings, especially churches. This attracts many visitors and provides numerous recreational and educational opportunities.

- **Recreation:** Recreation is a significant service in the NCA. It is generally low key and predominantly associated with the parkland and woodland sites such as Salcey and Whittlewood forests. The area has a good network of rights of way and offers a diverse range of recreational opportunities both formal and informal. This attracts visitors from surrounding urban areas and further afield as well as offering local residents opportunities to enjoy green spaces near where they live. Visits support the local economy, help improve people's understanding and appreciation of the NCA's key attributes and promote their health and wellbeing.

- **Biodiversity:** Although only a small proportion of the NCA is designated as an SSSI for its biodiversity interest, the Ridge contains a diverse range and extensive network of semi-natural habitats of principal importance, including lowland mixed deciduous woodland, wood pasture and parkland, hedgerows, veteran trees, lowland meadow, flood plain grazing marsh, fen and reedbed. These habitats support a range of uncommon and scarce species especially associated with woodland habitats, such as white admiral and wood white butterflies, dormouse, barbastelle and noctule bats, bullfinch, numerous scarce moths and specialist beetles of mature trees.

Mature species-rich hedgerows provide connectivity in the landscape.

Statements of Environmental Opportunity

SEO 1: Manage, enhance and extend the woodland resource around Salcey, Yardley Chase and Whittlewood, to support a strong sense of place and history, reduce soil erosion and flood risk, improve water quality, benefit biodiversity, support timber and biomass production and aid in climate regulation.

For example by:

- Promoting the management of existing woodlands, and new woodland planting where appropriate, to enhance the biodiversity and the recreational value of the woodland as well as helping to improve water quality and reduce soil erosion.
- Linking and expanding existing woodland areas such as Yardley Chase, Salcey and Whittlewood forests to improve habitat connectivity.
- Managing the woodland, parkland and coniferous plantations for their biodiversity and high recreational value as well as for their contribution to landscape character and climate regulation.
- Stimulating local markets for wood products, biomass and wood fuel to support sustainable woodland management and timber production.
- Exploring opportunities to bring unmanaged woodland into management to develop biomass production through active woodland management, for example through coppicing or as a by-product of commercial timber operations.
- Conserving, strengthening and restoring habitat links between woodland, hedgerows and historic parklands to maintain a continuous woodland network.
- Conserving ancient and veteran trees in hedgerows, historic parkland and tree avenues for their biodiversity and heritage value, planning for the provision of replacement veteran trees in the future.
- Conserving, restoring and managing the open areas of the forest (wide forest rides and 'forest lawns') to create a network of open habitat throughout the woodland for the benefit of the wide variety of species that rely on woodland edge and open habitat as well as for people who use the forest for recreation.
- Ensuring that the SSSI woodlands such as Odell Great Wood, Salcey and Whittlewood forests and Yardley Chase are managed to maintain and improve their condition.
- Promoting awareness of the important woodland habitats and species of the area and providing advice to landowners on appropriate management.
- Ensuring that populations of deer are managed to reduce the damage caused to the natural regeneration of the woodland when numbers are too high.
- Seeking opportunities to extend and link areas of woodland, where appropriate, to reduce flood risk, improve water quality and aid aquifer recharge.
- Conserving and managing ancient and veteran trees for the benefit of fauna (such as invertebrates dependent on dead or decaying wood).
- Maintaining, managing and extending the network of wooded habitat for dormice, breeding birds, bats and invertebrates.
- Increasing where possible, the area of woodland cover to help stabilise the soil, enhancing soil quality with organic matter and promoting soil fauna.

SEO 2: Protect, manage and promote the historic features and designed landscapes, including the registered parks and gardens, remnant Royal Hunting Forest and Grand Union Canal, to ensure that local distinctiveness is preserved, a sense of place and history is maintained and to provide improved interpretation and educational opportunities that will increase people's understanding and enjoyment.

For example by:

- Protecting and enhancing key landscape attributes, such as the remnant Royal Hunting Forest, hedgerows and historic parkland that help to define a strong sense of history and place, and are important habitats supporting numerous species including breeding birds, bats and invertebrates.
- Encouraging the restoration and sustainable management of woodland and historic parklands.
- Protecting historic sites and features, such as 'forest lawns', woodbanks and boundaries, and moated sites.
- Promoting the restoration and good management of historic buildings, especially those that are listed and 'at risk'.
- Promoting the use of local building stone and traditional local building materials to conserve the character of villages and historic buildings.
- Maintaining where possible the current nucleated settlement pattern of villages along the forest and ridge edges to give a strong sense of place.
- Restricting inappropriate development to help maintain village character.
- Limiting the visual impact of any new development and ensuring that it is sensitively designed and located.
- Promoting the recreational and educational opportunities offered by the geodiversity, historic features and designed landscapes of the NCA while conserving and enhancing them.
- Offering high-quality interpretation at key historic sites and designed landscapes, and providing improved interpretation and educational opportunities to increase people's understanding and enjoyment.
- Encouraging a greater awareness of the area's heritage by improving access to heritage assets and promoting appreciation of their local distinctiveness.

The Grand Union Canal and Canal Museum at Stoke Bruerne are popular visitor attractions.

SEO 3: Manage and plan for the recreational use of the area's woodlands, parkland and visitor attractions, and conserve the overall tranquillity of the area, including strategic views from the elevated landform of the Ridge over the surrounding landscape. Enhance access connections for people and wildlife by putting in place multi-functional green infrastructure networks, building on existing resources such as the Grand Union Canal and numerous cycle and walking routes to create strong access and ecological networks.

For example by:

- Managing the woodland, parkland and coniferous plantations for their biodiversity and high recreational value as well as their contribution to landscape character.
- Promoting the opportunities offered by historic features, for example the Grand Union Canal and Canal Museum, and the designed landscapes of the NCA, and providing improved interpretation and educational opportunities to increase people's understanding and enjoyment.
- Managing visitor pressure and demand at key woodland sites, for example Salcey Forest, to ensure that demand can be accommodated without conflict between different users, and without causing adverse effects on the natural environment.
- Managing localised compaction and erosion in areas of high recreational pressure, for example within forested areas such as Salcey and Whittlewood and along the green lanes in north Bedfordshire.
- Promoting awareness and understanding of the area's geodiversity and the impact it has on the landscape. Securing opportunities to access geological features and exposures, where appropriate, to increase the understanding and enjoyment of geodiversity.
- Maintaining, extending and promoting the use of the National Cycle Routes and the rights-of-way network.
- Ensuring that any new developments incorporate well-designed green infrastructure, to include improved access and recreation opportunities for local communities and visitors as well as improving health and well-being by accessing local green space.
- Working with local planning authorities to ensure that development is appropriately designed to minimise the impacts of noise and light pollution to protect the tranquillity of the area, for example by removing obtrusive features such as signage, lighting and poles, enhancing the wooded peripheries of settlements, and increasing tree planting around new developments to help filter noise and light pollution and enhance 'undisturbed' views from the surrounding countryside.
- Providing improved interpretation and educational opportunities to increase people's understanding and enjoyment of the area.
- Maintaining and managing strategic and elevated views across the surrounding countryside and lower lying claylands to improve legibility of the Ridge and to provide sense of place and connection with the surrounding natural environment.

SEO 4: Manage agricultural practices and strengthen semi-natural habitats, particularly those near the Oolite aquifer and along watercourses, to protect and improve soil quality, reduce erosion, regulate water flow and improve water quality both in the aquifer and in watercourses and to help climate regulation.

For example by:

- Working with local farmers, landowners and managers to promote best practice through agri-environment schemes to promote biodiversity, address soil erosion and improve soil and water quality to continue the important service of food provision by sustainable means.
- Promoting management techniques and best practice grazing regimes, especially on the steeper slopes of the Ridge, to reduce localised soil compaction and erosion, and improve water infiltration.
- Seeking opportunities to extend and link areas of woodland, hedgerow and grassland to strengthen their resilience to changes in climate, help bind soils together and aid water infiltration, thus reducing flood risk.
- Implementing measures to control invasive non-native species to prevent or reduce damage to native species' populations and habitats, for example to control the spread of Himalayan balsam along the River Kym and to promote biosecurity measures to prevent the spread of species such as Dikerogammarus villosus, an invasive freshwater shrimp.
- Managing hedgerows, field margins, road verges and the green lanes of north Bedfordshire to facilitate carbon storage as well as to provide structural diversity and a variety of flowering plants that support, in particular, farmland birds and pollinators.
- Improving habitat connectivity in the landscape by extending hedgerows, field margins and grassland to create good ecological networks in the landscape, support biodiversity, improve soil and water quality and help climate regulation.
- Encouraging the extension and improved connectivity of riparian habitats, including those in streams, such as flood plain grazing marsh and reedbeds along watercourses, for example the River Tove, to increase resilience to water shortages, filter out pollutants, help regulate water flows, aid aquifer recharge and support biodiversity.
- Creating and extending buffer strips along the rivers Tove, Kym, Til and Great Ouse to help filter sediments and pollution and to provide benefits for biodiversity.
- Encouraging the strengthening of hedgerows, particularly across steeper slopes, and the creation of grassland to help to slow the flow of water from the land and reduce run-off.
- Promoting the sustainable use of local water resources provided by the Oolite aquifer by commercial and domestic users to reduce the pressure on water resources in this NCA.
- Promoting green infrastructure within and around urban areas such as Towcester, Brackley, Bozeat and nearby Olney to help mitigate the impact of flooding.
- Encouraging the use of water efficiency measures and sustainable drainage schemes in planned new developments to help reduce run-off and flooding downstream in the River Great Ouse catchment.
- Supporting the management of water abstraction licences from the Oolite aquifer to ensure that water abstraction and poor water quality do not threaten wetland and riparian habitats.
- Working to reduce surface and groundwater pollution in the Upper Great Ouse catchment by managing farmland under the principles established by Catchment Sensitive Farming Project.

Supporting document 1: Key facts and data

Total area: 33,776 ha

1. Landscape and nature conservation designations

There are no protected landscapes within the Yardley Whittlewood Ridge NCA.

Source: Natural England (2011)

1.1 Designated nature conservation sites

The NCA includes the following statutory nature conservation designations:

Tier	Designation	Name	Area (ha)	% 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)	Buckingham Thick Copse NNR	45	<1
National	Site of Special Scientific Interest (SSSI)	A total of 10 sites wholly or partly within the NCA	1,045	3

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 98 local sites in Yardley and Whittlewood Ridge NCA covering 2,622 ha, which is 8 per cent of the NCA.

Source: Natural England (2011)

- Details of individual Sites of Special Scientific Interest can be searched at: http://www.sssi.naturalengland.org.uk/Special/sssi/search.cfm
- Details of Local Nature Reserves (LNR) can be searched: http://www.lnr.naturalengland.org.uk/Special/lnr/lnr_search.asp
- 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

SSSI condition category	Area (ha)	% of SSSI land in category condition
Unfavourable declining	78	7
Favourable	185	18
Unfavourable no change	9	1
Unfavourable recovering	773	74

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

This NCA reaches elevations of 150 m in the west and dips to 80 m in the east.

Source: Natural England (2010)

2.2 Landform and process

This NCA is physically distinct from the adjacent low-lying vales and forms a noticeable broad plateau. From the gently undulating plateau top the land can be seen to slope gently away in most directions with long views over surrounding vales.

Source: Yardley Whittlewood Ridge Countryside Character Area Description

2.3 Bedrock geology

Underlying the ridge are Jurassic Oolitic Limestones which run in a south-west to north-east alignment, parallel to the more substantial Middle Lias Ironstones of Northamptonshire to the north-west. The underlying geology of this NCA falls into two main types. To the west and east the upland ridge is composed of middle and upper Jurassic rocks capped by boulder clay. The clay was laid down during the Pleistocene as ice from the last glaciations melted and retreated leaving its sediment load behind. The Yardley Whittlewood Ridge is split in two by the River Tove. Here the second type of underlying geology is visible. The exposures consist of upper to middle Jurassic aged deposits which the River Tove has cut through eroding the thick boulder clay and depositing alluvium. The exposures are of a relatively recent age in geological terms.

Source: Yardley Whittlewood Ridge Countryside Character Area Description

2.4 Superficial deposits

Subsequent glacial activity has smoothed over this outcrop and left irregular drifts of boulder clay over the underlying Cornbrash.

Source: Yardley Whittlewood Ridge Countryside Character Area Description

2.5 Designated geological sites

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

There is 1 Local Geological Site within 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

2.6 Soils and Agricultural Land Classification

Soil types mirror the underlying geology. The east and west sides of the ridge have soils that are heavy (neutral or slightly acid) clays, fringed by areas of more calcareous clays. Where the River Tove cuts into the area the valley contains a ribbon of permanently waterlogged (or 'gley') soils of alluvial origin. Soils are patchy and varied, ranging from a free-draining chalky till to less permeable clay. The thin and variable soils in this NCA have historically constrained agricultural development so that much of the area is wooded and has been so since at least the 13th century.

Source: Yardley Whittlewood Ridge Countryside Character Area Description

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

Agricultural Land Classification	Area (ha)	% of NCA
Grade 1	0	0
Grade 2	4,475	13
Grade 3	23,157	69
Grade 4	3,641	11
Grade 5	0	0
Non-agricultural	2,446	7
Urban	56	<1

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 classification 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 (km)
River Til	6
River Tove	5
Grand Union Canal	3
River Great Ouse	3
River Kym	3

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.

The ridge forms a low watershed between the catchments of the Nene to the north and the Great Ouse to the south. The Tove drains the vale in the north, turning at Towcester to cut through the ridge at Grafton Regis and then flows south-east and joins the Great Ouse. There is a noticeable absence of other watercourses on the ridge.

3.2 Water quality

The total area of Nitrate Vulnerable Zone is 33,776 ha; the whole of the NCA.

Source: Natural England (2010)

3.3 Water Framework Directive

Maps are available from the Environment Agency showing current and projected future status of water bodies http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=_e

4. Trees and woodlands

4.1 Total woodland cover

The NCA contains 4,345 ha of woodland (13 per cent of the total area), of which 3,015 ha is ancient woodland.

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

4.2 Distribution and size of woodland and trees in the landscape

The distinctive character of the ridge stems from its history as the site of a series of Royal Forests from the 13th century. The remnants of these woodlands at Salcey Forest (Yardley Chase) and Whittlewood remain important landscape features. These extensive blocks of oak/ash woodland are supplemented by tracts of more recent conifer plantations. There is a concentration of semi-natural ancient woodlands in the Yardley Chase and Whittlewood areas. Striking elm avenues exist in Stowe Park. Other parks and estates include those at Biddlesden, Melchbourne and Whittlebury. Formal landscapes with massive avenues and woodland rides are found at Castle Ashby and Chase Park. Dutch elm disease has had a dramatic effect, resulting in the widespread loss of hedgerow trees.

Source: Yardley-Whittlewood Ridge Natural Area Profile; Yardley Whittlewood Ridge Countryside Character Area Description; Countryside Quality Counts (2003)

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	3,458	10
Coniferous	630	2
Mixed	65	<1
Other	192	1

Source: Forestry Commission (2011)

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

Woodland type	Area (ha)	% of NCA
Ancient semi-natural woodland	1,643	5
Ancient re-planted woodland (PAWS)	1,372	4

Source: Natural England (2004)

5. Boundary features and patterns

5.1 Boundary features

Fields are generally medium-sized, with full hedgerows and hedgerow oaks and ash trees. Hedgerows are generally substantial and species-rich and are often filled out with elm suckers. Hedgerow trees are frequent.

Source: Yardley Whittlewood Ridge Countryside Character Area description; Countryside Quality Counts (2003)

5.2 Field patterns

The structure of this area is largely widespread forest with 'lawns' for pasture and small forest villages. This pattern was dominant until the early 17th century. Agricultural intensification has resulted in an increase in field size.

Source: Yardley Whittlewood Ridge Countryside Character Area description; Countryside Quality Counts (2003)

6. Agriculture

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

6.1 Farm type

In 2009 there were a total of 233 commercial holdings recorded. Of these, 95 were cereal (10 per cent less than in 2000), 50 were grazing livestock (18 per cent less than in 2000) and 13 were mixed (28 per cent less than in 2000) and 55 were other types (31 per cent higher than in 2000).

Source: Agricultural Census, Defra (2010)

6.2 Farm size

In 2009, 34 per cent of all recorded commercial holdings were more than 100 ha in size (80 in total). The land area in these holdings was 84 per cent of all farmed land in this NCA. In 2009, 23 per cent of all recorded commercial holdings were in the size bracket 5 ha to 20 ha, a land area of 595 ha or 2 per cent of the total farmed area. In 2009, 9 per cent of recorded commercial holdings were in the size bracket 50 ha to 100 ha or 15 per cent of the total number of holdings in this NCA.

Source: Agricultural Census, Defra (2010)

6.3 Farm ownership

2009: Total farm area = 27,094 ha; owned land = 18,833 ha
2000: Total farm area = 28,629 ha; owned land = 19,722 ha

Source: Agricultural Census, Defra (2010)

6.4 Land use

Eighty per cent of this NCA is farmed land. Of that, cereals were grown on 41 per cent (11,109 ha), 29 per cent or 7,999 ha were used for grass and uncropped land (which includes grassland and sole-rights rough grazing and uncropped arable land), 19 per cent or 5,188 ha were used for oilseeds. Small areas of land (less than 4 per cent) were used to grow other arable crops (including field beans, peas for harvesting dry, maize and miscanthus) and fruit.

Source: Agricultural Census, Defra (2010)

6.5 Livestock numbers

In 2009 the numbers of livestock were: cattle 8,100 (21 per cent less than in 2000), sheep 32,200 (37 per cent less than in 2000), and pigs 500 (93 per cent less than in 2000).

Source: Agricultural Census, Defra (2010)

6.6 Farm labour

In 2009 there were 313 principal farmers and 40 salaried managers. There were 71 full time workers (55 per cent less than in 2000), and 27 casual or gang workers (61 per cent less than in 2000). The number of part time workers was 54 in 2000 and 58 in 2009.

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

Ancient semi-natural broadleaved woodland is the most extensive habitat in this NCA, and found throughout the area. In some of these woodlands, particularly Whittlewood Forest, there are notable over-mature pedunculate oak standards which are of importance as habitats for ancient woodland invertebrates. The typical canopy forming species are pedunculate oak, ash and field maple with birch and aspen locally.

By far the largest area of semi-natural habitat is represented by woodland in this NCA. Woods such as Salcey Forest are extensive and have a network of rides and occasional open grasslands contained within the woodlands. Wood-pasture is typified by over-mature pollard trees of ash and pedunculate oak and is well represented in this NCA. Ancient trees support a wide range of wildlife which is not found elsewhere. Unimproved grassland occurs as discrete agricultural fields, along woodland rides, roadside verges, and green lanes and as part of the complex habitat mosaic found at Yardley Chase. Unimproved grassland in river valleys has developed flood meadow vegetation.

Source: Yardley-Whittlewood Ridge Natural Area Profile

7.2 Priority habitats

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

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 mixed and yew woodland (broad habitat)	2,514	7
Coastal and flood plain grazing marsh	199	1
Fen	21	1
Lowland calcareous grassland	14	<1
Lowland meadow	11	<1
Purple moor grass and rush pasture	3	<1
Reedbed	3	<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/ – select 'Habitat Inventories'
- Maps showing locations of S41 species are available at: http://data.nbn.org.uk/

8. Settlement and development patterns

8.1 Settlement pattern

Settlements are small and relatively few, and tend to occur along the edges of the ridge. Some of the villages on the ridge were forest villages, nucleated villages with open fields (until the main periods of enclosure in the 18th and 19th centuries) whose residents held rights over the forest lands. Ashton, Hartwell, Hackleton, Piddington, Quinton and Hanslope were all villages of the Forest of Salcey. Rural depopulation in the early 19th century left some villages less compact, for example Knotting.

Source: Yardley Whittlewod Ridge Countryside Character Area description; Countryside Quality Counts (2003)

8.2 Main settlements

There are no large settlements in this NCA. The largest village is Bozeat. The total estimated population for this NCA (derived from ONS 2001 census data) is: 29,703.

Source: Yardley Whittlewood Ridge Countryside Character Area description; Countryside Quality Counts (2003)

8.3 Local vernacular and building materials

Building materials are varied with red brick and the soft local Oolitic limestone both frequently used with either grey slate or red pantile roofing. Steep thatched roofs also occur, more frequently towards the east.

Source: Yardley Whittlewood Ridge Countryside Character Area description; Countryside Quality Counts (2003)

9. Key historic sites and features

9.1 Origin of historic features

Roman influence was limited to major routes crossing the ridge which ran through two Roman settlements to the north of the NCA. During Anglo-Saxon times, clearance of the woodland and the establishment of settlements continued. The extensive woodlands along the ridge were appropriated as Royal Forests from the 13th century. The woods of Whittlewood and Salcey were passed to the Dukes of Grafton. The structure of widespread forests with lawns for pasture and small forest villages continued until the early 17th century. Clearance of woodland speeded up with the Parliamentary enclosures in the late 18th century

and became more rapid in the early 19th century. References to extensive ancient forests around Melchbourne and Odell Great Wood and Knotting West Wood are historical as these areas are now large arable fields with few trees.

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

9.2 Designated historic assets

This NCA has the following historic designations:

- 8 Registered Parks and Gardens covering 991 ha
- No Registered Battlefields
- 11 Scheduled Monuments
- 464 Listed Buildings

Source: Natural England (2010)

More information is available at the following address:

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

10. Recreation and access

10.1 Public access

- Four per cent of the NCA, 1,268 ha, is classified as being publically accessible.
- There are 585 km of public rights of way at a density of 1.7km per km2.
- There are no National Trails within the Yardley Whitlewood Ridge.

Sources: Natural England (2010)

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

Access designation	Area (ha)	% of NCA
National Trust (Accessible all year)	0	0
Common Land	0	0
Country Parks	0	0
CROW Access Land (Section 4 and 16)	1,185	3
CROW Section 15	0	0
Village Greens	2	<1
Doorstep Greens	0	0
Forestry Commission Walkers Welcome Grants	0	0
Local Nature Reserves (LNR)	0	0
Millennium Greens	0	0
Accessible National Nature Reserves (NNR)	0	0
Agri-environment Scheme Access	14	<1
Woods for People	1,250	4

Sources: Natural England (2011)

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

11. Experiential qualities

11.1 Tranquillity

Based on the CPRE map of tranquillity (2006) the most disturbed area with the highest value is on the edge of Rushden, the least disturbed area is within Yardley Chase.

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

Tranquillity	Tranquillity Score
Highest value within NCA	39
Lowest value within NCA	-63
Mean value within NCA	4

Sources: CPRE (2006)

More information is available at the following address:
http://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 urban category was absent until 2007, but appeared around Towcester and Rushden and to a lesser extent Wollaston. The area categorised as disturbed increased by 155 per cent. A breakdown of intrusion values for this NCA is detailed in the table below.

Intrusion category	1960s (%)	1990s (%)	2007 (%)	Percentage change (1960s-2007)
Disturbed	20	43	51	31
Undisturbed	80	57	48	-32
Urban	n/a	n/a	1	1

Sources: CPRE (2007)

Notable trends from the 1960s to 2007 are that the elevated and wide plateau top makes it suitable for airfields, two of which are now used for race tracks – Silverstone which is a Grand Prix circuit and attracts large volumes of visitors to key events, and Santa Pod.

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

12 Data sources

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

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

Supporting document 2: Landscape change

Recent changes and trends

Trees and woodlands

- Trees and woodland are significant features of the landscape with 11 per cent of the area wooded. The majority of this (78 per cent) is semi-natural ancient woodland with particular concentrations in the Salcey Forest, Yardley Chase and Whittlewood areas. Significant areas replanted with conifers around time of the First and Second World Wars have been undergoing removal by the Forestry Commission. Restoration by natural regeneration and new planting is taking place.

- Between 1999 and 2003, the area of woodland covered by a Woodland Grant Scheme rose from 8 per cent to 14 per cent.

Boundary features

- The growing dominance of arable production and a requirement for larger fields to accommodate modern agricultural equipment has led to an increase in field sizes and the removal of some hedgerows. Inappropriate management of hedgerows such as infrequent cutting or over trimming is more of an issue than total neglect. The majority of the hedgerows in the NCA are mature, species-rich and intact.

- The estimated boundary length for the NCA in 2003 was around 2, 257 km of which only a small proportion, 54 km (around 2 per cent) was under Countryside Stewardship agreements including 9 km of hedgerow management and 20 km of hedge planting and restoration. Data from 2011 suggests that this only increased slightly to 61 km.

Suckering elm regenerating post-Dutch elm disease.

- Dutch elm disease had a dramatic effect on hedgerow trees, resulting in the widespread loss of many, however many hedgerows remain species-rich, are mature and contain suckering elm.

Agriculture

- Agricultural intensification, in particular a shift from pastoral and mixed farming to more arable farming has resulted in an increase in field size, loss of some hedgerows, the fragmentation and loss of semi-natural habitats, particularly grasslands and damage to underground historic features.

- A subtle change in land use near settlements has taken place to accommodate small paddocks and the keeping of horses for recreation which has impacted on sense of place in some areas.

- The area under grass generally shows a long-term decline, but there has been some shift from cereals to lowland cattle and sheep, implying a less intensively farmed landscape. The uptake of Countryside Stewardship for pasture management is limited. In 2003, 404 ha of lowland pasture on neutral/acid soils were in an agreement and 141 ha under regeneration of grassland/semi-natural vegetation.

Settlement and development

- The rate of development in the area is moderate. There are however pressures to increase the size of existing settlements to accommodate additional residential development, particularly in towns on the edge of the NCA such as Towcester, Bozeat and Olney. There is also increasing demand for improving the leisure and recreational facilities of the area both formal and informal opportunities, for example around Silverstone associated with the recent upgrading of the A43.

Semi-natural habitat

- Only around 3 per cent of the NCA is designated for its biodiversity interest as Sites of Special Scientific Interest, of which the majority is ancient semi-natural woodland and the area has largely remained the same. A few remnants of lowland meadow and flood plain grazing marsh are also designated.

- Other semi-natural habitats, such as wood pasture and parkland, semi-improved grassland and wetland habitats concentrated within the small number of river valleys, have suffered losses and increased fragmentation due to changes in land use, agricultural intensification and lack of management.

- Countryside Stewardship uptake for the area follows the national average. The largest annual Countryside Stewardship agreements in 2003 were for lowland pastures on neutral/acid soils (404 ha) and regeneration of grassland/semi-natural vegetation (141 ha).

Historic features

- The area is especially important for its historic parkland, much of which is on the Registered Parks and Gardens list although the resource is smaller in extent than it was in 1918. By 1995 it is estimated that 30 per cent had been lost with about 991 ha remaining. About 12 per cent of the remaining parkland is covered by a Historic Parkland Grant, and about 21 per cent is included within an agri-environmental scheme.

- The large areas of wood pasture and parkland that may once have existed in the grounds of large estates and historic houses such as Castle Ashby have gradually been lost to other land uses or have lost their traditional features through neglect. Locally it is estimated that approximately 97.8 ha of wood pasture and parkland is within Local Wildlife Sites with possibly over 1,000 ha on 30 plus sites, in various states of dereliction outside of this.

- Approximately 74 per cent of historic farm buildings remain unconverted with a high proportion (93 per cent) of these remaining structurally intact.

Rivers

- In 1995 the biological water quality of the river reaches in the NCA was most frequently classified as excellent (63 per cent). Between 1995 and 2000 about 6 per cent had improved quality and 18 per cent showed a loss. The chemical water quality of the rivers was most frequently classified as excellent (60 per cent). Between 1995 and 2000 about 5 per cent had improved quality and none showed a loss of quality.

- In 2009 the Environment Agency assessed the ecological status of the River Tove, the Grand Union Canal and the River Kym/Til as 'moderate'. Near the source of the River Great Ouse the ecological potential is 'good' but this reduces to 'moderate' further downstream. The groundwater status in parts of the NCA is 'good', but there are some areas considered to be 'poor'.[4]

- The whole of the NCA is classified as a Nitrate Vulnerable Zone with measures in place to reduce inputs of phosphates and nitrates to the watercourses and improve water quality. Water availability, both surface and ground water within the NCA, is considered to be restricted with measures in place to monitor abstraction rates.

Minerals

- Historically the area has been the subject of only local and small-scale mineral extraction in places where the underlying limestone comes close to the surface and was used locally as a building stone.

- There are deposits of sand and gravel in the river valleys. An active sand and gravel quarry exists on sloping land to the west of the A509, near Bozeat. Land has also been allocated for an extension of this site to meet objectives in the currently adopted Minerals and Waste Development Framework 2006–2026.[5]

Drivers of change

Climate change

- An increase in extreme weather events, hotter, drier summers and heavier winter rainfall could result in an increase in the incidence of grass and woodland fires during dry summers that may also lead to increased soil erosion that reduces soil quality and affects water quality.

- Periods of drought may alter the species composition of semi-natural habitats particularly grassland and woodland so that the species more tolerant of drought conditions out compete those that are not. Wind blow and drought may lead to the loss of veteran trees in parkland landscapes. There may even be a decline in the amount of woodland cover and changes in species abundance especially specialist species of veteran tree habitats.

- Climate change may make some tree species more vulnerable to pests and disease, or vulnerable to competition from invasive species. Warmer winters may allow pathogens and their vectors to increase their range resulting in new pests and diseases becoming a potential threat.

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[4]River Basin Management Plan, Anglian River Basin District, Main document, Environment Agency (December 2009; URL: www.environment-agency.gov.uk/research/planning/124725.aspx)

[5]Northamptonshire Minerals & Waste Development Framework Partial Review: Local Aggregates Assessment (June 2012; URL: www.northamptonshire.gov.uk/en/councilservices/Environ/planning/policy/minerals/Documents/PDF per cent20Documents/Local per cent20Aggregates per cent20Assessment per cent20Final.pdf)

- Agricultural practices may change as farmers adapt to changes in weather patterns or water availability. Greater demands on agriculture to produce higher yields could put pressure on the remaining areas of semi-natural grassland and other semi-natural habitats.

- Changing weather conditions could lead to a longer growing season and the ability to grow different types of crops, however this may lead to winter cropping and a loss in winter stubble with a consequent loss of food sources for farmland birds. There may be an increased demand for energy crops that changes cropping patterns. It may also lead to deterioration in water quality, through the run-off of soil nutrients and increased use of herbicides and pesticides.

- It is likely that there will be an increase in demand for outdoor recreation during the summer adding further pressure on managing areas such as Salcey and Whittlewood forests. Additional path and visitor facility maintenance may be required and storm damage may hinder access or detract from the user experience. Where habitats are fragmented they are likely to be more vulnerable to damage and sensitive species to disturbance.

Other key drivers

- There are moderate residential development pressures around the urban areas and villages in the NCA especially around Towcester, Bozeat and Olney. There is also pressure to expand and improve large recreational facilities such as those at Silverstone Circuit and Santa Pod raceway including improvements to roads, supporting infrastructure and accommodation that impacts on the tranquility of the area. In addition there are proposals to improve the road and rail infrastructure of the area. The need to accommodate further growth and expansion will present a challenge to ensure that the character of the area is not adversely affected.

- Opportunities exist to improve multi-functional green infrastructure links and the design of the urban fringes in ways that respect landscape character, improve access for local communities and visitors and provide social, economic and environmental benefits.

- There is some pressure to extend the sand and gravel quarry at Bozeat with land already allocated for future extraction.

- The wide plateau top and elevation above surrounding land has made the area suitable for telecommunications masts with many visible in the landscape. More recently the area has been the subject to proposals for generating renewable energy with pressure to accommodate wind turbines for example in the River Tove Valley.

- The demand for informal and formal leisure and recreation in the area is high and is likely to increase which presents challenges for the management of the historic, natural and built environment to ensure that the current character and feeling of tranquility of the area is not adversely affected. Opportunities exist to promote the conservation and enhancement of the historic and natural environment and increase people's understanding and enjoyment of key assets.

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.

Locally quarried limestone is often used in village buildings especially churches.

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: Manage, enhance and extend the woodland resource around Salcey, Yardley Chase and Whittlewood, to support a strong sense of place and history, reduce soil erosion and flood risk, improve water quality, benefit biodiversity, support timber and biomass production and aid in climate regulation.	↘ **	↑ ***	↔ **	N/A	↑ **	↑ ***	↗ **	↗ **	↗ **	↗ **	↗ **	↗ **	N/A	↗ ***	↗ **	↗ **	↗ **	↗ ***	↔ *
SEO 2: Protect, manage and promote the historic features and designed landscapes, including the registered parks and gardens, remnant Royal Hunting Forest and Grand Union Canal, to ensure that local distinctiveness is preserved, a sense of place and history is maintained and to provide improved interpretation and educational opportunities to increase people's understanding and enjoyment.	↔ **	↔ **	↔ *	N/A	↔ **	↗ *	↗ *	↗ *	↗ *	↗ *	↔ **	↔ **	N/A	↑ **	↑ **	↗ *	↗ **	↗ **	↗ *
SEO 3: Manage and plan for the recreational use of the area's woodlands, parkland and visitor attractions, and conserve the overall tranquillity of the area, including strategic views from the elevated landform of the Ridge over the surrounding landscape. Enhance access connections for people and wildlife by putting in place multi-functional green infrastructure networks, building on existing resources such as the Grand Union Canal and numerous cycle and walking routes to create strong access and ecological networks.	↔ **	↗ **	↔ *	N/A	↘ *	↗ *	↗ *	↗ *	↗ *	↗ *	↔ *	↔ *	N/A	↗ **	↗ **	↘ **	↑ ***	↘ **	↔ *
SEO 4: Manage agricultural practices and strengthen semi-natural habitats, particularly those near the Oolite aquifer and along watercourses, to protect and improve soil quality, reduce erosion, regulate water flow and improve water quality both in the aquifer and in watercourses and to help climate regulation.	↗ **	↔ *	↔ **	N/A	↗ *	↗ **	↗ **	↗ **	↗ **	↗ **	↗ **	↗ **	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 .

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

Landscape attributes

Landscape attribute	Justification for selection
A long broad and gently undulating limestone plateau elevated over the surrounding low lying countryside.	■ Long views over the adjacent lower lying claylands. The views are often interrupted by the extensive blocks of woodland that are particularly characteristic of the NCA. Open views across the NCA and into adjacent NCAs are part of the character of the area and need to be maintained through management. ■ The underlying limestone geology gives the ridge a feeling of elevation above the adjacent lower-lying claylands of Bedfordshire, Cambridgeshire and Northamptonshire.
Limestone deposited during the Jurassic Period, and the impacts of the last glaciation gives rise to variable soils.	■ The underlying limestone and irregular drifts of boulder clay that overlie it, give the ridge its smooth undulating appearance and physical character. ■ Soils are variable, ranging from free draining chalky soils to less permeable clay that have influenced local land use especially agriculture and woodland coverage. ■ Locally quarried limestone is a commonly used building material reflected in village buildings especially churches adding to a sense of place.
A well wooded character with extensive areas of ancient semi natural woodland, ancient parkland trees as well as blocks of coniferous woodland.	■ The NCA contains a high proportion of woodland of which the majority is ancient woodland and designated as SSSI. The former Royal Hunting Forests dating from 13th century around Yardley Chase, Salcey Forest and Whittlewood Forest give the area a sense of place and history. The woodlands support a wide range of species of birds, mammals and butterflies and moths. ■ The extensive systems of rides through the woodlands comprise a significant area of unimproved grassland important for woodland edge species such as the wood white butterfly. Opportunities to link areas of habitat should be encouraged, particularly centring upon SSSI woodlands. ■ There are considerable numbers of mature trees in avenues, hedgerows and parklands associated with historic houses and estates (for example Hinwick House, Castle Ashby, Stoke Park), many of which are ancient or veteran. Long term management of parkland oaks and other veteran trees should be encouraged. The parkland oaks are a notable feature of the landscape and support an important assemblage of beetles that depend on continuity of old and over mature timber. ■ Following the First and Second World Wars, many areas of deciduous woodland were cleared for or supplemented by more recent conifer plantations. There is potential to restore aspects of the past landscape and work is taking place to restore these areas through conifer removal, natural regeneration and planting.

Landscape attribute	Justification for selection
A mixed agricultural landscape of medium sized arable fields and pasture interspersed with blocks of woodland and bounded by mature hedgerows.	■ Field pattern reflects the landscape history of the area due to the influences of the former Royal Hunting Forests and Parliamentary enclosure acts carried out during the 18th and 19th centuries. Fields are medium sized and often bounded by mature hedgerows with hedgerows trees usually oak or ash and suckering elm. ■ Soil variability and permeability have influenced agricultural land use with pasture dominating in the west of the area, and more mixed farming giving way to an increasingly arable landscape further east towards the Bedfordshire and Cambridgeshire claylands. Poor soils and permeability has meant more woodland being retained than in other NCAs. ■ Small remnants of unimproved grassland remain, and other areas of semi-improved grassland exist along the wide road verges bordering the numerous minor roads and in green lanes. Some are particularly diverse providing valuable habitats and essential connectivity for species within the landscape.
Two rivers rise in the NCA, but due to the geology and soils there are few watercourses resulting in wetland habitats being concentrated in the river valleys.	■ The limestone ridge creates a physical boundary between the catchments of the River Nene to the north and the River Great Ouse to the south. Two rivers rise in the NCA, River Great Ouse and River Kym/Til, but there is an absence of other watercourses along the ridge. This drainage pattern means that there is a concentration of wetland habitats within the river valley many of which are fragmented and under pressure from development, agricultural intensification and land use change. There are opportunities to expand and improve them through appropriate management. ■ An aquifer exists under the Oolitic limestone. Water availability both surface and ground water within the NCA is considered to be restricted with measures in place to monitor abstraction rates. ■ The whole of the NCA is classified as a Nitrate Vulnerable Zone with measures in place to reduce inputs of phosphates and nitrates to the watercourses and improve water quality.

Landscape attribute	Justification for selection
The NCA has a historic feel that stems from the former Royal hunting forests of the 13th century, supplemented by the areas rural settlement pattern, parkland and associated historic houses and managed estates.	■ The former Royal Hunting Forests dating from 13th century around Yardley Chase, Salcey Forest and Whittlewood Forest give the area a good sense of place and history. There are several Scheduled Ancient Monuments, numerous Listed Buildings and a number of large well managed estates with historic country houses and associated parkland landscapes such as Castle Ashby, Stoke Park, Stowe, and Hinwick House. ■ The area is predominantly rural and sparsely populated with a scattering of small nucleated settlements traditionally grouped around the edge of the forest. There are attractive limestone buildings in the villages particular churches built using the locally quarried limestone. ■ The military use of Yardley Chase in the Second World War adds to its historical significance.
Despite its proximity to numerous urbanising influences and recreational pressures, the Yardley Whittlewood Ridge retains a high feeling of tranquillity and a rural character.	■ The Ridge retains a high feeling of tranquillity despite being in commuting distance of Towcester, Northampton and Milton Keynes and having several major transportation links crossing it for example the M1, A5, West Coast and Midlands mainline railways. There are no major settlements within the NCA so it is sparsely populated and most roads are minor giving the area a rural feel. ■ Development pressure is moderate in nearby towns and villages and needs to be managed carefully to retain the character of the area for example using local stone in new buildings. ■ There is a variety of leisure and recreation opportunities in the NCA, both formal and informal and most closely associated with the forest and parklands/historic houses. There are also visitor attractions catering for larger numbers of visitors including Silverstone Circuit, Santa Pod Raceway and Stoke Bruerne Waterways Museum. The demand for recreation and leisure opportunities is high and likely to increase with nearby development.

Landscape opportunities

- Protect the overall tranquility and rural character of the area including strategic views from the elevated landform of the Ridge over the surrounding landscape and enhance the visual prominence and legibility of the Ridge by appropriate woodland planting or management.
- Protect the extensive ancient woodland of Salcey and Whittlewood Forest and Yardley Chase. Conserve, strengthen and restore habitat links between woodland, hedgerows and historic parklands to maintain a continuous woodland network.
- Manage the deciduous woodland, wood pasture and parkland, and coniferous plantations for their biodiversity and high recreational value as well as their contribution to landscape character and climate regulation.
- Conserve ancient and veteran trees in hedgerows, historic parkland and tree avenues for their biodiversity and heritage value, planning for the provision of replacement veteran trees in the future.
- Conserve, restore and manage the open areas of the forest (wide forest rides and 'forest lawns') to create a network of open habitat throughout the woodland benefitting the wide variety of species that rely on woodland edge and open habitat as well as people who use the forest for recreation.
- Manage the river valleys to conserve and enhance their riparian habitats. Secure opportunities to protect and improve the geomorphology of the rivers and increase in stream habitat to support key species. These habitats are limited, but form an important component of the landscape character.
- Manage farming practices to protect and improve soil quality, regulate water flow and improve water quality both in the aquifer and in watercourses.
- Conserve and enhance historic features and designed landscapes, including historic parkland and provide improved interpretation and educational opportunities to increase people's understanding and enjoyment.
- Plan for and manage developmental impacts and where possible obtain improvements to biodiversity, access and green infrastructure so that landscape character is maintained and adverse impacts on tranquillity and quality of landscape are limited.
- Conserve the character and pattern of the distinctive limestone villages of the Yardley Whittlewood Ridge. Encourage new development to respect the distinctive character of the villages by using traditional local building materials, limiting its visual impact and by ensuring it is sensitively designed and located.
- Conserve the natural environment, while enhancing the area as a recreational and educational resource. This is especially important in the Salcey and Whittlewood Forests and around Yardley Chase, where an historic, wooded feel to its character should be maintained, while also providing the necessary infrastructure to accommodate visitors. Manage visitor access and recreational activities to ensure that demand can be accommodated without conflict between different users, local communities and the historic, built and natural environment.
- Manage hedgerows, field margins, road verges and green lanes to provide structural diversity and a variety of flowering plants, and improve habitat connectivity in the landscape supporting in particular farmland birds and pollinators.

Ecosystem service analysis

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

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

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Food provision	Arable, mixed and pastoral farming Soils	The Ridge is predominantly agricultural in character supporting mixed, pastoral and arable farming (mostly cereals with some field beans, peas and maize). Statistics indicate that there has been a decrease in the farmed area, cropping and number of livestock since 2000. The area under grass generally shows a long term decline. 69 per cent of the agricultural land was classified as Grade 3 under the Provisional ALC Survey, 13 per cent Grade 2 and 11 per cent Grade 4. The underlying geology gives rise to variable soils that historically have dictated where cultivation has taken place.	Local	The mixed pastoral and arable landscape is important for food production and the farmed landscape is likely to be influenced by changes in the market. Multiple benefits gained in terms of maintaining levels of food production, preserving historic character and enhancing biodiversity exist, but there are pressures on water and soil quality. The low grade soils particularly the heavy less permeable clays on the east and west sides of the ridge have constrained agricultural development so that much of the area remains wooded. Climate change could lead to increased demand for water, soil erosion, drought stress on crops and potential threats arising from new pest species and crop and livestock diseases. Temperature changes could affect the timing of planting and harvesting crops.	Work with farmers to ensure the long-term viability of the soil to support the production of food and the agriculture industry. Encourage farmers to use techniques such as establishing break crops to manage land and protect soil. Work with local , land managers to promote best practice through agri-environment schemes, such as the establishment of buffer strips and margins, and the appropriate management of hedgerows to promote biodiversity, address soil erosion and improve soil and water quality to continue the important service of food provision by sustainable means. Secure opportunities to encourage sustainable farming practices to enhance biodiversity and improve soil and water quality by for example reducing the use of herbicides and pesticides, buffering field margins, and retaining winter stubble.	**Food provision** **Biodiversity** **Regulating soil quality** **Regulating water quality** **Regulating soil erosion** **Sense of place / inspiration** **Climate regulation**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Timber provision	Lowland mixed deciduous woodland Conifer plantations Soils	The NCA contains a high proportion of woodland 3,858 ha or 11 per cent and a high percentage of ancient woodland. Many of the larger blocks are owned and managed by the Forestry Commission who are extracting some timber commercially, but also restoring areas previously replanted with conifers for biodiversity and landscape benefit.	Regional	Existing woodland cover is high, however the proportion of conifer is low at 2 per cent. Much of the conifer is on ancient woodland sites, which means this is likely to be a one off resource as the conifers are removed. There is scope for low grade woodland products in the short to medium term and higher value timber production long term with active woodland management. Increases in timber production need careful consideration against the impacts on food production, landscape and biodiversity. Benefits include increased biodiversity and carbon sequestration, improvements in water and soil quality, reduced soil erosion and stimulating local markets in wood products and fuel. With climate change the species composition of woodlands may change affecting timber production over time; however production is likely to continue. New pests and diseases may be a potential threat.	Promote the management of existing woodlands and the replacing of introduced species with native species, as well as undertaking new woodland planting where appropriate that can enhance the biodiversity and recreational value of the woodland along with benefits for water quality, soil erosion and adaptation to climate change. Link, and expand woodland areas to improve habitat connectivity. Stimulate local markets for wood products, biomass and wood fuel to support sustainable timber production. Explore opportunities to bring unmanaged woodland into management and promote the benefits for biodiversity, landscape and contribution to climate regulation.	**Timber Provision** **Biodiversity** **Climate regulation** **Biomass energy** **Regulating water quality** **Regulating soil quality** **Recreation** **Sense of place / inspiration** **Sense of history**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Water availability	Rivers Til, Tove, Great Ouse and Kym Aquifer Grand Union Canal	The main watercourses are the rivers Til, Tove, Great Ouse and Kym. In the western part of the NCA lies an aquifer under the Oolite limestone strata. Water from the rivers and aquifer is abstracted for public water supply, agricultural, horticultural and industrial use. The Grand Union Canal dissects the NCA at Stoke Bruerne within the River Tove valley and relies on some water abstraction to maintain water levels. The status of the groundwater resources within the Oolite aquifer is 'restricted' and linked to the areas surface water availability status which is also 'restricted'.	Local	Water availability both surface and ground water within the NCA is considered to be restricted with measures in place to monitor abstraction rates. The quantity of water available from the confined Oolite aquifer diminishes the further away abstraction is located from the valley of the River Great Ouse. Any new development is likely to put additional pressure on local water resources with applications for abstraction considered on their merits. Abstraction from the Tove and the Great Ouse to the Grand Union Canal near Stoke Bruerne is permitted and already monitored carefully. Changes in climate are likely to impact on water resources and the riparian habitats of the NCA. Water shortages may lead to changes in species composition and habitat succession. Reduced river flows due to low rainfall and drought, could lead to reduced water quality, with diffuse pollution becoming more of an issue. Increased demand for water from agriculture could increase pressure for irrigation and also impact on water quality. Flood risk at certain times of the year may impact on biodiversity and water quality.	Promote the sustainable use of local water resources by commercial and domestic users to reduce the pressure on water resources in this NCA. Monitor and manage water abstraction licences with new applications for groundwater abstraction considered on a case-by-case basis to reduce the pressure on the aquifer. Incorporate and encourage the use of water efficiency measures in new developments. Encourage the extension and improved connectivity of semi natural habitats especially riparian habitats to increase resilience to water shortages and to help regulate water flows by slowing down the passage of water, adding storage capacity to the catchment, or feeding water to the aquifer. Encourage the strengthening of hedgerows particularly across steeper slopes and creation of grassland to help to slow the flow of water from the land and reduce run-off. Support measures to maintain and improve soil structure to increase permeability and water retention by the soil.	**Water availability** **Regulating water flow** **Climate regulation** **Biodiversity** **Food production**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Genetic diversity	N/A	N/A	N/A	N/A	N/A	**N/A**
Biomass energy	Energy crops Existing deciduous woodland Conifer plantations	There is limited biomass provision in the NCA at present, but potential for energy crops such as miscanthus or short rotation coppice (SRC) exists. Miscanthus has been planted on a small scale on the south-western side of NCA. The existing high proportion of woodland cover that includes extensive blocks of oak/ ash woodland supplemented by tracts of more recent conifer plantations has potential to support the production of biomass.	Local	Opportunities exist for sensitive energy crop planting with either miscanthus or short rotation coppice (SRC). Potential yields for SRC are generally medium, although there are areas with high SRC potential to the east of Radstone and Hartwell and around Yardley Hastings. The potential miscanthus yield in the NCA is generally high in the north-east of the NCA (Yardley Hastings to Rushden) and medium in the south-west of the NCA. This has the potential to aid climate regulation and help regulate soil quality and erosion, but would need careful siting to avoid landscape and biodiversity impacts. Biomass from woodland brought back under management and as a by-product of commercial timber production has the potential to bring biodiversity and landscape benefits, aid climate regulation and soil erosion and stimulate local markets in wood products.	Encourage, where suitable short rotation coppice and miscanthus, ensuring this does not have an impact on historical assets or the open, expansive nature of views from the ridge. Seek opportunities to develop biomass production through active woodland management for example through coppicing or as a by-product of commercial timber operations. Stimulate local markets for biomass and wood fuel to support sustainable woodland management.	**Biomass energy** **Climate regulation** **Regulating soil erosion** **Regulating soil quality** **Biodiversity**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Climate regulation	Woodland – deciduous and coniferous, lowland wood pasture and parkland Hedgerows Semi natural grassland – unimproved and semi-improved Underlying limestone geology Soils	11 per cent of the NCA is wooded. The mosaic of semi-natural habitats, in particular woodland, wood pasture and parkland, grassland, and hedgerows act as a carbon store and the limestone geology also acts as a carbon store which was locked into the rock on formation. The main soil types of the NCA are mineral soils with a low carbon content (0-5 per cent).	Regional	The wooded nature of the NCA lends itself well to a role in the sequestration and storage of carbon especially where woodland is under active management, which would also benefit biodiversity and potentially biomass energy. There are also other semi natural habitats present, grassland and hedgerows, that offer opportunities to store carbon and for increasing the storage of carbon if strengthened. Permanent grassland retains carbon, an increased proportion of which would be released through microbial action if the soil was ploughed and exposed to the air. Despite the carbon content of the main soil types in this NCA being low there may be potential for increasing carbon sequestration by increasing the organic matter inputs and by reducing the frequency and or area of cultivation.	Maintain levels of carbon sequestration through sustainably managing the extensive woodland. Actively manage woodland for multiple benefits as well as for climate regulation and promote biomass energy from forestry operations. Maintain the hedgerow network, wood pasture and parkland, which store carbon both through the trees themselves and the permanent grassland beneath. Extend where possible and improve the condition of semi natural habitats through management to increase their capacity to sequester carbon. Encourage the maintenance of permanent pasture to increase soil carbon storage, with a subsequent improvement in soil quality. Encourage sustainable farming practices to support carbon storage of soils for example by reducing ploughing, increasing soil organic matter to help carbon storage/retention where appropriate as well as the drought tolerance of crops.	**Climate regulation** **Biodiversity** **Regulating soil quality** **Regulating soil erosion** **Regulating water quality** **Regulating water flow** **Biomass energy**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating water quality	Underlying limestone geology Soils Aquifer Woodland Semi-natural habitats including flood plain grazing marsh, reedbed and hedgerows Rivers Til, Tove, Great Ouse and Kym	The underlying geology, and high proportion of vegetation cover in this NCA particularly woodland, but also other semi-natural habitats including flood plain grazing marsh, hedgerows and limited riverine habitats such as reedbed, help to filter out any pollutants and sediments regulating water quality. However, the soils are thin and variable so water may run away quickly causing localised soil erosion and impacting on water quality. The groundwater status in parts of the NCA is 'good', but there are some areas considered to be 'poor'. The ecological potential of the River Tove, the Grand Union Canal and the River Kym/Til is 'moderate'. Near the source of the River Great Ouse the ecological potential is 'good' but this reduces to 'moderate' downstream. The whole of the NCA is classified as a Nitrate Vulnerable Zone with measures in place to reduce inputs of phosphates and nitrates to the watercourses and improve water quality.	Local	Groundwater quality in the NCA is affected by the leaching of agricultural products into the aquifer. Management measures can help reduce the impact on water quality. The whole of the NCA area is a Nitrate Vulnerable Zone (NVZ). Surface water quality improvements gained by reducing sediment, nutrient and run-off from agricultural land as well as controlling damage caused to the soil by vehicles or stock. Semi-natural habitats such as woodland, hedgerows and grassland as well as reedbed have the potential to filter out pollutants and sediment. This ability could be greatly strengthened by linking or expanding existing fragmented habitat. Climate change may bring drier summers leading to lower water levels and a concentration of pollutants. Flooding can introduce silt and other contaminants to watercourses. Increased run-off following intense rainfall may result in nitrate pollution of water supplies.	Encourage land owners and managers to increase and link areas of semi-natural habitat such as flood plain grazing marsh and reedbed to help slow water passage and filter out pollutants. Work to reduce surface and groundwater pollution at a catchment scale by managing farmland under the principles established by Catchment Sensitive Farming Project. Improve the soil structure through increasing organic matter, reducing compaction and promoting sustainable management to minimise the loss of sediments. Where possible expand buffer strips along watercourses to help filter sediments and pollution and provide benefits for biodiversity.	**Regulating water quality** **Biodiversity** **Regulating soil erosion** **Regulating soil quality** **Climate regulation** **Sense of place / inspiration**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating water flow	Soils Woodland Semi-natural habitats including grassland and hedgerows Rivers Til, Tove, Great Ouse and Kym	Many of the soils in this NCA have a degree of impeded drainage. There is a high proportion of woodland cover and other semi-natural habitats that help intercept rainfall and regulate run-off. The majority of the NCA is within the River Great Ouse Catchment. It is quite rural so there is not a major risk of flooding to settlements. However, Towcester, located in the south-west of the NCA, is at risk of flooding from the River Tove. There is a flood storage reservoir upstream of the town and flood defences have been constructed which currently help to reduce the flood risk. The preferred approach to assess the flood risk and to continue with the current flood risk management and maintenance activities. The approach to managing flood risk in the rest of the NCA is to use the undeveloped flood plain to store flood water. This will reduce flood risk to settlements downstream. Maintenance work on rivers will increase the capacity of the flood plain to retain water also bringing benefit to the river environment and wetland habitats.[6]	Local	The soils are variable and shallow ranging from a free-draining chalky till to less permeable clay. Of the four main types many have a degree of impeded drainage which can lead to run-off especially if soils are damaged or compacted. The east and west sides of the ridge have particularly heavy clay soils and soils in the river valley are generally more waterlogged. The extensive woodland cover, mosaic of grassland, strong network of hedgerows and other semi-natural habitats present help with the interception of water reducing run-off and minimising soil erosion. Changes in climate with more rainfall in winter and intense rainfall in summers could exacerbate flood risk. Development pressures in the NCA and particularly around Towcester may also impact on flood risk and the need for additional management. The River Great Ouse catchment is known for its quick response during periods of heavy rainfall therefore measures taken in this NCA will help to regulate and manage flows further downstream in other NCAs.	Work with land owners and managers to encourage good soil management to reduce poaching and compaction. Manage vegetation within the catchment to help to bind the soil reducing the risk of erosion and slowing the passage of water. Increase the current flood storage capacity by creating or increasing areas of flood plain grazing marsh reedbeds, concentrating on areas at risk. Seek opportunities to extend and link areas of woodland, hedgerow, grassland and other semi-natural habitats to assist in absorbing water flow and provide benefits for biodiversity. Seek opportunities to increase the capacity of the flood plain, conserve and extend riparian habitats to retain water and bring benefit to the river environment. Promote green infrastructure within urban areas to help mitigate the impact of flooding. Encourage the use of sustainable drainage schemes (SuDS) such as permeable surfacing especially within urban areas to help reduce run-off.	**Regulating water flow** **Regulating soil erosion** **Regulating water quality** **Regulating soils quality** **Biodiversity** **Climate regulation** **Sense of place / inspiration**

[6] *Great Ouse Catchment Flood Management Plan: Summary Report*, Environment Agency (January 2011)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating soil quality	Soils Broadleaved woodland Semi-natural habitats	There are four main soil types in this NCA: i. Slowly permeable seasonally wet slightly acid, but base-rich loamy and clayey soils, covering 42 per cent of the area; ii. Lime-rich loamy and clayey soils with impeded drainage (41 per cent); iii. Freely draining lime-rich loamy soils (12 per cent); iv. Slightly acid loamy and clayey soils with impeded drainage (3 per cent). The slowly permeable seasonally wet slightly acid, but base-rich loamy and clayey soils suffer compaction and are easily damaged when wet. This leads to poor water infiltration and diffuse pollution as a result of surface water run-off. The lime-rich loamy and clayey soils with impeded drainage have some natural resilience and enhanced workability. Soils are also at risk of topsoil compaction and poaching. The freely draining lime-rich loamy soils are typically shallow and droughty, but have a degree of natural resilience and are valuable for groundwater recharge.	Local	Measures that help to maintain a good soil structure both through management measures that build up soil organic matter levels and the use of minimum tillage such as direct drilling will help improve soil quality, as well as reducing soil erosion and contributing to sustainable agriculture. Maintaining good structural conditions will aid water infiltration, aquifer recharge and prevent pollution of groundwater. There is the potential to increase organic matter content by management interventions. The amount of semi-natural habitat and tree cover in this NCA means that much of the soil is maintained in good condition. However, where the soil is under agricultural use, maintaining and improving the soil quality will safeguard and retain productive food provision in the long term and increase the soils resilience to climatic change and extreme weather events.	Promote management techniques that prevent compaction and improve water infiltration such as the careful use of machinery and careful management of grazing. Add organic matter where appropriate to improve the soil structure. Promote the minimal use of tillage operations where possible. Encourage the use of crops which break up the soil such as rape or beans. Promote best practice grazing regimes to reduce localised compaction and erosion of soils. Promote cultivation with soils in mind – adopting Defra's Code of good agricultural practice (2009) and the Environment Agency's Think soils initiative (2008) to avoid soil compaction and maintain good soil structures. Increase where possible the areas under woodland or permanent vegetation to stabilise the soil, increase quality with organic matter and soil fauna. Manage localised compaction and erosion in areas of high recreational pressure for example within forested areas and along green lanes.	**Regulating soil quality** **Regulating water quality** **Regulating water flow** **Regulating soil erosion** **Food provision** **Biodiversity** **Climate change regulation** **Recreation** **Sense of place / inspiration**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating soil erosion	Soils Woodland Semi-natural habitats (grassland, strong hedgerow network)	Just over half the soils found in this NCA are at risk of erosion. Soils most at risk of erosion are the lime-rich loamy and clayey soils with impeded drainage (41 per cent of the NCA area) and the slightly acid loamy and clayey soils with impeded drainage (3 per cent). These are easily compacted by machinery or livestock increasing the risks of soil erosion by surface water run-off, especially on slightly steeper slopes. By contrast the slowly permeable seasonally wet slightly acid, but base-rich loamy and clayey soils (42 per cent) are at low risk of soil erosion.	Local	Employing management measures will improve soil structure in areas most at risk on the edge of the ridge, help increase water infiltration (aiding aquifer recharge) and reduce the risk of erosion. The potential for soil erosion is exacerbated where organic matter levels are low after repeated and frequent arable cultivation, or where soils are compacted. Increasing the areas of semi-natural habitat for example extending hedgerows, establishing grassland, planting more woodland is likely to help to bind the soils together; aid water penetration reducing erosion and improving quality by incorporating organic matter may help.	Extend if possible the semi-natural vegetation cover on the steeper sides of the ridge by planting more woodland or buffering hedgerows to help increase the organic matter content of soils, reduce run off and erosion improving biodiversity, and helping to regulate water quality and flow. Sustainably manage agricultural land to reduce soil erosion, for example through types of crop rotations, use of machinery and timing of cropping. Work with farmers and landowners to choose options within agri-environment schemes or adopt best practice that will help to regulate soil erosion. Manage localised compaction and erosion in areas of high recreational pressure for example within forested areas such as Salcey and Whittlewood and along green lanes in north Bedfordshire.	**Regulating soil erosion** **Regulating soil quality** **Regulating water flow** **Regulating water quality** **Biodiversity** **Climate regulation** **Recreation** **Sense of place / inspiration**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Pollination	Unimproved and semi-improved grassland Road verges, green lanes and field margins Hedgerows	The area of flood plain grazing marsh, lowland calcareous grassland and lowland meadow in the NCA is small (224 ha). However, there are some remaining examples of species rich unimproved lowland meadows, designated as SSSI that, support rich assemblages of species including green winged orchids. Semi-improved and unimproved grassland also occurs as discrete agricultural fields, along woodland rides, roadside verges and green lanes. The hedgerows are mature, species-rich and often bounded by field margins or wide species-rich road verges.	Local	The grassland and hedgerows provide good corridors and habitats for pollinators. The appropriate management of these habitats to create a diverse structure provide the best sources and networks for pollinating invertebrates to move through the landscape. Maintaining a healthy population of pollinators is important for food provision as well as biodiversity. Oil seed rape, beans and small areas of fruit are grown in the NCA and need insects for pollination. Encouraging the provision of flower-rich grasslands/ pasture, field margins and headlands through agri-environment schemes will be of great benefit to many pollinating insects including bumblebees.	Seek opportunities to restore, recreate and manage areas for pollinators, for example by promoting agri environment options with pollen and nectar mixes. Manage the mosaic of woodland and semi-natural habitats including road verges and green lanes to provide structural diversity and a variety of flowering plants that can provide breeding sites and a food source for pollinators. Manage hedgerows to maintain a diverse range of flowering species, hedge age and structure. Manage field margins and improve habitat connectivity in the landscape. Encourage the minimum use of herbicides and pesticides to minimise impacts on pollinators.	**Pollination** **Biodiversity** **Food production** **Pest regulation** **Sense of place / inspiration** **Sense of history**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Pest regulation	Unimproved and semi-improved grassland Road verges, green lanes and field margins Hedgerows Woodland and trees	The mosaic of semi-natural habitat in the NCA supports a variety of predatory species, such as beetles, which can contribute to the regulation of populations of pests. Ancient, semi-natural woodland, wood pasture and parkland containing ancient and veteran trees especially support many deadwood specialist invertebrates.	Local	The NCA provides a wide range of habitats for species that contribute to the regulation of pests. Fragmentation and breaks in the network and connectivity of habitats may limit the movement and effectiveness of predatory species.	Enhance and expand the network of semi-natural habitats particularly hedgerows, grasslands along road verges, green lanes and field margins that aid the movement of predatory species through the landscape and bring benefits for pest regulation, as well as pollination and biodiversity. Encourage the use of field margins, beetle banks and headlands in arable land to encourage pest regulating species. Conserve and manage ancient and veteran trees for the benefit of fauna (such as invertebrates dependent on dead or decaying wood). Improve the condition of semi-natural habitats and where possible seek to expand them to provide a range of niches to support pest regulating species.	**Pest regulation** **Biodiversity** **Pollination** **Food production** **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	Elevation above surrounding claylands Pastoral, mixed and arable farming Medium sized fields bounded by hedgerows Hedgerow trees Wide species rich road verges Mature broadleaved woodland Sparsely populated area with small rural villages Large historic houses and designed landscapes Locally quarried limestone used in buildings especially churches William Cowper - poet	Sense of place is provided by the broad, low limestone ridge elevated above the adjacent claylands which forms a low watershed between the River Nene and Great Ouse catchments. Pastoral farming on higher ground to the west gives way to arable on lower ground to the east, with medium sized fields, mature species-rich hedgerows and hedgerow oaks, many of which are now stag headed. Numerous minor roads with species rich grass verges. The distinctive nature of the area originates from its history as a series of Royal Forests from the 13th century that reflect the generally poor nature of the underlying soils. Remnants of these extensive woodlands remain at Salcey Forest, Yardley Chase and Whittlewood. Significant parklands associated with large country houses and estates add to the historic feel of the landscape. Population is sparse with only a few hamlets and villages largely sited along the edge of the ridge. Locally quarried limestone has been used in local buildings especially churches adding to sense of place.	Local	A sense of inspiration is likely to be associated with the wooded landscape providing strong contrasting colours between conifer and deciduous woodland and framing strategic long distance views over the surrounding landscape and creating a sense of expansiveness, although these views are sometimes interrupted by blocks of woodland. Pressure on the distinctiveness of the area and its sense of place comes from expanding urban areas at the periphery, and from increased infrastructure development. Promoting and maintaining the character of the ridge will help integrate new development into the existing landscape. Managing and promoting locally distinctive features such as the forests, historic houses and association with the poet William Cowper is likely to increase the sense of place and has the potential to increase the attractiveness of the area to visitors. Conserving and enhancing the distinct landscape character is likely to benefit biodiversity.	Maintain and manage strategic views across the surrounding countryside to improve legibility of the ridge. Protect and enhance the key landscape attributes such as woodland, hedgerows, parkland that helps to define landscape character. Prevent inappropriate development and promote the use of local building stone to maintain character of villages and historic buildings. Maintain where possible the current nucleated settlement pattern of villages along the forest and ridge edges. Offer high quality interpretation at key sites, and provide opportunities for education about the key attributes of the area.	**Sense of place / inspiration** **Sense of history** **Sense of tranquillity** **Recreation** **Biodiversity** **Geodiversity**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Sense of history	Historic Royal hunting forest Listed buildings Scheduled ancient monuments Large historic houses, designed landscapes and parkland Settlement pattern and use of locally quarried limestone Grand Union Canal, Canal Museum and nearby Blisworth Tunnel Yardley Chase World War bunkers	The NCA has 8 Registered Parks and Gardens covering 991 ha, 11 Scheduled Ancient Monuments and 464 Listed Buildings. History of the landscape stems from the establishment of Royal Hunting Forests in the 13th century, the high number of large well managed estates, historic country houses and associated parkland landscapes. Linked with this wooded landscape is a nucleated settlement pattern of small 'forest' villages. Building materials are distinctive and varied and include local limestone. The Grand Union Canal cuts north-south through the ridgeline. Yardley Chase has a history of military use.	Regional	Maintaining, conserving and enhancing the sense of history provided by the key attributes of the NCA in particular the forest, parkland, historic features and designed landscapes, through increased interpretation and opportunities has the potential to increase the service. This may lead to increased recreation and tourism in the area which would require careful management to ensure this it is sustainable and does not have a negative impact on the assets themselves. The reinforced sense of history could contribute strongly to sense of place in the landscape.	Encourage the restoration and sustainable management of woodland and historic parklands. Protect historic sites and features, such as 'forest lawns', woodbanks and boundaries, and moated sites. Use where possible agri-environment agreements to protect historic farmsteads, buildings and other features such as ridge and furrow. Restrict inappropriate development to help maintain character and promote the use of local building materials. Promote the restoration and good management of historic buildings especially those that are listed and 'at risk'. Encourage greater awareness of the area's heritage by improving access to heritage assets and promoting appreciation of their local distinctiveness.	**Sense of history** **Sense of place / inspiration** **Recreation** **Climate regulation** **Geodiversity**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Tranquillity	Woodland Parkland Minor road network and rural villages	Tranquillity has declined significantly; undisturbed areas have decreased from 80 per cent in the 1960s to 48 per cent in 2007, primarily due to the development of redundant airfields now used as racetracks – Silverstone and Santa Pod. The largest areas of tranquillity lie away from the main road and rail transport corridors that cross the ridge. The strongest sense of tranquillity is particularly associated with the extensive woodland cover and parklands of the NCA.	Local	Despite the dramatic decline in tranquillity many parts of the NCA retain a feeling of remoteness, especially in the well wooded areas. Increasing tranquillity through expanding areas of woodland could increase biodiversity, enhance a sense of place and the settings of the numerous heritage assets.	Enhance the wooded peripheries of the settlements and increase tree planting where appropriate around new developments to help filter noise and light pollution and enhance 'undisturbed' views from the surrounding countryside. Work with local planning authorities to ensure that development is appropriately designed to minimise the impacts of noise and light pollution. Protect elevated views which provide a sense of connection with the surrounding natural environment. Prevent inappropriate development and promote the use of design statements to retain the character of local historic buildings of villages. Seek opportunities to protect the tranquil character of the area to prevent intrusion in particular light and noise pollution and remove obtrusive features such as signage, lighting and poles.	**Tranquillity** **Sense of place / inspiration** **Sense of history** **Recreation** **Biodiversity**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Recreation	Woodland Historic houses, estates and associated designed landscapes Rights-of-way network National Cycle Routes Race tracks Grand Union Canal, Canal Museum and nearby Blisworth Tunnel	Recreational opportunities are primarily associated with parklands and woodland sites for example Salcey Forest offers opportunities to view a range of wildlife and has a Tree Top Way. The historical interest and the numerous informal recreational and access facilities such as Castle Ashby, the Grand Union Canal, the Canal Museum and nearby Blisworth Tunnel means this is a landscape popular for recreational and education purposes. Recreation is supported by the area's 585 km rights of way network (with a density of 1.7km per km^2). There are two National Cycle Routes that pass through the area (Route 6 and 5). Facilities catering for occasional large numbers of visitors include Silverstone and Santa Pod racetracks. Other recreational facilities like golf courses, parks and museums bring a more suburban feel into parts of the NCA.	Regional	Recreation is a significant service in the NCA; is generally low key and associated with the parkland and woodland sites such as Salcey and Whittlewood forests. With increased development pressures it is likely that demand for leisure and recreation will increase with subsequent pressures on biodiversity, soil and water quality. Opportunities exist to cater for increased demand without significant effects on other services so long as the assets are well managed for both biodiversity and recreation. Managing potential conflicts between users of the area will be needed.	Conserve and enhance historic and designed landscapes, and provide improved interpretation and educational opportunities to increase people's understanding and enjoyment. Ensure that any new developments incorporate well designed green infrastructure, to include improved access and recreation opportunities for local communities and visitors. Maintain, extend and promote the use of the rights of way network. Manage visitor pressure and demand at key sites to ensure that demand can be accommodated without conflict between different users, and without causing adverse effects on the natural environment.	**Recreation** **Sense of place / inspiration** **Sense of history** **Sense of tranquillity** **Biodiversity** **Regulating water flow** **Regulating soil quality** **Regulating soil erosion** **Geodiversity**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Biodiversity	Habitats and species of principal importance SSSI	Just 3 per cent of the NCA is designated nationally for its biodiversity interest. There are 10 SSSI wholly or partly within the area totalling 1,045 ha. There are 98 Local Sites totalling 2,622 ha or 8 per cent of the NCA. There is over 2,759 ha of priority habitats within the NCA including 2,514 ha of lowland mixed deciduous woodland, 199 ha of coastal and flood plain grazing marsh, 21 ha fen, 14 ha lowland calcareous grassland and 11 ha lowland meadow. Other priority habitats include purple moor grass and rush pasture, reedbed and lowland heathland. The diverse variety of semi-natural habitats support a range of rare species many associated with woodland edge habitats including butterflies such as white admiral and wood white, dormouse, barbastelle and noctule bats, and numerous scarce moths and specialist beetles.	Regional	As a result of its geology, soils and history a large proportion of ancient woodland remains, which is highly biodiverse. Many of these sites are designated as SSSI. They support interesting ground flora, important populations of breeding birds, and a number of priority species such as dormouse, barbastelle and noctule bat, bullfinch and woodland butterflies and moths. Ancient trees and parklands are particularly important for a wide range of specialist beetles especially those of deadwood. The arable areas are important for farmland birds such as the turtle dove. The ponds of Yardley Chase are important for great crested and palmate newts. Over-browsing by deer is having a damaging impact on the woodland understory and the associated biodiversity such as woodland birds. Hedgerows, road verges and green lanes serve as important links between patches of woodland providing a valuable ecological network. There are only fragments of unimproved grassland left, however they support a rich diversity of wildflowers and scarce species such as the green winged orchid. Riparian habitats are restricted to the river valleys yet provide valuable habitat connectivity within the landscape. With climate change woodland in particular will have a key role in regulating the climate helping to store carbon especially if under active management, intercept water helping to recharge groundwater and filter pollutants improving water quality. The management and extension of semi-natural habitats within the NCA will bring benefits for soil and water quality, climate regulation and recreation.	Ensure areas of designated land remain in favourable condition and improve the condition where possible. Promote awareness of and provide advice to landowners on managing habitats of biodiversity interest. Ensure that semi-natural habitats are managed in a way which will maintain and enhance their wildlife interest. Actively manage hazel coppice within woodlands and hedgerows for dormice. Maintain, manage and protect the network of roosts, hibernacula, flight lines and feeding grounds of bats, in particular Noctule and Barbastelle bats. Encourage the appropriate management of ponds in Yardley Chase known to be important for great crested and palmate newts. Ensure that populations of deer are managed to reduce the damage caused to the natural regeneration of the woodland when numbers are too high. Control invasive non-native species to prevent or reduce damage to native species populations and habitats, for example control the spread of Himalayan balsam along the River Kym and implement biosecurity measures to help prevent the spread of species such as *Dikerogammarus villosus*, an invasive freshwater shrimp. **Continued over...**	**Biodiversity** **Sense of place / inspiration** **Regulating water quality** **Regulating water flow** **Regulating soil quality** **Regulating soil erosion** **Recreation** **Tranquillity** **Climate regulation** **Geodiversity**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Biodiversity continued					**...continued from previous** Secure opportunities to protect and improve the geomorphology of the rivers, for example the River Tove and increase in stream habitat to support key species. Conserve ancient and veteran trees for the benefit of fauna (such as invertebrates dependant on dead or decaying wood) and flora especially lower plants that depend upon them; and for their heritage value and contribution to a sense of place. Plan for the provision of veteran trees of the future. Increase the connectivity of fragmented semi-natural habitats where possible seek to link and extend them to strengthen their resilience. Secure opportunities to encourage sustainable farming practices to enhance biodiversity for example reducing the use of herbicides and pesticides, buffering field margins, and retaining winter stubble to support farmland birds and pollinators. Ensure that water abstraction and poor water quality does not threaten important wetland habitats. Manage visitor pressure and demand at key sites to ensure that demand can be accommodated without causing adverse effects on the natural environment, such as disturbing sensitive habitats or species.	

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Geodiversity	Limestone used in buildings Elevation above surrounding claylands Soils	Locally quarried limestone is a commonly used building material particularly in churches giving a strong sense of place. A number of attractive limestone villages with a unified built character exist within the NCA. There are no nationally designated geological sites in the NCA and only 1 Local site at Bozeat Quarry (a non-statutory designation). The underlying limestone geology provides elevation over the adjacent lower lying claylands and good views of the surrounding countryside. The underlying geology gives rise to variable soils that historically have dictated where agricultural development has taken place so that much of the area remains wooded.	Local	The underlying geology and soils help to give the Yardley Whittlewood Ridge a strong sense of place and history due to the influence it has had on drainage, land use and settlement patterns. Opportunities exist to promote this through the recreational and educational opportunities afforded by the geodiversity of the Ridge. Exposures of geodiversity especially those designated locally as a Local Site and those within the Tove river valley are important for the geology and geological processes they reveal.	Ensure that new development is in keeping with the character of the area by using local stone in buildings enhance senses of place and history. Maintain and manage strategic views from the Ridge across the surrounding countryside to improve its legibility. Promote awareness and understanding of the area's Geodiversity heritage and the impact it has on the landscape. Secure opportunities to maintain views of and access to geological features and exposures where appropriate, improving access to cuttings, quarries and other exposures of geological features for increased understanding and enjoyment of geodiversity.	**Geodiversity** **Sense of place / inspiration** **Sense of history** **Recreation**

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Front cover: Fields with stone barn and cedar tree. Poppies in the distance.
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