



Introduction

As part of Natural England's responsibilities as set out in the Natural Environment White Paper¹, Biodiversity 2020² and the European Landscape Convention³, 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.

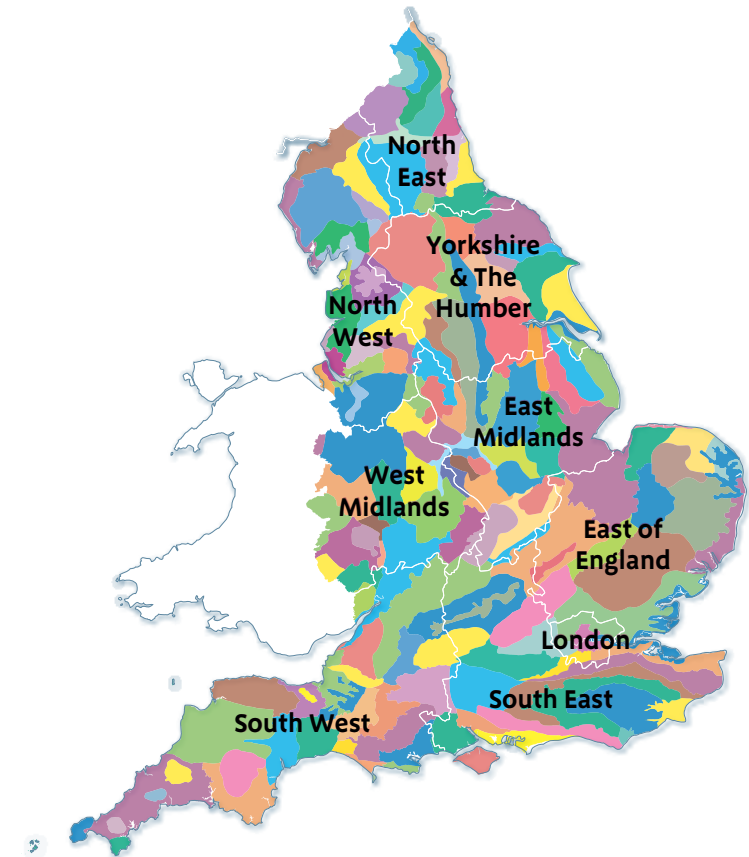
NCA profiles are guidance documents which can help communities to inform their decision-making about the places that they live in and care for. The information they contain will support the planning of conservation initiatives at a landscape scale, inform the delivery of Nature Improvement Areas and 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 Southern Magnesian Limestone National Character Area (NCA) is mainly defined by the underlying Permian Zechstein Group, formerly known as the Magnesian Limestone. It creates a very long and thin NCA that stretches from Thornborough in the north down through north Derbyshire to the outskirts of Nottingham further south. The limestone creates a ridge, or narrow belt of elevated land, running north–south through the NCA, forming a prominent landscape feature. The geology has influenced many aspects of the landscape, from use of its limestone resource as a local building material to the specialised limestone grasslands associated with limestone areas.

The presence of the ridge, and the drift deposits covering much of it, has produced light, fertile soils that have attracted settlement for more than 13,000 years. The important archaeological evidence and mammal fossils found at Creswell Crags and the impressive barrows and henge monuments at Thornborough Henges (three intact henges) are nationally important geological and archaeological features that provide a historic link to the story of human settlement and society within the area and beyond. Opportunities to maintain the landscape setting of these important sites and increase access to and engagement with them need to continue to be secured.

The NCA comprises of open, rolling arable farmland enclosed by hedgerows, with plantation woodlands, historic estate properties and parkland. The localised networks of grasslands and semi-natural habitats have become fragmented, and many species face challenges moving through the NCA. In places, rivers and dry valleys dissect the plateau from west to east, creating wetland habitats. Impacts on this agricultural landscape include limestone, coal and some sand and gravel extraction, associated infrastructure and tips; many of which have now been restored. The pace of settlement and industrial development expansion has been greater in the north than in the south, but the landscape still retains its essential rural character.

Sustainable food production is important in this largely rural area, to maintain the quality of the fertile soils and reduce erosion. The farmed landscape also contributes to the tranquillity of this NCA, and is valued as a contrast to the more urban, industrialised areas to the west and where major road infrastructure crosses the NCA. Parkland trees and plantations associated with country estates give a well-wooded feel in some areas of the NCA. There are more wooded areas within the NCA now than were recorded at the time of *Domesday Book*.

Click map to enlarge; click again to reduce.

Managing and maintaining these key landscape characteristics will be important in retaining the 'essence' of the Southern Magnesian Limestone NCA. There is a need to promote sustainable agriculture and appropriate hedgerow and woodland management and planting. Appropriate habitat enhancement and links are fundamental to this, along with guiding suitable development and appropriate mitigation of the impacts of changes to the landscape.



The three henges at Thornborough are of national importance and form part of a complex Neolithic and bronze-age ceremonial landscape.

Statements of Environmental Opportunity

- **SEO 1:** Protect the underlying geology and range of historic landscape features, including the extensive Palaeolithic, Neolithic and bronze-age monuments, as part of the wider landscape and the evidence and time-depth of the area's historic evolution. Increase opportunities to improve access to, understanding of and enjoyment of historic features within the landscape, as well as their links to biodiversity and underpinning geodiversity.
- **SEO 2:** Protect and manage existing semi-natural habitats, including grasslands, wetlands and woodlands; and increase the area of semi-natural habitats, restore and create new areas, and create networks and links between habitats, to make their ecology more resilient and to afford increased movement of species.
- **SEO 3:** Protect the overall rural landscape and maintain its highly tranquil quality, managing the arable landscape to ensure the continued production of quality crops while also enhancing landscape features such as field boundaries and improving biodiversity, soil quality, reduction of soil erosion, water quality and flood risk management.
- **SEO 4:** Promote the successful incorporation of any future major land use changes, directing them where they can enhance the existing landscape and seeking optimum design to obtain the greatest net benefits, such as to minimise visual impact on the wider landscape, incorporating green infrastructure and creating new access to enhance recreational opportunity for people to experience wildlife.

Description

Physical and functional links to other National Character Areas

The Southern Magnesian Limestone is a very long, narrow National Character Area (NCA) stretching from Nottinghamshire in the south through north Derbyshire to North Yorkshire in the north. The limestone ridge runs roughly north to south and this elevation provides visual links to and from the lower-lying land to both the west and the east.

Several major rivers cut through the ridge – the Ure, Nidd and Wharfe flow east from the Pennine Dales Fringe NCA, while the Aire and Don flow in from the west from the Nottinghamshire, Derbyshire and Yorkshire Coalfield NCA, all eventually joining the Humber to the east. The naturally desired routes of the Rother and the Erewash are both blocked by the ridge, meaning that they run further north and south respectively before finding their way through. These river corridors provide important ecological connectivity, as well as communications routes and, in the past, locations for key defensive structures. Water draining from the Coal Measures influences the plant communities of semi-natural habitats along the west and south edges.

In the past there have been significant economic links between the fertile farmland on the ridge and the industrial areas to the west.



Limestone has traditionally been used as a building material throughout the NCA providing a link to the local geology.

Key characteristics

- Underlying limestone creates an elevated ridge with smoothly rolling landform; river valleys cut through the ridge, in places following dramatic gorges. There are also some dry valleys.
 - Fertile, intensively farmed arable land, with large fields bounded by clipped hawthorn hedges, creating a generally large-scale, open landscape.
 - Semi-natural habitats, strongly associated with underlying limestone geology, include lowland calcareous grassland and limestone scrub on the free-draining upland and gorges with wetland habitats associated with localised springs and watercourses, but all tend to be small and fragmented.
 - Large number of abbeys, country houses and estates with designed gardens and parklands, woodlands, plantations and game coverts.
 - Long views over lowlands to the east and west, and most prominent in the south.
 - Woodlands combining with open arable land to create a wooded farmland landscape in places, where traditionally coppiced woodlands support dormouse populations.
 - Unifying influence of creamy white Magnesian Limestone used as a building material and often combined with red pantile roofing.
 - Localised industrial influences, especially in the Aire and Don valleys, and in the south and along the fringe of the Coal Measures to the west, with former mines and spoil heaps (many now restored), power lines, settlements, industry and transport routes.
- Influenced by the transport corridor of the A1 which is apparent in an otherwise undisturbed rural countryside.
 - Archaeological evidence, with some notable prehistoric sites, reflects the longstanding importance of the area for occupation and transport.



Bramham Park is one of a number of large country houses that have designed gardens and parklands.

Southern Magnesian Limestone today

The underlying Permian Magnesian Limestone forms a distinct but low ridge of land running north to south, cut through by rivers following some dramatic gorges. Towards the north the limestone is largely covered by drift deposits, so that the ridge is less obvious, but the whole area is unified by the widespread use of the local limestone as a building material. The well-drained soils and low altitude have given rise to a landscape of rolling landform, fertile farmland and well-wooded estates. The ridge forms an escarpment with a steep scarp face to the west and a gentle slope dipping to the east, elevated enough to give long views out over the more industrialised lowlands to the west and the farmed lowlands to the east.

The soils are free draining and very fertile, giving rise to productive arable cropping. The fields are generally large and geometric, bounded by low, flailed hawthorn hedges, although stone walls do also occur, for example as estate boundaries and in villages. Hedgerow trees are infrequent, which adds to the open character of the farmed landscape, and the hedges often emphasise the rolling landform. This open, rolling farmland contrasts with the scattered woodlands and supports important populations of farmland birds including lapwing, grey partridge, yellow wagtail, tree sparrow and corn bunting.

Woodland cover is reasonably high overall, often owing to the trees and woodlands in the grounds of the many large country houses that were established on the ridge plateau. Historical evidence suggests that woodland cover is currently higher than at the time of the Domesday Book records. Many are plantation woodlands, but oak, ash and lime typically form the canopy of deciduous woodlands. The few remnants of ancient woodland in this area have a particular abundance of the nationally scarce large-leaved lime. A good example is Sprotbrough Gorge where the canopy consists of ash and wych elm and is the largest area of this woodland type in South Yorkshire. Where hazel forms the understory, woodland can be particularly important for dormouse, and this NCA has been identified as a priority area for its conservation. The woodlands support

a wide range of birds including lesser spotted woodpecker, marsh tit, spotted flycatcher and hawfinch.

The designed parklands and gardens, supported by estates, are a major influence on the landscape. With their extensive areas of woodlands, plantations and game coverts, in places they give the feel of a well-wooded landscape. The estates include early monastic abbeys such as Fountains Abbey and Newstead Abbey, and later, country houses established with the wealth generated from the industrialisation of the coalfield to the west. Designed parklands include the internationally renowned gardens at Studley Royal, along with Newby Hall, Bramham Park, Lotherton Hall, Brodsworth Park, Hardwick Hall and Annesley Hall. Fountains Abbey is part of the Studley Royal and Fountains Abbey World Heritage Site and provides outstanding value to the area through the designed landscape and associated Cistercian abbey.



Hetchell Woods provides a refuge for species of lowland calcareous grassland habitat and a mosaic of grassland, woodland and wetter habitats.

Other semi-natural habitats are limited and fragmented. Of particular note are the small areas of Magnesian Limestone (calcareous) grassland, which is characteristic of this landscape. It is a nationally scarce habitat, and has a number of rare specialist species such as Yorkshire broomrape and the brown argus butterfly which is associated with it. These grasslands tend to occur on steeper slopes or in the narrow valley bottoms, and some of the most significant stretches can be found around Maltby, west of Sprotbrough, and near Castleford, Micklefield and Bramham. Where they are not actively managed, they are replaced by scrub, which forms a particularly varied mix, with hawthorn, blackthorn, guelder rose and dogwood, providing important habitat for birds and insects.

The river valleys that cut through the limestone ridge are picturesque, with some dramatic gorges with overhanging woodlands. These include Nidd Gorge at Knaresborough, the Don Gorge near Conisbrough and Creswell Crags. In medieval times defensive castles were built on the high land of gorges such as these, giving them control over movements up and down the river valleys, and these castles – such as Knaresborough, Conisbrough, Mexborough and Tickhill – still remain as striking features in the landscape.

The rivers continue to play an important role in connecting the industrial towns to the west with the Humber and the North Sea to the east. Historically the rivers were important transport corridors. Along some valleys, such as the Aire, there are widespread industrial influences including evidence of mining spoil, power lines, railways, roads, subsidence depressions and pits where sand and gravel have been extracted. Areas in the south around Nottingham are more heavily settled where the limestone is more faulted, giving rise to more industrial activity as a result of the availability of coal and other materials.

Most of the settlements have more in common with the traditional former mining towns and villages lying to the west and grew up to service the large industrial towns. Only a few are rural limestone villages, with red pantile roofs. Limestone buildings can be found in towns such as Wetherby, Tadcaster, Boston Spa and

Ripon, in the villages and isolated large farmsteads, and in estate boundary walls, as well as in the defensive castles such as at Conisbrough. These contrast with the later factories and terraces of workers' housing in urban areas which were built in brick with slate roofs.

The importance of the limestone as a building material is reflected in the presence of a number of large limestone quarries, for example near Bolsover, while the quality of the water abstracted from the limestone aquifers has contributed to the development of breweries (for example at Masham and Tadcaster) and spas (Boston Spa). In the north, associated with the valleys of the Ure and Swale, deposits of sand and gravel have also been exploited, and wetlands created from the altered landforms.

The limestone ridge has played an important role in connecting communities from prehistory, with a series of henges and other features running down the ridge from Thornborough to Ferrybridge. There is evidence of Roman camps and settlements linked by the main north–south route which followed the drier, elevated land, and which now forms the A1. The M1, M18 and M62 all cross the ridge, linking west with east. These major roads introduce traffic noise, and are often highly visible along their length. This accessibility by road and rail to routes running both north–south and east–west has given rise to a large number of warehousing sites over recent years. Access for people is less well established within the NCA with low levels of access routes. Formal access is provided by the established parks and gardens of the large estates such as the gardens at Newby Hall. The extent of parkland has reduced over recent decades, but as Registered Parks and Gardens cover 2.5 per cent of the area, they remain a key influence on the character of the landscape, as well as being home to many veteran trees, important for the insects and lichens that they support. Many of the parklands are now open to the public, providing important access opportunities.

The landscape through time

Underlying the NCA are the Upper Carboniferous Coal Measures, a sequence of river-lain sandstones, silts and muds and, at depth, coal. Exposed in the deeper river valleys, it has had a significant influence on the modern development of the NCA as a source of mined coal and the local use of sandstone in buildings. The NCA is dominated by the easterly dipping Permian Magnesian Limestone escarpment. The Magnesian Limestone was deposited on the western edge of a shallow tropical sea (similar to the Bahamas) approximately 250-260 million years ago and forms a continuous belt from Nottingham to the Durham coast. It comprises a lower unit of dolostone and dolomitic limestones (the Cadeby Formation), which forms the dominant landscape feature, overlain by red mudstone with gypsum (the Edlington Formation). Following on from this is the upper dolostone and dolomitic limestone unit (the Brotherton Formation) followed by more red mudstone and gypsum (the Roxby Formation). The sequence locally has a number of swallow holes caused by the underground dissolution of gypsum and limestone. The Magnesian Limestone sequence is clearly seen where it is cut by rivers, for example in the Nidd Gorge at Knaresborough, the Wharfe Valley at Wetherby, Boston Spa and the Don Gorge near Doncaster.

Exposures in the Magnesian Limestone, often associated with former quarries, provide important and accessible sections allowing interpretation and understanding of and continued research into the geodiversity of the NCA. The best examples of these exposures are protected as Sites of Special Scientific Interest, for example at Quarry Moor near Ripon and Cadeby Quarry.

North of Wetherby the Magnesian Limestone is largely covered with glacial deposits from the last glaciations. South of Wetherby the Magnesian Limestone has only a thin local cover of glacial deposits. The soils here are derived from the limestones and, locally, their associated red clays. They are generally very fertile and often support agricultural land classified as Grade 2 in quality.



Limestone quarrying in central and southern areas has local impacts on the landscape but can also provide opportunities through restoration of sites after use.

Internationally important evidence of early use of this landscape by humans is found in the caves at Creswell Crags. Creswell Crags provides evidence of three phases of occupation. The earliest, 40,000–60,000 years ago, corresponds to a Neanderthal occupation of migrating hunter gatherers and is evidenced through stone tools; there is also evidence of occupation approximately 32,000–33,000 years ago by modern hunter gatherers and lastly upper Palaeolithic hunters 14,000–15,000 years ago. Tools and animal remains found in the caves provide important evidence of the adaptation of humans to the late glacial and early post-glacial environments and the caves also contain the only evidence of Palaeolithic art in the country. The area was extensively exploited by hunter-gatherer groups during the Mesolithic Period and the succeeding Neolithic Period saw the construction of several important groupings of barrows and henge monuments, particularly around Thornborough Henges between the Ure and the Swale rivers. The intact quality of the three henges at Thornborough and their position in a landscape, rich in other burial monuments and features, make this site nationally important. Significant monuments are also found elsewhere, however, such as the Neolithic long barrow at Whitwell.

The light and fertile soils of the ridge favoured settlement in this area at the onset of farming around 4,000 BC.

There is evidence that, from the Iron Age to well after the end of the Roman occupation, there was increased agricultural exploitation of the area with the use of ditches and banks to define settlements, stock pens, fields and tracks. In this period, the landscape had probably been cleared of much woodland and was occupied by single, quite widely spaced farmsteads with their associated field systems and ditched trackways leading outwards to the open pastures and woodland. Examples of important defensible hill forts remain from this period at Barwick in Elmet in the central section and Markland Grips in the south.



There are some large wooded areas within the NCA giving some places a well wooded feeling within the more open landscape.

The Roman occupation had a major influence on the landscape as the ridge was a favoured location for the making of Roman roads along with military camps and settlements. The routes, later to become known as Ermine Street and Dere Street, were the basis for much of the route of the modern A1 which has a significant influence on the landscape today.

Arable-based open field farming, probably developed in the later Anglo-Saxon period, was extensive until the late 18th century, after which the present day pattern of large-scale fields and some dispersed farmsteads was established. Earlier small-scale and irregular enclosure patterns can still be seen around some villages.

In Yorkshire, Ripon developed as an ecclesiastical centre from the 7th century (the shrine of St Wilfrid), and in the 12th century as a planned borough with a market and church of collegiate canons, while in Derbyshire Bolsover was a planned 12th-century town outside the castle. The medieval period saw the pattern of nucleated settlements laid down, such as the market towns of Knaresborough and Pontefract, but a high number of deserted/shrunken settlements indicate a subsequent reduction in population from the high settlement levels of the early 14th century. Knaresborough originated as a medieval market centre between the Pennines and the Vale of York, and as a textile centre, until its decline from the early 19th century. Several dramatic defensive sites were established, especially overlooking the narrow gorges which acted as routes across the ridge, such as at Knaresborough, Conisbrough and Barlborough.

Wealthy landowners have also had a notable influence on the landscape by means of the fine buildings and designed parklands that they created from the 16th century. The wealth and resource range from the remains of the great abbeys, such as Fountains Abbey near Ripon, to the chain of country houses and designed parklands which runs along the ridge from Bedale Hall in the north to Hardwick Hall and Newstead Abbey, once home of Lord Byron, in the south. It includes the internationally renowned gardens at Studley Royal and estates such as Bramham, Ledston and Lotherton to the east of Leeds as well as Brodsworth, Cusworth and Melton Parks near Doncaster, with later estates based on the industrial wealth earned from surrounding areas. Some of these houses, parks and estates were created by wealthy industrialists involved in coal mining and steel making in areas to the west during the 18th and 19th centuries.

In the 19th and 20th centuries development followed the rivers, notably the Aire and the Don, as they were key trading routes between the North Sea and the industrial hinterland. Exploitation of deep coal resources at Maltby and Creswell led to industrial developments and settlements, while military installations and airfields were constructed along the line of the A1.

This narrow strip of land has been under considerable pressure from both industrial and residential development in recent years, leading to an expansion of towns such as Castleford, Doncaster and Hucknall. There has also been a significant increase in large warehouses, associated with the upgrade of the key north–south route of the A1, and its links with other motorways running east–west. These developments have led to a reduction in the extent of dark night skies and tranquillity.

Mineral workings have also had local impacts on the landscape, with limestone quarrying in central and southern areas (including around Whitwell), coal mining around Maltby, Creswell and Bolsover, and sand and gravel extraction in particular in the Ure and Swale corridors.

The landscape still remains dominated by agriculture, in particular arable production, with a recent reduction in livestock and dairying. Woodland cover has increased over time, with many small woodland parcels established throughout the area, and larger blocks in the south associated with the Greenwood Community Forest. However, traditional coppice management, which contributed to the diversity of woodland fauna including the dormouse, and flora have declined. Improved management of hedgerows in this area continues to enhance the landscape and the biodiversity within it.

Ecosystem services

The Southern Magnesian Limestone 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 Southern Magnesian Limestone NCA is contained in the 'Analysis' section of this document.

Provisioning services (food, fibre and water supply)

- **Food provision:** Agriculture is highly productive here, with half the land area classified as Grade 2, and predominantly cultivated for quality cereals and oilseeds. The free-draining loamy soils are important in providing fertile land for cultivation. In total approximately 75 per cent of the land is used for agriculture and the fertile soils yield higher production than many other areas. Grazing is also common on a quarter of the land but thought to be declining in recent years.
- **Water availability:** The Magnesian Limestone is designated as a Principal Aquifer. Principal Aquifers are geological strata that exhibit high intergranular and/or fracture permeability and they usually provide a high level of water storage, supplying water and/or river base flow on a strategic scale. The entire NCA overlies the major Magnesian Limestone aquifer, where generally there is little groundwater available for further abstraction, and in some places there is over-abstraction. The soils that cover 55 per cent of the area are free draining and thus valuable for aquifer recharge, although good structural conditions will need to be maintained. Of the major rivers that cross the ridge, the Ure and Nidd are protected from further abstraction to ensure adequate flows further downstream.

There is no water available from the Wharfe or Cock Beck, but there is some available along the lower Aire. There are no major reservoirs in the area.

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

- **Regulating water quality:** The chemical status of the groundwater aquifers in the NCA is generally poor. Nearly the entire NCA is a nitrate vulnerable zone, and nutrient inputs should match needs to prevent pollution of the underlying aquifer. Phosphate pollution, as well as sedimentation of watercourses, has been identified as a particular issue associated with arable production and dairy farming in the catchment sensitive farming areas in this NCA.

The ecological status of surface waterbodies is generally moderate, but a few stretches of river are failing to achieve good chemical status, such as the rivers Aire and Don.

Cultural services (inspiration, education and wellbeing)

- **Sense of place/inspiration:** A sense of place is provided by the distinctive rolling, elevated landform of the limestone ridge and the use of the local limestone as a building material reinforces the sense of place. The strong agricultural character of the landscape reflects the high-quality underlying soils that support predominantly arable farmland. A lack of hedgerow trees and low, flailed hawthorn hedges add to the open character of this farmed land which contrasts strongly with areas of significant woodland cover including woodlands of estates and designed parklands.

Significant small areas of unimproved calcareous grassland on steep valley sides and meadows in narrow valley bottoms, which are species rich, contribute colour and diversity to this landscape. Semi-natural ancient woodland, often with ash and lime forming the canopy with an understory of characteristic limestone shrub species, are an important feature of the limestone ridge and the river-cut gorges.

Within the valleys are more intimate landscapes, characterised by the World Heritage Site of Studley Royal and Fountains Abbey, which contrast with the dominant arable ridge. In addition, the rare quality of the groundwater, influenced by the underlying limestone and gypsum bedrock, has contributed to the development of breweries (for example at Tadcaster) and the small town of Boston Spa.

- **Sense of history:** The long settlement history is evident in the fossil remains in the caves of Creswell Crags, and the grouping of Neolithic round barrows, henge monuments, bronze- age/iron-age settlements, iron-age hill forts and earthworks, and the Roman road that forms the basis for much of the route of the current A1. Settlement patterns vary throughout the area with a strong pattern of nucleated medieval limestone villages evident in the north-east, more traditional mining towns and villages in the west, medieval market towns (for example, Ripon, Knaresborough and Pontefract) and dispersed farmsteads. To the south the pattern of nucleated limestone villages reoccurs with some former mining settlements.

Historic character is reinforced by the use of local building materials, limestone combined with brick and stone cobbles with red pantile roofs, which in some places sit next to brick and slate terraces that housed the growing industrial population.

Other key features of the historic development of the area are the number of abbeys, including Fountains Abbey, and country houses with parkland and estate woodlands, including Bramham Park, Ledston, Lotherton and Hardwick Halls, Bolsover Castle and Newstead Abbey. Evidence of a more recent industrial past is revealed in the coal mining and related settlements towards the south and west, some created as model villages, such as at Creswell.

- **Biodiversity:** The NCA includes some areas of nationally scarce Magnesian Limestone grassland which is species rich and also supports a wide range of invertebrates. This network is fragmented and patchy and at risk from scrub encroachment and nutrient enrichment. The high woodland cover supports a range of bat and bird species and often provides stepping stones and corridors through more intensely farmed areas. Where farmland is managed with well-maintained hedgerows and arable field margins this supports important assemblages of farmland birds.
- **Geodiversity:** The Permian Magnesian Limestone that underlies this NCA has influenced much of the landscape through history and natural features. Creswell Crags provides internationally important evidence of early societies, with the cave art early evidence of settlers' creative and cognitive response to the surrounding natural world. The underlying geology is particularly prominent where river valleys have cut through the limestone, likewise in road and rail cuttings and at former quarry and mining sites. There is much potential to provide increased access and interpretation of these features.

The area is important for the production of quality limestone for building and construction purposes, and for sand and gravel in the north of the area. Coal deposits were exploited through deep mining at Maltby, Langwith and Shirebrook while there are still shallow deposits that can be accessed through open cast mining around Castleford and Knottingley.

Statements of Environmental Opportunity

SEO 1: Protect the underlying geology and range of historic landscape features, including the extensive Palaeolithic, Neolithic and bronze-age monuments, as part of the wider landscape and the evidence and time-depth of the area's historic evolution. Increase opportunities to improve access to, understanding of and enjoyment of historic features within the landscape, as well as their links to biodiversity and underpinning geodiversity.

For example, by:

- Protecting the historic environment for its contribution to local character and sense of identity and as a framework for habitat restoration and sustainable development.
- Conserving and interpreting archaeological earthworks and sub-surface archaeology, while recognising the potential for undiscovered remains.
- Encouraging appropriate management of archaeological sites, including arable reversion to grassland, scrub management and minimum till.
- Protecting the settings of archaeological features, especially the internationally significant Palaeolithic finds at Creswell Crags, and the grouping of Neolithic and bronze-age monuments between Boroughbridge and Catterick, and encouraging appropriate land management practices on adjacent land.
- Restoring and managing historic parklands so that the integrity of their historic interest is retained, including key elements such as buildings, follies, walks and vistas, while also providing accessible environments for the 21st century.
- Protecting the setting of designed parklands, including vistas in and out of the parks.
- Conserving and restoring features such as stone walls and stone gateposts.
- Maintaining the diversity of geology and traditional buildings which contribute to the National Character Area can be achieved by using and promoting traditional materials such as limestone and red pantiles, and also maintaining traditional skills in walling, building repair and construction.
- Increasing awareness of the rich history of the area by providing access and interpretation where possible, such as for the Neolithic and bronze-age features between Bedale and Ferrybridge and their landscape setting.
- Increasing awareness of the more recent history of the area by providing further access and interpretation of the many designed parklands and estates, where appropriate, bringing attention to the links with wealth generation in industrial areas to the west.
- Raising awareness of the more recent industrial heritage of the Southern Magnesian Limestone, including both the influence of the textile industry (for example in Sutton-in-Ashfield, Kirkby-in-Ashfield and Hucknall) and the deep mines on the concealed coalfield which have left a legacy of mineral lines, reclaimed heaps and colliery villages as part of the landscape in areas such as Shireoaks in Nottinghamshire and Shirebrook in Derbyshire.
- Ensuring that important geological exposures are retained and made accessible, where appropriate.
- Bringing attention, through interpretation, to the relationships between geology and subsequent land uses and development patterns in the area, for instance spas and breweries.
- Raising awareness of the importance of geological features that have not been designated to date but have importance in the local landscape setting.

SEO 2: Protect and manage existing semi-natural habitats, including grasslands, wetlands and woodlands; and increase the area of semi-natural habitats, restore and create new areas, and create networks and links between habitats, to make their ecology more resilient and to afford increased movement of species. .

For example, by:

- Protecting and managing existing fragments of semi-natural grassland habitats, especially the nationally scarce Magnesian Limestone grassland, and ensuring that they are under sound management, with appropriate grazing.
- Ensuring that existing woodlands are well managed, including protecting them from grazing and reinstating traditional coppice management to improve the structural and species diversity of native woodland. Appropriate management will ensure that the woodlands continue as features within the landscape, providing timber and wood fuel, as well as enhancing biodiversity and especially supporting the conservation of the dormouse population.
- Promoting the use of management practices to encourage native species development and the value of parkland trees, veteran trees and other woodland designed landscapes.
- Restoring, expanding and linking fragments of unimproved limestone and neutral grasslands, for instance with grassland strips along watercourses and field margins, and managing them effectively through, for example, appropriate grazing.
- Expanding areas of woodland cover, in particular on steeper slopes on valley sides, on degraded land and in connection with new development, using native species as far as possible, especially, where appropriate, large-leaved lime, which is nationally scarce.
- Encouraging the widening of the range of habitats within arable areas, including introducing permanent grassland margins along watercourses and field edges, and linking these to the wider grassland resource where possible.
- Protecting existing wetlands from further drainage and from diffuse pollution and nutrient or sediment run-off by establishing permanent grass buffer strips, and bringing adjacent land under appropriate management.
- Securing expansion of wetland habitats such as lowland fen, flood plain grazing and wet woodlands, to make them more robust and to develop ecological networks, corridors and stepping stones.

SEO 3: Protect the overall rural landscape and maintain its highly tranquil quality, managing the arable landscape to ensure the continued production of quality crops while also enhancing landscape features such as field boundaries and improving biodiversity, soil quality, reduction of soil erosion, water quality and flood risk management.

For example, by:

- Ensuring that the expansive views along the open ridge, and the contrasts with the narrow valleys and wooded areas, are retained.
- Using semi-natural land cover to enhance landform features, particularly in gorges and dry valleys.
- Encouraging the introduction of permanent grassland margins on steep slopes and along field edges and watercourses, to form links between grasslands and other semi-natural habitats, and to reduce soil erosion, diffuse pollution and nutrient run-off.
- Encouraging agricultural practices such as introducing fallow into rotations, overwintering stubble and conservation headlands to increase the organic content of the soil and to provide refuges for arable weeds and food for farmland birds.
- Encouraging the management of nutrient inputs to ensure that no surplus nutrients enter the groundwater.
- Bringing hedgerows and hedgerow trees into sound management so that they fill out and form valued features within the landscape, providing more structural shelter for wildlife, and are acting as corridors or stepping stones with the arable landscape.
- Encouraging the management of land adjacent to wetlands and to other semi-natural habitats so that their biodiversity interest is protected and enhanced, by avoiding inappropriate land management, nutrient and sediment run-off, and diffuse pollution.

SEO 4: Promote the successful incorporation of any future major land use changes, directing them where they can enhance the existing landscape and seeking optimum design to obtain the greatest net benefits, such as to minimise visual impact on the wider landscape, incorporating green infrastructure and creating new access to enhance recreational opportunity for people to experience wildlife.

For example, by:

- Ensuring that new strategic plans for the long-term restoration and management of minerals sites improve local landscape character, enhance and promote geodiversity features and encourage the expansion of appropriate semi-natural habitats, linking with adjacent features and habitats where possible.
- Using traditional local materials for the repair and restoration of vernacular buildings and stone walls.
- Seeking opportunities to expand flood storage areas along the river corridors, especially the Don and Dearne, and establishing a range of wetland habitats such as permanent wet grassland and wet woodland.
- Seeking opportunities to restore rivers to their natural courses, especially along the headwaters of the Erewash, to reduce the energy of flood flows and allow natural geomorphological processes to take place.
- Ensuring that new development incorporates networks of green infrastructure that increase the permeability of the built environment where appropriate, maintains landscape character, and not only enhances biodiversity but also allows for connection between habitats and species movement.
- Improving access into rural areas from existing and new settlements, in particular using paths along river corridors and designed parklands, where appropriate, and creating links with the Trans Pennine Trail.
- Protecting the contrasts between the pockets of relative tranquillity and more active areas through careful control of development.
- Minimising light spill at night through careful lighting design.
- Minimising visual intrusion caused by development, for example warehouses in the A1 corridor, through use of recessive colours, designing to appropriate volume and mass and incorporating green roofs and green infrastructure.
- Encouraging the use of traditional local materials and colours combined with high-quality new design and development.

Supporting document 1: Key facts and data

Area of Southern Magnesian Limestone
National Character Area (NCA): 136,762 ha

1. Landscape and nature conservation designations

There are no National Parks within the NCA. 449 ha of the Nidderdale Area of Outstanding Natural Beauty falls within this NCA.

More information about the protected landscape can be found at:

- www.nidderdaleaonb.org.uk/

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)	Kirk Deighton SAC	4	<1
National	National Nature Reserve (NNR)	n/a	0	0
	Site of Special Scientific Interest (SSSI)	A total of 51 sites wholly or partly within the NCA	1,314	1

Source: Natural England (2011)

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

The SSSI which lie along the limestone ridge are influenced by the underlying geology and comprise unimproved calcareous grassland, species-rich scrub and woodland, wetlands with a base-rich influence, and exposures of limestone rock itself.

Kirk Deighton SAC is important for its population of Great Crested Newts.

There are 166 Local sites in within the Southern Magnesian Limestone NCA covering 1,799 ha which is 2 per cent of the NCA.

Source: Natural England (2011)

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

1.1.1 Condition of designated sites

SSSI condition category	Area (ha)	Percentage of NCA SSSI resource
Unfavourable declining	154	12
Favourable	718	55
Unfavourable no change	173	13
Unfavourable recovering	268	20

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

The underlying Southern Magnesian Limestone forms a long low ridge running north – south, with an average height of 64 m, but rising to a maximum of 196 m.

Source: Southern Magnesian Natural Area Profile, Southern Magnesian Limestone Countryside Character Area description

2.2 Landform and process

The landform is of a low rolling ridge running north-south, cut by river valleys running west to east, some of which follow fault lines. There are several smaller valleys, which are often dry in their upper stretches.

Source: Southern Magnesian Natural Area Profile, Southern Magnesian Limestone Countryside Character Area description

2.3 Bedrock geology

The solid geology of the NCA is predominantly Permian Magnesian Limestone of the Zechstein sequence, overlying Upper Carboniferous Coal Measures, which can be seen in places where river valleys have cut through the limestone. The limestone is made up of a lower Cadeby formation, which shows reef formations, and an upper Brotherton formation, separated by the Edlington formation which contains evaporite layers. The dolomitic limestone has been extensively worked for roadstone and aggregates, and the harder, deeper bedded layers have provided high quality building stone. A breakdown of the solid geology as a proportion of the total land area is: 53 per cent, dolomite, 13 per cent mudstone, siltstone and sandstone; 20 per cent sandstone and 12 per cent calcareous mudstone.

Source: Southern Magnesian Natural Area Profile, Southern Magnesian Limestone Countryside Character Area description, Natural England (2010)

2.4 Superficial deposits

In the north of the NCA the drift is dominated by glacial deposits which almost obscure the underlying limestone topography. These thin to the south, and there are some alluvial deposits in the river valleys. Creswell Crags showcases evidence of sediment sequences accumulated over tens of thousands of years.

Source: Southern Magnesian Natural Area Profile, Southern Magnesian Limestone Countryside Character Area description, Natural England (2010)

2.5 Designated geological sites

Exposures of the underlying Magnesian Limestone, often a result of former quarrying, road and rail cuttings and river gorges provide important and accessible sites, enabling the understanding, interpretation and continued research into the geodiversity of the NCA.

Tier	Designation	Number
National	Geological Site of Special Scientific Interest (SSSI)	13
National	Mixed Interest SSSIs	2
Local	Local Geological Sites	70

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

41 per cent of the soils are relatively freely draining and lime-rich loams of moderate depth, their calcareous nature giving them a degree of natural resilience to drought. These soils, along with slightly acid freely draining loamy soils are valuable for aquifer recharge, as well as giving rise to fertile land for cultivation. 27 per cent of the soils are slowly permeable and seasonally wet, either base-rich loamy and clayey, or acid loamy and clayey, which may suffer compaction or capping as they are easily damaged when wet.

Source: Natural England 2010

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

Grade	Area (ha)	% of NCA
Grade 1	633	<1
Grade 2	66,596	49
Grade 3	51,003	37
Grade 4	3,924	3
Grade 5	40	<1
Non-agricultural	3,599	3
Urban	10,967	8

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.

■ Nidd	30 km	■ Ryton	12 km
■ Ure	28 km	■ Don	11 km
■ Wharfe	24 km	■ Went	11 km
■ Aire	16 km	■ Meden	10 km
■ Beck	15 km	■ Poulter	10 km
■ Torne	14 km		

Source: Natural England (2010)

This NCA is crossed by a number of rivers, flowing from the west and draining east to eventually join the Humber Estuary. The low ridge forms an effective barrier to their flow, causing some rivers, notably the Rother and the Erewash, to be deflected to flow northwards, the Rother joining the Don before cutting through the ridge. Several rivers have cut through the ridge in places forming dramatic river gorges, such as at the Nidd Gorge and Don Gorge. Some of the smaller valleys are dry in their upper stretches.

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

3.2 Water quality

The total area of Nitrate Vulnerable Zone is 133,791ha, 98 per cent of NCA.
Source: Natural England (2010)

3.3 Water Framework Directive

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

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

4. Trees and woodlands

4.1 Total woodland cover

The NCA contains 12,355 ha of woodland, 9 per cent of the total area, of which 3,284 ha is ancient woodland. There are 2 community forests – Greenwood and the South Yorkshire Forest – both of which are towards the south of the NCA and together cover 14,384 ha (11 per cent of the NCA).

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

4.2 Distribution and size of woodland and trees in the landscape

While woodland is relatively evenly distributed throughout, there is some local variance in the levels of tree cover. Significant woodland areas are linked to the historic creation of large country houses and their designed parklands and managed estates with plantations and game coverts, for instance at Hardwick Hall, Bramham Park and Stockeld Park. Some of the largest areas of woodland are in the central part of the NCA, between Micklefield and Bramham, and further south, including Whitwell Wood, Scarcliffe Park near Langwith, and north of Hucknall. The 3,284 ha of ancient woodland, that covers 2 per cent of the land area, often occurs on steeper slopes, or on parish boundaries, but are often isolated and fragmented.

Source: Southern Magnesian Natural Area Profile, Southern Magnesian Limestone Countryside Character Area description

4.3 Woodland types

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

Area and proportion of different woodland types in the NCA (over 2 ha)

Woodland type	Area (ha)	% of NCA
Broadleaved	9,099	7
Coniferous	1,630	1
Mixed	738	<1
Other	888	<1

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

Area and proportion of ancient woodland and planted ancient woodland within the NCA.

Type	Area (ha)	% of NCA
Ancient semi-natural woodland	1,497	1
Planted Ancient Woodland (PAWS)	1,787	1

Source: Natural England (2004)

5. Boundary features and patterns

5.1 Boundary features

Field boundaries are usually low, flailed thorn hedges although stone walls built of local limestone also occur in some places, as estate boundaries and around villages. Post and wire fences are also much in evidence. In some places field boundaries are defined by little more than a remnant treeless hedge bank, or change in cropping pattern. Hedgerow trees are relatively sparse contributing to the open character of the landscape.

Source: Southern Magnesian Limestone Countryside Character Area description; Countryside Quality Counts (2003)

5.2 Field patterns

Open field farming was extensive until late 17th century, after which the present day pattern of large scale fields, regular and geometric, was established. In places the hedges go over the low hills, emphasising the smooth, rolling landform. Smaller field patterns, dating from earlier periods of enclosure, also occur, for instance around Clifford and Bagthorpe.

Source: Southern Magnesian Limestone 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

With nearly half of the cultivated land of Grade 2 level, this is a highly productive area dominated by arable cropping, producing cereals for the quality and feed markets. Agricultural production is focussed on cereals (37 per cent of holdings) and other arable cropping, with some livestock rearing, including pigs and poultry (totalling 20 per cent). There has been a decline in dairy farms over recent years.

Source: Agricultural Census, Defra (2010)

6.2 Farm size

Farm size is generally large, with nearly 75 per cent of the land being farmed in holdings of over 100 ha.

Source: Agricultural Census, Defra (2010)

6.3 Farm ownership

About half the land is managed by farmers who own their land.

2009: Total farm area = 91,370 ha; owned land = 50,874 ha

2000: Total farm area = 94,550 ha; owned land = 54,261 ha

Source: Agricultural Census, Defra (2010)

6.4 Land use

Just under half the land is devoted to cereals; this combined with oilseeds (which has increased by 84 per cent since 2000) and other arable crops amounts to two thirds of the farmed land. About 25 per cent of the land is grass or uncropped.

There has been a decrease of 13 per cent in the amount of grass and uncropped land since 2000, which reflects the reduction in livestock numbers.

Source: Agricultural Census, Defra (2010)

6.5 Livestock numbers

There is some dairying along with sheep and pig rearing, but in line with trends elsewhere in the region, livestock numbers have declined over the past decade, with significant reductions in the numbers of sheep (down by 31 per cent) and pigs (down by 26 per cent) since 2000.

Source: Agricultural Census, Defra (2010)

6.6 Farm labour

Most farms are managed by a principal farmer, but there has been an increase in salaried managers and part-time workers along with a reduction in full-time workers and casuals. This reflects the typical decline of agricultural employment, and also the move to larger farms run by managers.

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

The underlying limestone geology is the predominant influence on the priority habitats found in this NCA. However, as a predominantly arable landscape, habitats tend to be small and fragmented. The lowland calcareous grassland supports uncommon plants such as pasque flower, wild candytuft and coral-necklace, while species-rich scrub / ash woodland on limestone includes shrubs such as wild service tree, baneberry and mezereon. Lowland mixed deciduous woodlands, often with an understory of historically coppiced hazel, support populations of dormouse (this is a priority NCA for dormouse) and woodland bird assemblages, while there are still refuge areas within the arable landscape for rare arable flora and farmland bird assemblages.

A breakdown by habitat is provided below:

Lowland calcareous grassland: Unimproved Magnesian Limestone grassland is nationally scarce, existing only on the narrow band of Magnesian Limestone which runs between Nottinghamshire and the River Tyne. These low nutrient grasslands are very species-rich and brim with colour in the spring and summer, as primroses are followed by orchids (including frog, fly and burnt orchids), oxeye daisy, common rock-rose, basil thyme and marjoram.

More uncommon plants of this grassland include pasque flower, purple milk vetch and rare spring sedge. The Yorkshire (or Thistle) Broomrape is parasitic on creeping thistle and to date has only been found in Yorkshire and almost totally within this NCA. The grassland also supports much invertebrate life, the Brown Argus butterfly, and the Duke of Burgundy butterfly which is associated with calcareous grassland in mosaic with scrub.

Lowland meadows: These unimproved grasslands on thick neutral soil on level ground are very rare in the arable landscape. Through spring and summer these are full of colour, with spring orchids such as the declining green-winged orchid, giving way to summer meadow flowers such as knapweed, great burnet, meadow cranes-bill and devils-bit scabious. They support a rich and varied invertebrate life.

Arable field margins: Arable margins and field corners retain plants such as green field speedwell, prickly poppy, scarlet pimpernel, black medick, and narrow fruited cornsalad. These less intensive arable margins support an assemblage of birds comprising corn bunting, grey partridge, lapwing, turtle dove, tree sparrow and yellow wagtail.

Lowland mixed deciduous woodland: Oak (*Quercus robur* and *Q. petraeas*), ash (*Fraxinus excelsior*) and lime (*Tilia* spp) provide the leafy canopy. The woodlands have a particular abundance of the nationally scarce large-leaved lime (*Tilia platyphyllos*), which is usually only found in ancient woodland. Yew (*Taxus baccata*) trees also occur. These woodlands support an assemblage of woodland birds comprising lesser spotted woodpecker, marsh tit, spotted flycatcher and hawfinch.

Upland mixed ashwoods: Occurring on steeper and higher slopes, ash forms the main canopy species in these woodlands, with typical associated understorey of hazel, hawthorn, dogwood, spindle and ground flora of dog's mercury with bluebells, lily of the valley and herb Paris. At Sprotbrough Gorge SSSI, the ash occurs with wych-elm (*Ulmus glabra*) and is the largest area of this woodland type in South Yorkshire. Large-leaved limes are locally very distinctive within this NCA, and woodlands here have a particular abundance of this nationally scarce species.

Wet woodland: Occurring on wetter ground, such as in the flushed gullies at Birkham Wood SSSI, alder often forms the canopy, with a wet grassland ground flora of meadowsweet and opposite-leaved golden saxifrage.

Wood pasture and parkland: The many large parklands contain veteran trees which are particularly important for invertebrates and lichens.

Watercourses and ponds: Streams in this NCA are home to some of England's rare species, including the native white-clawed crayfish, water vole, otter, brown trout and European eel. There are few ponds, but those that exist are a valuable habitat for many species, including breeding areas for amphibians. The ponds at Kirk Deighton support one of the largest breeding populations of Great Crested Newts in the UK, and are internationally recognised as a Special Area of Conservation.

Lowland fens: On areas of boggy ground, fed by spring water emerging from the limestone, moisture loving plants can form a species-rich patch of lush vegetation. Saw-wort, marsh valerian, meadowsweet and bog pimpernel are found here, and the uncommon water violet. The best of the remaining fragments are now protected as Sites of Special Scientific Interest, such as Bishop Monkton Ings.

Source: Southern Magnesian Limestone Natural Area Profile

7.2 Biodiversity Action Plan (BAP) priority habitats

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

More information about *Biodiversity 2020* can be found at:

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

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

Habitat	Area (ha)	% of NCA
Broadleaved mixed and yew woodland (broad habitat)	6,167	5
Lowland calcareous grassland	904	1
Coastal and floodplain grazing marsh	610	1
Fens	482	<1
Reedbeds	246	<1
Lowland meadows	227	<1
Purple moor-grass and rush pastures	118	<1
Lowland heathland	42	<1

Source: Natural England (2011)

7.3 Key species and assemblages of species

- Maps showing locations of UK BAP priority habitats are available at: <http://magic.Defra.gov.uk/website/magic/>
- Maps showing locations of S41 species are available at: <http://data.nbn.org.uk/>

8. Settlement and development patterns

8.1 Settlement pattern

The A1 (based originally on a Roman road) follows the slightly higher land of the limestone through much of the NCA, linking settlements such as Doncaster, Wetherby and Boroughbridge. Several towns have grown up around the crossing points of the main rivers. Small nucleated villages are characteristic of the ridge, as well as larger villages such as Boston Spa and Aberford. Former colliery communities such as Dinnington, Clowne and Micklefield occur towards the south, where the Coal Measures were more easily accessible.

Source: Southern Magnesian Countryside Character Area description; Countryside Quality Counts (2003)

8.2 Main settlements

This long area encompasses a number of larger settlements, including part of the city of Nottingham and the large town of Doncaster, and the principal settlements of Knaresborough, Wetherby, Ripon, Mexborough, Pontefract, Hucknall and Ashfield. The south of the NCA is more heavily populated than the north. The total estimated population for this NCA (derived from ONS 2001 census data) is: 561,672.

Source: Southern Magnesian Limestone Countryside Character Area description; Countryside Quality Counts (2003)

8.3 Local vernacular and building materials

Limestone is widely used as a building material, its distinctive creamy white colouring contributing to the character of many settlements. Boundary walls are often made of local limestone as well. Roofing is of red pantiles, slate or stone slates. Brick terraces are prominent in later industrial settlements.

Source: Southern Magnesian Limestone Countryside Character Area description; Countryside Quality Counts (2003)

9. Key historic sites and features

9.1 Origin of historic features

The light and fertile soils of the ridge favoured early settlement, with the caves at Creswell Gorge containing some of the earliest significant Palaeolithic evidence, with fossils of mammals such as woolly rhino, reindeer and mammoth. Mesolithic and Neolithic history is reflected in archaeological finds including stone tools and flint scatters. There is a particularly significant group of Neolithic and bronze-age features lying between the rivers Ure and Swale, stretching between Boroughbridge and Bedale, with an important line of three henges at Thornborough.

The current A1 follows the route of the Roman Dere Street, and there are several remains of Roman forts, camps, roads and villas.

Ripon developed as an ecclesiastical centre from the 7th century, and as a planned borough from the 12th century. Mediaeval settlement laid down the strong pattern of nucleated settlements, particularly in the north-east, and there is also a high concentration of deserted / shrunken settlements. But there are very few dispersed farmsteads; those that exist relate to medieval grange farms or shrunken settlements.

Several defensive sites were established in the medieval period, often on cliffs overlooking the narrow river gorges, such as at Knaresborough, Conisborough, Mexborough, Pontefract, Tickhill and Kippax.

The establishment of parks is marked from the 16th century, in particular Hardwick Hall, Studley Royal and the grounds of the former Cistercian monastery of Fountains. Open field farming was extensive until the present day pattern of large scale fields was laid down from the 17th century.

The fertile soils, along with the wealth generated by the textiles, engineering and manufacturing industries to the west, led to the establishment of many country houses. With their landscaped parks and supporting estates they now form a major feature of this area, and include Newby Hall, Lotherton Hall and Bramham Park. They also include landmarks in the development of the English landscape style such as Studley Royal with its water gardens.

Industrialisation followed the rivers, notably the Aire and the Don, which provided key links between the coalfield to the west and the east coast, and the exploitation of deep coal resources for example, at Maltby.

Military installations and airfields of the 20th century follow the line of the A1.

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

9.2 Designated historic assets

This NCA has the following historic designations:

- 26 Registered Parks and Gardens covering 3,431 ha
- 3 Registered Battlefields covering 405 ha
- 156 Scheduled Monuments
- 2,863 Listed Buildings

Source: Natural England (2010)

The Heritage at Risk register indicates that there are 113 designated monuments at risk in the NCA. The current condition of designated historic features can be seen on the Heritage at Risk register.

- 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

- 2 per cent of the NCA 3,101 ha is classified as being publically accessible.
- There are 1,528 km of public rights of way at a density of 1.1 km per km².
- There are no National Trails within the Southern Magnesian Limestone NCA. However, the Trans Pennine Trail crosses the southern part.

Sources: Natural England (2010)

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

Access designation	Area (ha)	% of NCA
National Trust (Accessible all year)	128	<1
Common Land	70	<1
Country Parks	320	<1
CROW Access Land (Section 4 and 16)	197	<1
CROW Section 15	43	<1
Village Greens	73	<1
Doorstep Greens	3	<1
Forestry Commission Walkers Welcome Grants	852	<1
Local Nature Reserves (LNRs)	574	<1
Millennium Greens	5	<1
Accessible National Nature Reserves (NNRs)	0	0
Agri-environment Scheme Access	22	<1
Woods for People	2,066	2

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 lowest scores for tranquillity are in the middle to south of the NCA, along road corridors (such as the A1) and in towns such as Ripon and Harrogate. The highest scores for tranquillity are away from the main settlement and transport corridors, particularly to the north and south of Ripon.

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

Category of tranquillity	Score
Highest value within NCA	115
Lowest value within NCA	-81
Mean value within NCA	-10

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 a similar pattern to the Tranquillity Map, with areas of disturbed land associated with the more populated south of the NCA and other larger settlements as well as the major road corridors, particularly the A1.

A breakdown of intrusion values for this NCA are detailed in the table below.

Category of intrusion	1960s (%)	1990s (%)	2007 (%)	% change (1960s-2007)
Disturbed	40	67	74	34
Undisturbed	57	31	17	-40
Urban	3	3	9	6

Sources: CPRE (2007)

Notable trends from the 1960s to 2007 are the decline in undisturbed land has been marked since the 1960s, probably linked to the increase in urban area.

- More information is available at the following address:
<http://www.cpre.org.uk/campaigns/planning/intrusion/our-intrusion-map-explained>



The low limestone ridge runs north-south through the NCA which is of an open, farmed character with few hedgerow trees.

12. Data sources

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

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

Supporting document 2: Landscape change

Recent changes

Trees and woodlands

- The Countryside Quality Counts (CQC) data for the period 1999 – 2003 shows a marked increase in woodland cover, with a 6 per cent increase in woodland through new planting during this time.
- Planting of small woodland parcels has taken place throughout the area.
- Some larger blocks of planting associated with the Greenwood Community Forest in the south.

Boundary features

- Only 4 per cent of boundaries were included under agri-environment agreements between 1999 and 2003.
- Hedgerow boundaries are a strong character feature in this NCA and in 2011 13,075 km of hedgerows were being managed through environmental stewardship agreements.

Agriculture

- Cereal production, along with oilseeds and cash roots, continues to dominate the agricultural production accounting for two thirds of the farmed land.
- In 2009 livestock numbers, in particular sheep and pigs had declined in numbers significantly since 2000, along with a move away from dairying to livestock rearing during this time.

- Over the same period there is the feeling that farm size tended to increase, with larger farms getting bigger.
- Overall there was a reduction in agricultural employment in 2009 from 2000, with an increase in salaried managers and part-time workers, but a decrease in principal farmers and full-time workers, possibly as a result of the move to larger farms.

Settlement and development

- CQC data shows that the most significant change in non-residential property units has occurred in southern and central parts of the area, around Hucknall and Ashfield.
- The upgrading of the A1 has impacted on local character in the north, and in places large scale developments, notably warehousing, are locally significant. Warehousing is also evident on the edge of settlements such as Wetherby, Castleford, South Elmsall, Doncaster, in the Dearne valley, around Annesley Woodhouse and Hucknall, and following the A38.
- In some settlements new housing respects local vernacular styles, using limestone as a building material; for example Tickhill has managed to retain its character although it has expanded significantly. However residential areas on the edge of settlements are often in ubiquitous modern housing styles.
- There was a reduction in the extent of dark night skies since 1993, and more intrusion arising from increases in settlements and traffic.

Semi-natural habitat

- Between 1999 and 2003 most agri-environment agreements were for lowland pasture and regeneration of grassland but uptake of agri-environment agreements is generally below average. This may be due to issues with scheme targeting and that by cutting to an NCA boundary such a long thin NCA only take small areas of much larger authoritative boundaries.

Historic features

- The extent of historic parklands, a key feature of the landscape, has declined since 1918, and now covers just 2.5 per cent of the area.

Coast and rivers

- In recent years rivers and their associated habitats and valleys have been a focus for conservation projects such as along the River Aire.

Minerals

- CQC highlights the central and southern parts of the NCA as important for limestone quarrying, while gravel extraction is also significant, in particular in the Swale and Ure corridors.
- Open cast mining has also been carried out around Castleford and Knottingley. Restoration of these sites can bring opportunities such as the area around St Aidan's which is now an important wetland supporting rich birdlife and assisting with flood mitigation.

Drivers of change

Climate change:

- Increasing incidents of flooding and change in river flow in the river valleys of the major rivers Ure, Nidd, Wharfe, Aire and Don, with more frequent winter flooding.
- Summer droughts leading to an increase in water demand for certain crops. Although at present the area is not heavily dependent on surface water sources, summer droughts may impact on aquifer re-charge.
- Extreme seasons and potential summer droughts may put stress on tree and scrub species.
- More extreme seasons can lead to cropping changes with the potential of a longer growing season leading to double cropping if hotter, drier summers are experienced consistently.
- There may be changes to calcareous grassland communities if increased droughts are experienced in the summer, with drought-resistant species and those with deeper roots gaining dominance.
- Changes and pressures on smaller isolated semi natural habitats will lead to the migration of species from local sites.

Other key drivers

- There will be continued pressure for development around the principal towns, with further housing and light industry.
- There will be pressure on semi-natural habitats from the spread of diseases that could have a large impact on the landscape, such as extensive tree loss of individual trees, woodlands and as boundary features due to ash die-back.
- With increasing populations, there is likely to be an increase in the need for food production, landfill capacity (often directed towards sand and gravel extractions), and renewable energy generation especially wind power.
- With new development, there are possibilities for incorporating green infrastructure that provides recreation for local populations, as well as addressing sustainable drainage and improved flood management. New settlements and expansion will need to be planned and designed to avoid coalescence of settlements and respect the nucleated settlement pattern set among farmland.
- There is likely to be continued demand for resources of limestone, sand and gravel, and open cast mining of coal, which may impact on the local landscape and the historic environment, but also open up possibilities for habitat creation and creation of appropriate landscape features and associated habitats.
- 'Making space for nature', the review of the efficacy of designated sites in delivering biodiversity benefits, carried out on behalf of Defra, is likely to determine future actions. Key recommendations included the need for more and larger sites dedicated to wildlife conservation to ensure resilience, better management of existing sites, and connected sites to enable species movement.
- Changes in commodity prices, and the review of the CAP in 2013, may affect agricultural practices and the scope for delivering environmental benefits through agri-environment schemes.

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.



Patches of semi-natural habitat remain within the more intensely managed arable areas of the NCA and are important to provide a network for species movement.

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	Tranquility	Recreation	Biodiversity	Geodiversity	
SEO 1: Protect the underlying geology and range of historic landscape features, including the extensive Palaeolithic, Neolithic and bronze-age monuments, as part of the wider landscape and the evidence and time-depth of the area's historic evolution. Increase opportunities to improve access to, understanding of and enjoyment of historic features within the landscape, as well as their links to biodiversity and underpinning geodiversity.	↘ *	↘ *	↔ **	n/a	↘ *	○ **	↔ *	↔ *	↗ **	↗ **	↔ **	↔ **	n/a	↑ ***	↑ ***	↗ **	↑ **	↗ **	↑ **	↑ ***
SEO 2: Protect and manage existing semi-natural habitats, including grasslands, wetlands and woodlands; and increase the area of semi-natural habitats, restore and create new areas, and create networks and links between habitats, to make their ecology more resilient and to afford increased movement of species.	↘ **	↗ ***	↗ **	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

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	Tranquility	Recreation	Biodiversity	Geodiversity
SEO 3: Protect the overall rural landscape and maintain its highly tranquil quality, managing the arable landscape to ensure the continued production of quality crops while also enhancing landscape features such as field boundaries and improving biodiversity, soil quality, reduction of soil erosion, water quality and flood risk management.	↗ *	↗ **	↗ **	n/a	↔ *	↗ *	↗ **	↗ **	↗ **	↗ **	↗ **	↗ **	n/a	↗ **	↗ **	↔ **	↔ **	↔ **	↗ **
SEO 4: Promote the successful incorporation of any future major land use changes, directing them where they can enhance the existing landscape and seeking optimum design to obtain the greatest net benefits, such as to minimise visual impact on the wider landscape, incorporating green infrastructure and creating new access to enhance recreational opportunity for people to experience wildlife.	↔ **	↔ **	↗ **	n/a	↔ **	↗ **	↗ **	↗ **	↗ **	↗ **	↔ **	↔ **	n/a	↗ **	↗ **	↗ **	↔ *	↗ ***	↗ ***

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

Landscape attribute	Justification for selection
<p>An elevated ridge of smoothly rolling landform, dissected by narrow river valleys, some dry.</p>	<ul style="list-style-type: none"> ■ The NCA is a long ridge of higher land, running north-south and formed by underlying Southern Magnesian Limestone, rising to a maximum of 196 m with an average height of 64 m. ■ The topography, has a steeper scarp to the west, dipping more gently with rolling topography to the east, and is more elevated towards the south. ■ The low rolling ridge is cut by river valleys running west to east, some of which follow fault lines. There are several smaller valleys, which are often dry in their upper parts.
<p>Underlying Magnesian Limestone geology and glacial drift deposits strongly influence soils, landform, historical and ecological character.</p>	<ul style="list-style-type: none"> ■ The solid geology of the NCA is predominantly Permian dolomitic limestone, overlying Upper Carboniferous Coal Measures, which are only exposed where river valleys have cut through the limestone. Exposures are most obvious in the gorges allowing access and research of the geology. ■ Widespread use of the local creamy warm coloured limestone in towns, villages and farmsteads gives visual unity and a sense of history to some settlements. Boundary and estate walls are also often built of local limestone. ■ Magnesian Limestone (calcareous) grassland is nationally scarce and is found in fragmented patches throughout the NCA, for instance around Sprotbrough, Maltby and near Bramham. A number of scarce specialist species like Yorkshire Broomrape and the brown Argus butterfly are associated with this habitat. ■ The dolomitic limestone has been extensively worked for roadstone and aggregates, and the harder bedded layers for building stone. ■ Sand and gravel has been extracted from areas around the Swale and Ure in the north, with land restored to agriculture or wildlife habitats, including open water.
<p>Free draining and fertile soils support productive arable cropping.</p>	<ul style="list-style-type: none"> ■ 49 per cent of the land is classified as Grades 1 and 2, with 37 per cent at Grade 3. ■ In the north glacial deposits tend to obscure the underlying limestone topography. These thin to the south, and there are some alluvial deposits in the river valleys. ■ Nearly three quarters of the farms are large, with holdings over 100 ha, accounting for 75 per cent of the land. ■ The dominant land use, covering about two thirds of the farmed land, is cereals, along with oilseeds, cash roots and other arable crops. ■ Livestock numbers have declined over recent years, with predominantly more pigs than other livestock – 100,000 pigs, 62,000 sheep and 34,000 cattle, including dairy herds.

Landscape attribute	Justification for selection
Large fields bounded by low-cut hedges creating a generally large-scale, open landscape.	<ul style="list-style-type: none"> Field boundaries are usually low, flailed thorn hedges through stone walls also occur in some places. Hedgerow trees are relatively sparse giving an open character to the landscape. Smaller field patterns can occasionally be found, often dating from earlier periods of enclosure, for example around Clifford and Bagthorpe.
Large number of abbeys, country houses and estates with designed gardens, parklands, estate woodlands and game coverts.	<ul style="list-style-type: none"> The fertile and free draining soils attracted the establishment of monasteries, such as Fountains, Welbeck, Roche and Newstead Abbeys, with associated large estates. The good-quality land later attracted industrialists to establish large designed parklands and estates, using the wealth generated from the industrial activity in the west. There are 26 registered parks and garden within the NCA; these include Newby Hall, Bramham Park, Lotherton Hall, Hardwick Hall and Barlborough Hall. The combined Fountains Abbey and Studley Royal gardens are a World Heritage Site.
Reasonably high woodland cover, much of it estate woodlands, combining with open arable land to create a wooded farmland landscape in some places.	<ul style="list-style-type: none"> 9 per cent woodland cover (12,355 ha). 6.7 per cent of the total land area is broadleaved woodland, with just 1 per cent mixed, and smaller areas of coniferous woodland (1.2 per cent). There are 3,284 ha of ancient woodland covering 2.5 per cent of the land area, but these woodlands are often isolated and 54 per cent of this figure includes PAWS.
Rivers cutting through the ridge, often through dramatic gorges, form important transport routes and defensive sites.	<ul style="list-style-type: none"> A series of castles remain where rivers form narrow valleys to pass through the limestone, for example Knaresborough, Sprotbrough, Conisbrough and Tickhill. As well as being striking landscape features, the rivers provide important ecological links across the ridge.

Landscape attribute	Justification for selection
<p>Fragmented semi-natural grasslands, notably the Magnesian Limestone grasslands, survive on marginal land, rich in flowers and supporting scarce fauna and flora.</p>	<ul style="list-style-type: none"> ■ Magnesian Limestone grassland is a nationally scarce habitat but tends to be limited to scattered and fragmented patches through the NCA. Some of the most significant stretches can be found around Maltby, west of Sprotbrough, around Castleford and Micklefield, and near Bramham. ■ Neutral grasslands occur more frequently towards the north, on the drift soil deposits. ■ There are a number of wet grasslands, reedbeds and flushes within the NCA supporting plants such as marsh arrowgrass. These habitats are most evident to the west of Doncaster, near Castleford and in smaller patches along the Wharfe valley, while significant areas of fen can be found along rivers such as the Ure and Aire.
<p>Industrial influences in the Aire and Don valleys, in the south and along the fringe of the Coal Measures to the west, along with a busy road network.</p>	<ul style="list-style-type: none"> ■ Coal has been exploited in the area through a number of deep mines; however most mines are now closed with former coalfield settlements nearby. ■ The area is crossed by a number of main roads including the A63, A64, A57, M18 and A630, while the A1 (M) runs north south along the drier elevated ridge.
<p>Archaeological evidence, with some notable prehistoric sites, reflects the long standing importance of the area for occupation and transport.</p>	<ul style="list-style-type: none"> ■ Mesolithic and Neolithic history is revealed through extensive archaeological finds such as stone tools and flints, with notable finds in caves at Creswell Crags. ■ Nationally important groupings of Neolithic long barrows and henge monuments can be found in the NCA, notably the stone circles and associated features around Thornborough Henges lying between the Swale and the Ure. ■ The A1 follows the route of the Roman Dere Street, and there are several Roman forts, camps, roads and villas included in the suite of Scheduled Monuments. ■ Medieval settlement is reflected through the pattern of nucleated settlements, as well as evidence of deserted settlements.

Landscape opportunities

- Protect the character of the farmed landscape, with its productive arable cropping, along with the many estate woodlands. Manage field boundaries, restoring where appropriate, so that they form stronger networks and reinforce historic patterns.
- Protect the designed parklands of the abbeys and country houses, their settings and the vistas both looking out and in and manage designed parklands and estates to restore key elements and make them fit for the needs of 21st century society.
- Manage and expand grasslands, wetlands and other semi-natural habitats, ensuring sympathetic adjacent land management, so that they are resilient and connected.
- Protect, manage, extend and buffer the scarce limestone grasslands.
- Protect distinctive landform features such as wooded limestone gorges and crags, and interpret the communications and defensive roles of the river valleys over time.
- Protect historic features such as barrows, henges, hill forts, early settlements, and their settings and provide interpretation to reveal the connections with the wider landscape.
- Protect traditional villages and farm buildings constructed of limestone.
- Manage existing woodlands, to ensure that they make an improved contribution to biodiversity and continue to contribute as landscape features in the long term. Encourage appropriate stocking for game management to reduce negative impacts on biodiversity.
- Plan for increases in biomass and woodfuel, through improved management of existing woodlands.
- Create new broadleaved woodlands to support the existing habitat network avoiding important heritage assets and other important habitats such as the rare Magnesian Limestone grasslands.
- Manage archaeological sites and historic ground features, through changes to land management such as reverting arable to permanent grassland, and scrub management.
- Plan to create links between urban areas and the rural countryside through the incorporation of green infrastructure within new developments, and linking with river corridors.
- Plan for the restoration of mineral extraction sites and other sites such as waste management to productive agriculture, and incorporating the creation of appropriate landscape features and wildlife habitats to reinforce the existing character of the area such as hedges, woodlands and appropriate semi-natural habitats both to enhance biodiversity and provide new access opportunities for local residents.
- Plan to improve access to the countryside, in particular improving access to historic parklands where appropriate and improve the network of footpaths.
- Plan to use local building materials such as limestone in restoration of vernacular architecture and within villages and for maintenance of drystone walls.
- Manage road verges to strengthen biodiversity and links.
- Interpret the communications and defensive roles of the river valleys over time.

Ecosystem service analysis

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

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

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Food provision	Soils Semi-natural habitats Water Arable crops	<p>Approximately 75 per cent of the land is used for agriculture, with two thirds of farmed land used for arable crops and oilseeds.</p> <p>About 25 per cent of the land is grass or uncropped and supports grazing.</p> <p>The majority of the soils (49 per cent) are Grade 2 and 37 per cent are Grade 3.</p> <p>Continued on next page...</p>	Regional	<p>The area is important for food production and the 2010 Agricultural Census showed an increase in oilseed production and decreases in livestock production from previous figures⁴. The area is dominated by arable cropping, producing cereals for the quality and feed markets.</p> <p>Farms in the area are generally large and it is felt the trend is for increasing farm size. The trend towards increased productivity from arable land is important for food security, but this needs to be achieved through sustainable farm management practices to ensure that natural features that support food production are retained and the need for future artificial controls (such as increased pesticide usage) reduced.</p>	<p>Encourage sustainable intensification of farmland for example matching nutrient input to need, creating grassland buffer strips to reduce nutrient run-off.</p> <p>Promote good soil management as well as sustainable above soil practices.</p> <p>Increasing the integration of semi-natural habitats throughout the intensely farmed environment creating networks of habitats which can support pollinating insects, benefitting food provision and increasing the capture of nutrient run-off.</p>	<p>Food provision</p> <p>Biodiversity</p> <p>Regulating soil erosion</p> <p>Regulating soil quality</p> <p>Regulating water quality</p> <p>Regulating water flow</p> <p>Sense of place / inspiration</p>

⁴ *Agricultural Census*, DEFRA (2010)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Food provision cont.		<p>... continued from previous page</p> <p>The freely draining loamy soils are important in providing fertile land for cultivation and the calcareous nature of the soils also gives them a degree of natural resilience to drought, yielding higher production.</p>		<p>Although cattle and sheep numbers are relatively low they have an important role in grazing of the important Magnesian Limestone and can help control scrub encroachment in areas of important semi-natural habitats.</p>	<p>Encourage an increase in traditional grazing through conservation grazing of limestone grasslands and the opportunities of mixed farming to use livestock to maintain semi-natural habitats.</p>	

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Timber provision	Existing woodlands Park estates Soils	<p>Woodland cover is fairly high at nearly 9 per cent of the NCA (12,355 ha).</p> <p>There is significant cover of broadleaved woodland covering 7 per cent of the NCA, about one third of this is ancient semi-natural woodland⁵.</p> <p>There are two sawmills, seven woodfuel suppliers and 34 registered wood boilers in the NCA.</p> <p>Large-leaved limes are locally very distinctive within this NCA, and woodlands here have a particular abundance of this nationally scarce species.</p>	Local	<p>Levels of woodland within the NCA are higher now than during Domesday census.</p> <p>Woodland and game coverts vary in size across the area with many managed by estates for local use. Much is found in small patches although, especially in Derbyshire, the woodlands are part of large wooded areas extending well beyond the NCA boundary.</p> <p>The timber resource is unevenly distributed through the NCA. The Derbyshire section of this NCA is unique in that it has occasional very large plantations (greater than 50ha) that do not occur elsewhere in Derbyshire.</p> <p>This along with the wooded farmland character and frequency of estate woodlands means there is potential to increase woodland within the existing landscape character.</p> <p>Any increases in woodland would need to be sensitively placed and managed to avoid reductions in delivery of other services such as food production and destroying nationally scarce habitats such as the limestone grasslands.</p> <p>Planting should reflect the local character of the woodlands and support expansion of large-leaved limes within woodlands in the NCA.</p>	<p>Manage existing woodland to increase local timber production increase biodiversity and ensure their long term survival as landscape features.</p> <p>Extend of woodlands in a way that will best improve the habitat network but is sympathetic to the location of other important habitats such as the Magnesian Limestone grasslands and the requirements of species associated with it.</p> <p>Encourage good soil management at harvesting times and when planting new woods.</p>	<p>Timber Provision</p> <p>Biodiversity</p> <p>Regulating water flow</p> <p>Regulating water quality</p> <p>Regulating soil quality</p> <p>Regulating soil erosion</p> <p>Sense of place / inspiration</p>

⁵ National inventory of woodlands and trees, Forestry Commission (2003)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Water availability	Rivers Magnesian Limestone aquifer Soils	<p>The entire NCA overlays the major Magnesian Limestone aquifer. There is generally 'no water available' for additional abstraction from this groundwater resource^{6,7,8}. In addition, there is a small area along the River Went where water resources are 'over licensed'⁹, and in the south of the NCA, to the north of Nottingham, groundwater resources are over abstracted and currently designated as 'water not available for licensing'¹⁰.</p> <p>The Magnesian Limestone aquifer contains Drinking Water Protected Areas that are designated "at risk" because of the level of drinking water required from this NCA and the potential need for extra drinking water treatment being required in this area.</p> <p>A number of major rivers cross this narrow NCA, including the rivers Ure and Nidd in the north and middle, where water resource has been overridden to 'no water available', to ensure adequate flows downstream in the River Ouse at York.¹¹</p> <p>Continued on next page...</p>	Regional	<p>The freely draining lime-rich loamy soils (41 per cent) and the freely draining slightly acid loamy soils (14 per cent) are valuable for aquifer recharge, but good structural conditions to aid water infiltration need to be maintained (aided by increased organic matter content).¹²</p> <p>Infiltration of water can be improved on soils vulnerable to erosion in the area (27 per cent) by avoiding compaction and increasing soil carbon content. Changes in agricultural land management to avoid these practices will improve soil structure and increase aquifer recharge.</p>	<p>Increase areas of grassland and other semi-natural habitats to improve infiltration of water to the aquifer.</p> <p>Improve soil quality and structure through promotion of good soil management practices, such as including fallow in rotations, over-wintering stubble, incorporating livestock grazing to increase organic content.</p>	<p>Water availability</p> <p>Regulating soil erosion</p> <p>Biodiversity</p> <p>Regulating water quality</p> <p>Regulating soil quality</p>

⁶ Swale, Ure, Nidd and Upper Ouse Catchment Abstraction Management Strategy, Environment Agency (March 2004) ⁷ Idle and Torne Catchment Abstraction Management Strategy, Environment Agency (March 2007) ⁸ Wharfe and Lower Ouse Catchment Abstraction Management Strategy, Environment Agency (March 2005) ⁹ Don and Rother Catchment Abstraction Management Strategy, Environment Agency (October 2003) ¹⁰ Lower Trent and Erewash Abstraction Licensing Strategy, Environment Agency (February 2013) ¹¹ Swale, Ure, Nidd and Upper Ouse Catchment Abstraction Management Strategy, Environment Agency (March 2004) ¹² Soils Data, Cranfield University (NSRI) and for the Controller of HMSO 2011

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Water availability cont		<p>... continued from previous page</p> <p>There is 'no water available' from the River Wharfe or Cock Beck, in the middle of the NCA¹³ but there is 'water available' along the lower River Aire within the NCA¹⁴. The River Went, running south of Pontefract, is 'over licensed' but there is 'water available' in the rivers Don and Dearne, which run through Doncaster¹⁵.</p> <p>Surface water resources around Maltby and Dinnington are generally 'over licensed' or have 'no water available'¹⁶. The River Meden, running north of Mansfield, has 'water available' but the River Leen, running south through Nottingham, has 'no water available'¹⁷.</p> <p>There are no major reservoirs in the NCA.</p>				
Genetic diversity	Not applicable in this NCA					

¹³ *Wharfe and Lower Ouse Catchment Abstraction Management Strategy*, Environment Agency (March 2005)

¹⁴ *Aire and Calder Catchment Abstraction Management Strategy*, Environment Agency (May 2007)

¹⁵ *Don and Rother Catchment Abstraction Management Strategy*, Environment Agency (October 2003)

¹⁶ *Idle and Torne Catchment Abstraction Management Strategy*, Environment Agency (March 2007)

¹⁷ *Lower Trent and Erewash Catchment Abstraction Management Strategy*, Environment Agency (March 2008)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Biomass energy	Existing woodlands Soils	<p>There are a total of 12,355 ha of woodland covering 9 per cent of the NCA.</p> <p>There is a medium potential yield for short rotation coppice, with small pockets of high and low potential yield across the NCA. There is generally a medium potential yield for miscanthus, with small pockets of high potential yield throughout the NCA¹⁸.</p>	Local	<p>The current woodland resource provides the potential for the provision of biomass through bringing unmanaged woodland under management and as a by product of commercial timber production.</p> <p>There is potential to accommodate miscanthus and short rotation coppice in arable areas to introduce diversity of structure, colour and texture but any increase in biomass crops needs to be sensitively sited to avoid encroaching upon archaeological features or other historic landscape features, and limestone grasslands, and detracting from the prominence of the limestone ridge.</p> <p>The high population of the Southern Magnesian Limestone and surrounding NCAs could provide a strong local demand for biofuel. Already the NCA has 34 wood boilers and 7 registered suppliers.</p>	<p>Encourage sensitively sited biomass crops within the farmed environment.</p> <p>Consider siting of woodland where it can provide a positive influence on the landscape such as breaking up the outline of industrial, residential and infrastructure developments or providing flood mitigation.</p> <p>Enhance management of existing woodlands to provide local wood fuel services and where this is not harmful to biodiversity and historic features, avoiding areas of important grasslands.</p> <p>Deadwood (and management to retain this) is also an important component of semi-natural woodland for biodiversity as well as nutrient cycling and soil formation which underpin a range of regulating services such as climate, water quality, soil erosion and quality.</p> <p>Promote good soil management techniques during harvesting and planting.</p>	<p>Biomass energy</p> <p>Biodiversity</p> <p>Regulating soil quality</p> <p>Regulating water flow</p> <p>Regulating soil erosion</p> <p>Sense of place / inspiration</p>

¹⁸ Opportunities and optimum sitings for energy crops, Natural England (December 2010; URL: www.naturalengland.org.uk/ourwork/farming/funding/ecs/sitings/areas/030.aspx)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Climate regulation	Soils Woodland, grassland and other semi-natural habitats	There is generally a low soil carbon content of 0-10 per cent throughout ¹⁹ , although there will be a higher soil carbon content under the 11,467 ha of woodland (8 per cent of the area), and under the 2,402 ha of unimproved grassland, grazing marsh, wetland and heathland habitat in the NCA.	Local	Existing woodland cover could be managed to further enable carbon sequestration and storage but generally there is low potential for the area to contribute to climate regulation through sequestration and storage. Increasing woodland and the use of sustainable urban drainage schemes(SUDS) within and around urban and industrial developments and alongside river courses will provide local climate regulation, improving the ability of semi-natural habitats to deal with rising temperatures and reducing the energy requirement for air conditioning. Siting and orientation of buildings can provide real benefits in lifetime energy requirements of those buildings.	Encourage sustainable practices such as matching nutrient inputs to crop need, reduced machinery use, including fallow in rotations and introduce over-wintering stubble in farming to reduce greenhouse gas emissions and increase soil carbon content and improve soil structure. Encourage the incorporation of passive solar design, SUDS and other features into developments to improve new development resilience to climate change and reduce future greenhouse gas emissions. Increase and integrate green spaces and semi-natural habitats into the landscape to provide cooling effects and access opportunities.	Climate regulation Biodiversity Regulating soil erosion Regulating soil quality Regulating water flow Regulating water quality Sense of place / inspiration

¹⁹ Percentage content of organic carbon in the top soil horizon across England and Wales (original data source: NSRI) from 'Land Use and Environmental Services', Environment Agency (July 2009)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating water quality	Magnesian Limestone Aquifer Semi-natural habitats Soils	<p>In regards to Water Framework Directive analysis the ecological potential or status of surface waterbodies in the NCA is generally 'good' with some short river lengths of 'poor' or 'bad' status or potential. The River Wharfe appears to have 'good' chemical status, while the rivers Aire and Don have 'poor' chemical status due to concentration of nitrate and pesticides in the groundwater. In the south of the NCA, the River Leen running into Nottingham is 'failing to achieve good' chemical status. The chemical status of the groundwater aquifers in the NCA is 'poor'.²⁰</p> <p>The Swale, Ure and Nidd and Ouse sections have 'good' chemical status.</p> <p>98 per cent of the area is a Nitrate Vulnerable Zone and the whole area overlies an important aquifer.</p>	Regional	<p>Part of the northern portion of the NCA lies within DEFRA's 'Yorkshire Ouse, Nidd and Swale' Priority Catchment where phosphate pollution, as well as sedimentation of water courses, is a particular issue associated with arable production and dairying, with a target area identified between Bedale and the River Ure²¹ to reduce run-off from farmyards.</p> <p>The matching of nutrient inputs to needs is required to prevent pollution of the water resource²².</p> <p>Good soil management is required especially of those soils which are vulnerable to compaction which can lead to diffuse pollution as a result of surface water run-off.</p>	<p>Encourage creation of permanent grassland buffer strips around agricultural fields and alongside watercourses to help filter ground water run-off, capturing sediment and nutrients before it enters the water system.</p> <p>Support and encourage appropriate use of fertilisers and pesticides, ensuring they are informed by good in-field analysis to reduce the amount used on individual sites.</p> <p>Encourage sustainable soil management such as introducing fallow into rotations, over-wintering stubbles, managing stocking regimes to avoid compaction and reduce erosion.</p>	<p>Regulating water quality</p> <p>Regulating water flow</p> <p>Regulating soil quality</p> <p>Regulating soil erosion</p> <p>Biodiversity</p>

²⁰ Humber River Basin Management Plan, Annex A: Current state of waters, Environment Agency (December 2009)

²¹ Capital Grant Scheme – Funding Priority Statement 2010/11, Catchment 8: Yorkshire Ouse, Nidd and Swale, Natural England

²² Soils Data, Cranfield University (NSRI) and for the Controller of HMSO (2011)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating water flow	Soil Semi-natural habitats Geology	<p>Much of the area of the NCA lies outside of the floodplains of the major rivers reducing the likelihood of rapid flooding onset and increasing predictability in water movement and impacts.</p> <p>With the many main rivers that cross the NCA there is considerable flood risk in places. There is also heightened flood risk at the confluence of rivers such as at Castleford.</p> <p>In the north of the NCA, around Ripon, the hazard of flooding is considered high, and expected to increase²³.</p> <p>The A1 (M) motorway is also at risk of flooding in the north of the NCA, which can lead to major disruption both locally and regionally when the rivers are in flood.</p> <p>Continued on next page...</p>	Regional	<p>The shape and character of the NCA mean that small sections of a high number of rivers flow through it and regulation of water flow within the NCA is largely dependent upon land management practices and activities upstream, for example in the Nottinghamshire, Derbyshire and Yorkshire Coalfields and Southern Pennines. Climate change is likely to exacerbate the frequency and intensity of flood flows.</p> <p>The Environment Agency supports the delivery of wetland creation and washland management in the north of the NCA to alleviate flooding along the A1 (M) and nearby towns. This includes the creation of multi-purpose washlands for flood management, wildlife and local communities at sites such as Snape Mires (east of Snape in the far north of the NCA). The EA also aims to deliver flood risk management benefits and habitat creation from a study to optimise washlands on key rivers in this area, including the Nidd and Ure²³. There are controlled washlands upstream (north) of Castleford at the confluence on the rivers Aire and Calder, whose function is to reduce flood levels through Castleford and for areas further downstream²⁴.</p>	<p>Encourage whole catchment approach to flood management to ensure work upstream outside of the NCA, such as in the South Pennines NCA, has positive impacts on habitats and communities within this NCA for example through improved infiltration and moderation of flood flows.</p> <p>Seek opportunities to create new washlands to increase water storage, moderate flows and provide a more natural solution to flood alleviation, especially along the Nidd, Ure and Erewash.</p> <p>Encourage the re-naturalisation of water courses where possible, especially along the headwaters of the Erewash, thus allowing natural geomorphological processes and encouraging the creation of a range of river and wetland habitats and linking them through green corridors within the urban environment.</p>	<p>Regulating water flow</p> <p>Regulating water quality</p> <p>Biodiversity</p> <p>Regulating soil quality</p> <p>Regulating soil erosion</p> <p>Sense of place / inspiration</p>

²³ Ouse Catchment Flood Management Plan, Environment Agency (July 2010)

²⁴ Aire Catchment Flood Management Plan, Environment Agency (July 2010)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating water flow cont		<p>... continued from previous page</p> <p>In Doncaster flood risk is considered 'significant'²⁵ while to the south of Doncaster there is less risk of fluvial flooding.</p> <p>There is low flood risk from the River Torne which rises south of Doncaster near Tickhill.</p> <p>At the southern end of the NCA, around Nottingham, there is a risk of flooding from the headwaters of the River Erewash, although the impact on people and property is considered relatively small²⁶.</p>		<p>Flood alleviation schemes are proposed at Ripon, Knaresborough and Tadcaster. The town of Boroughbridge currently relies on flood defences to protect almost 200 properties in the south of the town; the number of properties at risk is expected to increase to 300-500 properties in the future, dependent upon the condition of defences.</p> <p>In order to reduce flood risk in the south of the NCA along the River Erewash the EA encourages sympathetically regenerating river corridors through urban areas, including Nottingham; the use of farmland to reduce flood risk whilst improving and creating natural habitats; and in general to reduce reliance on hard defences and restore watercourses to a good geomorphological river status where appropriate²⁷.</p>	<p>Manage existing washlands and establish wetland habitats, especially wet grassland, thus reconnecting the watercourses to their surrounding habitats.</p> <p>Encourage the creation of more areas of semi-natural habitats in areas where this will have most impact to reduce cross ground water flow and improve infiltration rates.</p>	

²⁵ Don Catchment Flood Management Plan, Environment Agency (July 2010)

²⁶ River Trent Catchment Flood Management Plan, Environment Agency (December 2010)

²⁷ River Trent Catchment Flood Management Plan, Environment Agency (December 2010)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating soil quality	Geology Soils Semi-natural habitats	<p>There are 9 main soilscape types in the NCA.</p> <p>Freely draining lime-rich loamy soils make up 41 per cent</p> <p>Slowly permeable seasonally wet lightly acid but base-rich loamy and clayey soils account for 14 per cent.</p> <p>Slowly permeable seasonally wet acid loamy and clayey soils account for 13 per cent.</p>	Local	<p>Freely draining lime-rich loamy soils are typically of moderate depth and droughty but due to their calcareous nature have a degree of natural resilience.</p> <p>The slowly permeable seasonally wet soils may suffer compaction or capping as they are easily damaged when wet. In turn this may lead to increasingly poor water infiltration and diffuse pollution as a result of surface water run-off. Management measures that increase organic matter levels can help reduce these problems.</p>	<p>Encourage best practice agricultural management to maintain and improve soil structure and quality such as use of over-wintering stubbles, minimum cultivation and increasing extent of permanent grasslands.</p> <p>Encourage appropriate machinery use and timing and stock management on sites to reduce risk of soil compaction.</p>	<p>Regulating soil quality</p> <p>Regulating soil erosion</p> <p>Food provision</p> <p>Regulating water quality</p> <p>Regulating water flow</p> <p>Biodiversity</p>

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating soil erosion	Soils Semi-natural habitats	<p>Part of the north of the NCA lies within Defra's 'Yorkshire Ouse, Nidd and Swale' Priority Catchment.</p> <p>The freely draining lime-rich loamy soils that cover approximately 41 per cent of the NCA are particularly at risk of erosion, especially on sloping land when cultivated or bare soils are exposed (as in outdoor pig rearing). These have enhanced erosion risk where organic matter levels are low after continuous arable cultivation or where soils are compacted; both may also suffer from wind erosion.</p> <p>Those soils at low risk of erosion are the freely draining and loamy and clayey floodplain soils, the slowly permeable seasonally wet soils, and the loamy soils with naturally high groundwater together covering some 32 per cent of the NCA.</p>	Local	<p>Soil erosion in the north of the NCA from arable production and outdoor pig rearing over sandy and clay soils can lead to sedimentation of water courses²⁸. These problems of soil erosion and sedimentation are exacerbated by the soil types that cover approximately 57 per cent of this NCA, which are susceptible to soil erosion.</p> <p>The slightly acid loamy and clayey soils with impeded drainage (covering 9 per cent of the area) are prone to capping/slaking, leading to increased risk of erosion by surface water run-off, especially on steeper slopes. These soils are easily compacted by machinery and livestock if accessed when wet.</p> <p>Priorities in this catchment include reducing sediment losses with a target area of particular importance identified between Bedale and River Ure²⁹.</p>	<p>Encourage the establishment of grass buffer strips alongside watercourses and on slopes in areas of arable production to capture sediment run-off from arable crops especially during the autumn and winter, especially along the Ure.</p> <p>Encourage the creation of woodland, scrub and permanent grassland on sloping land to help bind the soil and reduce erosion.</p> <p>Manage woodlands by selective felling and maintaining continuous cover, especially on sloping land.</p> <p>Encourage farming businesses to adopt practices which reduce soil erosion such as minimum tillage, and appropriate grazing management.</p>	<p>Regulating soil erosion</p> <p>Regulating soil quality</p> <p>Regulating water flow</p> <p>Regulating water quality</p> <p>Biodiversity</p> <p>Food provision</p>

²⁸ Capital Grant Scheme – Funding Priority Statement 2010/11, Catchment 8: Yorkshire Ouse, Nidd & Swale, Environment Agency

²⁹ Soils Data, Cranfield University (NSRI) and for the Controller of HMSO (2011)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Pollination	Semi-natural habitats, in particular limestone grassland Field margins	The unimproved grasslands and ancient woodlands in the NCA harbour a rich flora, with associated scrub being important for insects ³⁰ . Existing grassland and lowland heathland totalling over 2500 ha (1 per cent of the NCA area) provide nectar sources for pollinating insects.	National	Grassland and heathland habitats within the NCA are fragmented and limited in extent. An increase in habitat area and better connectivity would increase the resource for pollinator species and increase the delivery of this service to insect pollinated food crops. Pollinators will be particularly important for pollination of oilseed crops and an increase in hedgerow and field margin size and diversity could increase pollination within the arable environment.	Increase and connect areas of semi-natural habitats, in particular flower rich Magnesian Limestone grasslands. Manage hedges, introduce permanent grass field margins, and manage road verges to enhance species richness and thus improve the permeability of the farmed landscape with habitats that support pollinating insects.	Pollination Biodiversity Sense of place / inspiration Food provision Regulation of water flow Regulation of water quality Regulation of soil quality

³⁰ Natural Area Profile 23: Southern Magnesian Limestone, Natural England (December 2010)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Pest regulation	Semi-natural habitats Field margins	Semi-natural habitats are mainly present in small, fragmented patches across the NCA.	Local	<p>Increasing semi-natural habitats, particularly species rich (Magnesian Limestone) grassland will increase the extent of habitat that supports pest regulating species.</p> <p>Diverse field margins and field corners can contain important species supporting pest regulators close to the agricultural crops, thus reducing the need to use chemicals.</p>	<p>Encourage the creation of species rich grassland and other semi-natural habitat, especially where creating a network through the farmed areas.</p> <p>Increase diversity and area of field margins to support pest regulating species and contribute to long term sustainable farming.</p>	<p>Pest regulation</p> <p>Food provision</p> <p>Biodiversity</p> <p>Regulating water quality</p> <p>Regulating water flow</p> <p>Regulating soil quality</p> <p>Regulating water flow</p>

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
A sense of place/ inspiration	<p>Limestone ridge</p> <p>Agricultural landscape</p> <p>Large park estates and associated woodlands</p> <p>River valleys</p>	<p>A sense of place is provided by the distinctive rolling landform of this low limestone ridge, with its escarpment in the west and gently dipping down to the east. The ridge is, in places, dissected by the valleys of several main rivers some of which run through dramatic river gorges overhung with woodland, some valleys are dry. The area has a strong agricultural character reflecting the high quality soils, with predominantly intensive arable farmland with small areas of permanent pasture on steeper slopes and in narrow valley bottoms.</p> <p>This open, arable rolling farmland and associated estate woodland also contrasts with localised areas of enclosed gorges, with deciduous woodlands and small pockets of pasture which provide limestone rich grassland.</p> <p>Continued on next page...</p>	Regional	<p>There is strong sense of place linked with the open arable landscape that is very much in contrast to the more industrialised areas in the Coalfields NCA to the west.</p> <p>The limestone ridge is important for providing sense of place in its own right, especially the dramatic escarpment edge from the historic Hardwick Halls, past Bolsover Castle along to Barlborough. The underlying limestone also influences habitats. For example limestone rich grasslands provide a unique habitat from the areas surrounding the NCA.</p> <p>The management of historic parks and estates to provide access and recreation for people to be inspired by the landscape.</p>	<p>Increase access opportunities for people to learn about the history of the landscape.</p> <p>Increase areas of Magnesian Limestone grassland and connect existing fragments to provide a more resilient network of this habitat type.</p> <p>Seek opportunities to encourage people from surrounding urban areas into the NCA to the historic parks, estates and archaeological sites and provide interpretation to enhance their understanding of the links between geology, history and today's landscape.</p> <p>Maintain views out from the ridge, and of the ridge itself, including the contrasts between open rolling arable land and small woodlands of estates.</p> <p>Maintain the rural sky line and edge of the escarpment which in places provides the setting for historical buildings and associated parkland.</p>	<p>Sense of place / inspiration</p> <p>Biodiversity</p> <p>Food provision</p> <p>Recreation</p> <p>Sense of history</p> <p>Geodiversity</p>

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
A sense of place/ inspiration cont		<p>... continued from previous page</p> <p>A lack of hedgerow trees and low, flailed hawthorn hedges adds to the open character of this farmed land which contrasts strongly with areas of significant woodland cover, much of it based on the many large estates and parklands.</p> <p>Some valleys create small intimate landscapes, such as the Skell valley which contains Studley Royal and Fountain's Abbey (now World Heritage Sites), which contrasts with the open arable ridge. In addition the unique quality of the ground water, influenced by underlying limestone and gypsum bedrock has contributed to the development of breweries for example at Tadcaster and spas for example at Boston Spa.</p>		<p>Senses of inspiration and escapism are associated with the elevated and exposed ridge where there are long views across the surrounding lowland and the river valleys. Many of the abbeys, country houses and parklands provide inspiration linking visitors to past ways of living. The rural and woodland areas are also valued for the sense of 'escapism' they provide, in contrast to the industrial settlements³¹.</p>		

³¹ *Countryside Character descriptions, Volume 3: Yorkshire & the Humber, Countryside Commission (1998)*

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Sense of history	Geology	1 World Heritage Site	National	Aspects of history that are likely to be particularly evident to the general public are the remains of a number of great abbeys such as Fountain's Abbey, which forms part of the Studley Royal estate World Heritage Site, and a large number of later country houses and estates with designated parklands and woodland, including Bedale Hall, Newby Hall, Bramham Park, Hardwick Halls, Ledston Hall and Lotherton Hall. There are also remains of key defensive structures along key river routes that cut across the ridge for example at Conisbrough and Mexborough. Evidence of a more recent industrial past is revealed in coal mining along the west side and quarries for the extraction of limestone.	Protect the archaeological resource by promoting appropriate land management, managing impacts of cultivation and access, and controlling encroachment of damaging vegetation. Protect historic features and their settings, especially where understanding of historic evidence needs to be read within the wider landscape context. Seek opportunities to raise awareness of the rich historic evidence within the area, by providing access and interpretation where appropriate. Protect and bring under sound management the many designed parklands and estates, so that key historic features are retained while meeting the needs of 21st-century society, providing access and interpretation where possible.	Sense of history Sense of place / inspiration Recreation
	Archaeology – settled caves and henges	26 Registered Parks and Gardens (cover 3,431 ha)				
	Abbeys, country houses, parks and estates	3 Registered Battlefields (cover 405 ha)				
	Industrial features	156 Scheduled Monuments (113 of these are at risk)				
	Local limestone used in buildings	The time depth of the landscape is evident, going from the internationally important Palaeolithic evidence of occupation in the caves at Creswell Crags and the Neolithic barrows and monuments at Thornborough Henges, to 20th-century mining and new industrial uses. There is evidence of bronze-age and iron-age settlements and hillforts; while Roman influence is seen through settlements and the Roman roads (Dere and Ermine Streets formed the basis for the route of the existing A1). Later, monasteries established large estates based on sheep grazing, such as at Fountains, Welbeck, Roche and Newstead Abbeys.				
		Continued on next page...				

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Sense of history cont		<p>... continued from previous page</p> <p>The historic settlement pattern varies throughout the area with a strong pattern of nucleated medieval limestone villages evident in the north, east and south, more traditional mining towns and villages to the west, medieval market towns (including Ripon, Knaresborough and Pontefract), and farmsteads dispersed throughout the landscape. Smaller irregular fields enclosed by limestone walls are located around the edges of villages.</p> <p>Historic character is further reinforced through the use of local limestone combined with brick and stone cobbles, with red pantile roofing, for farms and in villages; in places these sit next to bolder brick and slate terraces which housed the expanding industrial population.</p>				

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Tranquillity	<p>Semi-natural habitats</p> <p>Limestone ridge</p> <p>Historic abbeys, country estates, parklands and woodlands</p> <p>Agricultural landscape</p> <p>River valleys</p>	<p>Areas of undisturbed land have decreased from 57 per cent in the 1960s to 17 per cent in 2007, particularly influenced by the strong road network radiating from the central spine of the A1 (M) which is such a feature in this area³².</p>	Local	<p>This area has experienced a significant reduction in tranquillity.</p> <p>Densely settled areas around Nottingham, Doncaster and Pontefract and industrial influences such as mines, spoil tips, transport routes and power lines, particularly in the Aire and Don valleys and along the Coal Measures fringe, all reduce perceptions of tranquillity.</p> <p>However there are some important localised resources of tranquillity particularly in the rural north of the area, in the Derbyshire section and in some of the large parklands and estates, and along the narrow river valleys.</p>	<p>Protect areas with higher tranquillity from intrusion such as from new developments and infrastructure.</p> <p>Retain the contrasts between the quieter rural areas and the busy developed areas, by concentrating new developments within existing urban centre and controlling light pollution.</p>	<p>Tranquillity</p> <p>Sense of place / inspiration</p> <p>Sense of history</p> <p>Biodiversity</p>

³² Tranquillity mapping data, CPRE (2007)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Recreation	<p>Large estates and parklands</p> <p>Long distance routes such as Trans Pennine Way</p> <p>Semi-natural habitats</p> <p>River corridors</p> <p>Access routes</p>	<p>The NCA offers a network of Rights of Way totalling 1,523 km at a density of 1.11m per km² (including the Trans Pennine Trail and Ebor Way). While there is little open access land as defined by the CROW Act, with just 116 ha (0.06 per cent of the NCA) available, there are other access opportunities provided by Local Nature Reserves (574 ha), country parks (320 ha), and National Trust sites (128 ha) along with many accessible woodlands with 2,066 ha of Woods for People.</p>	Local	<p>The large parklands and estates provide open areas for recreation. Most of the open access land falls outside of CROW Act definitions and the formalisation of this land would help safeguard this resource.</p> <p>Providing good access routes from settlements within and in neighbouring NCAs to sites of archaeological, historic and geological importance will help increase engagement and understanding of these features.</p> <p>Links to the long distance trails is also important for encouraging recreation within the outdoors.</p>	<p>Seek opportunities to increase the amount of accessible land, in particular through incorporating green infrastructure in new residential and industrial developments.</p> <p>Seek opportunities to develop the networks of rights of way, especially those linking urban settlements to surrounding countryside and the Trans Pennine and Ebor Ways, and creating riverside routes where appropriate.</p>	<p>Recreation</p> <p>Sense of history</p> <p>Sense of place / inspiration</p> <p>Biodiversity</p>

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Biodiversity	<p>Magnesian Limestone grasslands</p> <p>Semi-natural habitat such as woodlands and grasslands</p> <p>Species</p> <p>Soils</p> <p>Rivers and streams</p>	<p>Kirk Deighton SAC (4 ha) is an important site for great crested newts.</p> <p>There are 51 SSSI sites (covering 1,314 ha) with over half (55 per cent) in favourable condition. There are also 166 local sites covering a further 1,799 ha.</p> <p>The NCA supports part of the very limited Magnesian Limestone grassland that supports a high species diversity of flora and fauna particularly invertebrates. Also a number of limited species such as the Yorkshire Broomrape that is mainly found within this NCA.</p> <p>There are also a high proportion of nationally scarce large-leaved lime woodlands.</p>	National	<p>The NCA has a relatively high woodland cover and there are opportunities to increase. Any new woodland cover will need to be done sensitively to avoid damage to landscape character, other semi-natural habitats and historic features. Consideration should be given to increasing native broadleaved woodlands in particular large leaved lime.</p> <p>The network of nationally rare Magnesian Limestone grasslands is fragmented and patchy. Increasing areas of this grassland, particularly where it increases current areas and links existing patches, will enhance the special biodiversity associated with this habitat, such as pasque flower, wild candy-tuft, brown argus and Duke of Burgundy butterflies, and improve its resilience to climate change.</p> <p>The presence of field margins and unfertilised field corners are important to support assemblages of farmland birds, such as corn bunting, grey partridge, lapwing, turtle dove, tree sparrow and yellow wagtail, many of which have seen declines in recent years.</p>	<p>Where spatially appropriate expand areas of the rare Magnesian Limestone grassland and restore existing areas to improve the network. Encourage the expansion of the use of traditional habitat management of the grasslands with appropriate levels of livestock grazing.</p> <p>Protect watercourses with grassland buffer strips to reduce run-off of nutrients in built up and agricultural areas. Protect waterways from invasive species and manage the network to reduce impact on native species such as great crested newts.</p> <p>Expand areas of woodland and semi-natural habitats to create a permeable network across the NCA to aid species migration and provide more resilience to important areas of habitat in terms of climate change.</p> <p>Promote farmland practices such as use of field margins and corners and over wintering stubble to support populations of farmland birds that are important in the area.</p>	<p>Biodiversity</p> <p>Sense of place / inspiration</p> <p>Recreation</p> <p>Geodiversity</p> <p>Regulating soil quality</p> <p>Regulation soil erosion</p> <p>Regulating water flow</p> <p>Regulating water quality</p>

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Geodiversity	Underlying geology Limestone pavement Soils	<p>There are 13 geological SSSI within the NCA and a further 2 mixed SSSI along with 70 local geological sites.</p> <p>The solid geology of the NCA is predominantly Permian Dolomitic Limestone of the Zechstein sequence, which can be seen where river valleys have cut through the limestone.</p> <p>The limestone is made up of a lower Cadeby formation, which shows reef formations, and an upper Brotherton formation, separated by the Edlington formation which contains evaporite layers.</p>	National	The underlying geology of the NCA provides a strong character for the NCA and has impacted on the settlement patterns and industries that have grown up here. The prevalence of quarries and mines is a result of the presence of coal, limestone, sand and gravels as locally abundant resources.	<p>Manage and protect important geological sites and seek to improve access and interpretation of these sites to improve understanding of the features and their impact on the landscape, particularly as part of restoration of mining sites.</p> <p>Promote opportunities to raise awareness of linkages between geology, landform and soils.</p>	<p>Geodiversity</p> <p>Sense of place / inspiration</p> <p>Sense of history</p>

Photo credits

Front cover: Barnburgh Cliff in Doncaster showing the open, farmed landscape of the NCA and the limestone ridge in the distance.

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