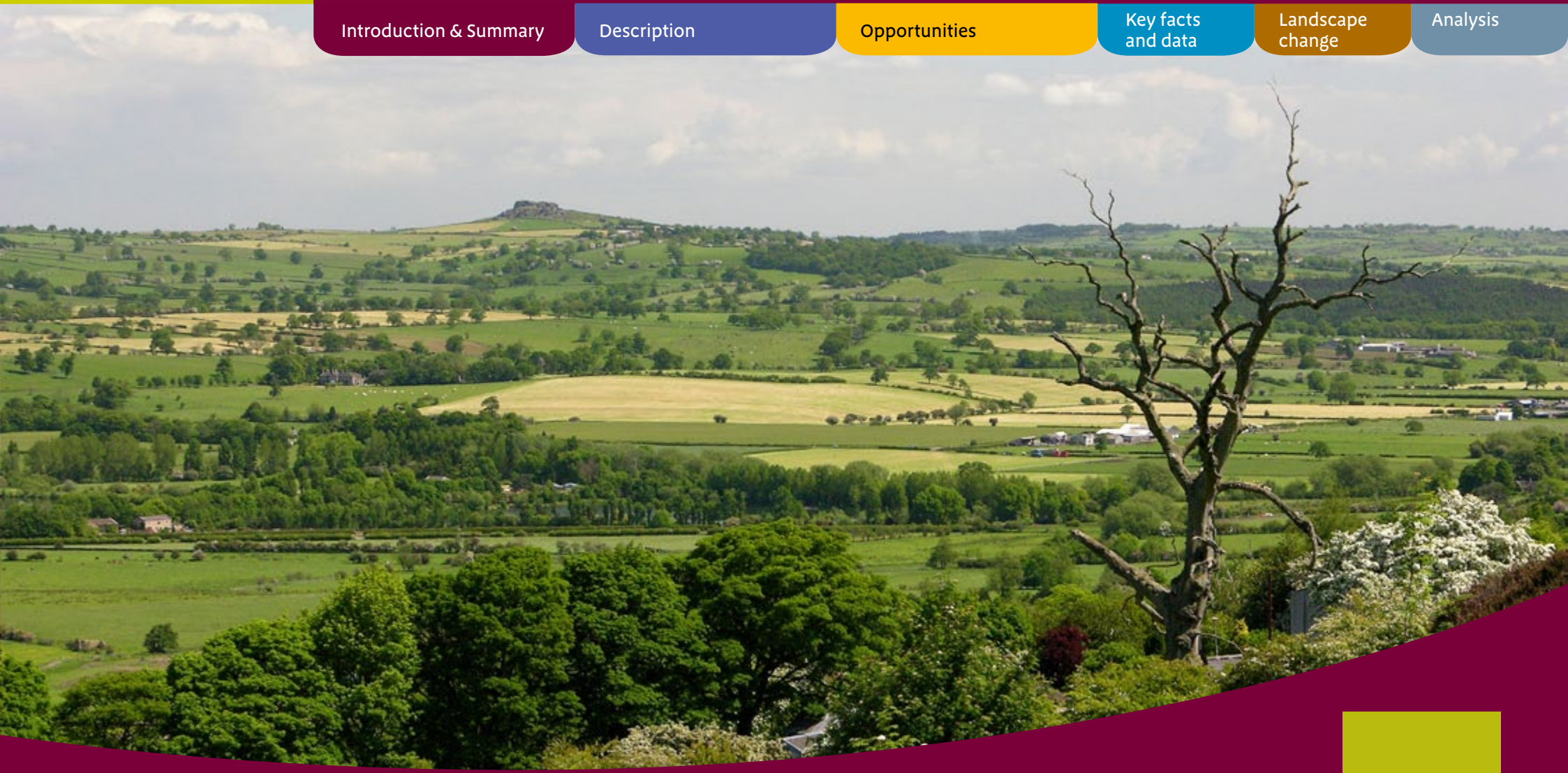
National Character Area profile:

22. Pennine Dales Fringe

Supporting documents



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Introduction

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

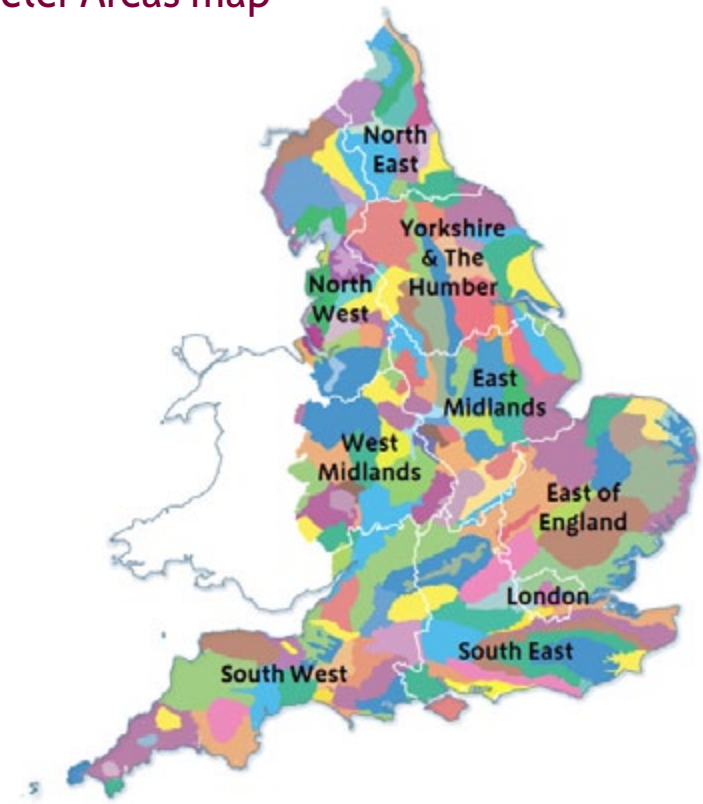
NCA profiles are guidance documents which can help communities to inform their decision-making about the places that they live in and care for. The information they contain will support the planning of conservation initiatives at a landscape scale, inform the delivery of Nature Improvement Areas and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

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

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

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

National Character Areas map



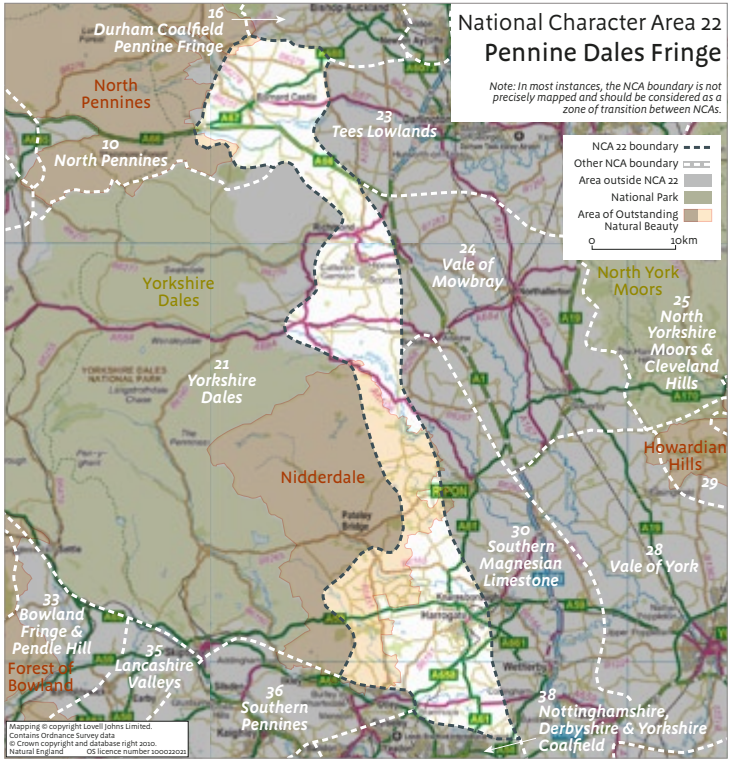
[1] The Natural Choice: Securing the Value of Nature, Defra (2011; URL: www.official-documents.gov.uk/document/cm80/8082/8082.pdf)
[2] Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services, Defra (2011; URL: www.defra.gov.uk/publications/files/pb13583-biodiversity-strategy-2020-111111.pdf)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

Summary

The Pennine Dales Fringe National Character Area (NCA) lies between the uplands of the Pennines to the west, and the Magnesian Limestone ridge and arable lowlands to the east. Almost 23 per cent of the area falls within the Nidderdale Area of Outstanding Natural Beauty (AONB) and almost one per cent in the North Pennines AONB. The land has a varied topography of exposed upland moorland fringes and plateaux dropping to lower foothills, separated by major river valleys and incised by numerous minor tributary valleys. It is underlain by Yoredale rocks in the north (limestone, sandstone and mudstone) and Millstone Grit in the south. It is a transitional landscape between upland and lowland. Drystone walls are common in the west while hedges, often thick and tall with frequent hedgerow trees, are more prevalent at lower elevations in the east. Broad valleys, widening to the east, with their more fertile soils support arable crops, while steeper, higher land in the west supports predominantly livestock farming.

Broadleaved woodlands (many of them of ancient origin), coniferous and mixed plantations, and numerous small woods and hedgerow trees all contribute to the well-wooded character of the area. Hamlets, villages and small market towns are particularly distinctive, with strong visual unity, being built in local Millstone Grit Group and Yoredale Group stone in the west and Magnesian Limestone in the east.

The NCA provides a range of ecosystem services, particularly in relation to food provision, water availability, sense of history and recreation. Food is provided by livestock and mixed farms, many of which supply local markets through farm shops and local restaurants. There is good availability of water, from the area's major rivers and reservoirs. Rich prehistoric and Roman archaeology, alongside many historic parklands with mature and often veteran trees, contribute to a strong sense of history. There are many high-quality recreation opportunities, particularly associated with historic parklands, country houses, quiet lanes, reservoirs and major rivers. The spa town of Harrogate is the largest settlement in the area and a popular tourist destination. There are a number of areas where there is high flood risk to residential areas, farmland and transport routes, and opportunities to mitigate this risk should be explored.



Click map to enlarge; click again to reduce.

Statements of Environmental Opportunity

- **SEO 1:** Protect and connect native broadleaved woodland, parkland and veteran trees to maximise their value for wildlife, flood risk alleviation, water quality, climate regulation, recreation, sense of place and sense of history.

- **SEO 2:** Encourage management of farmland to retain the pastoral and mixed agricultural character and to benefit biodiversity and the wider environment while maximising the value of food production.

- **SEO 3:** Protect the area's rich historic environment and geodiversity and manage development pressure to preserve tranquillity, sense of place and sense of history, and to enhance recreational opportunities.

- **SEO 4:** Protect and enhance the area's many major rivers, riparian habitats and wetlands to reduce flood risk, improve water quality and conserve the valuable contribution they make to sense of place, biodiversity, recreation and sense of history.

A transitional landscape ranging from moorland fringe to valley floodplain, with livestock grazing and drystone walls dominating on higher ground to the west.

Description

Physical and functional links to other National Character Areas

The Pennine moorlands form a physical and visual barrier to the west of the National Character Area (NCA). The eastward slope of the land means that the majority of long-distance views are to the low-lying flood plains and Magnesian Limestone ridge to the east, and on clear days across to the dramatic western escarpment of the North York Moors. The two NCAs immediately north and south of this – Durham Coalfield Pennine Fringe and Nottinghamshire, Derbyshire and Yorkshire Coalfield – have a very different character arising from much more intensive industry based around more accessible coal seams. The Southern Magnesian Limestone NCA borders this NCA to the east.

The NCA includes the mid sections of the rivers Tees, Swale, Ure, Nidd, Wharfe and Washburn. These major rivers rise in the Pennine uplands to the west, and flow through the area to drain into the low-lying Vale of York, Vale of Mowbray and Tees Lowlands to the east. Natural links with other NCAs include important feeding and nesting territory on the area's rough grassland for wading birds associated with the Yorkshire Dales and the North Pennines. Reservoirs along the Nidd and Washburn supply water to Leeds and other conurbations, and rivers supply water to other communities downstream. Transport links include a number of major roads including the A66, A684 and A59, connecting major settlements to the east and west of the Pennine uplands. Several long-distance walking routes pass through the area, including the Coast to Coast path, Ebor Way, Nidderdale Way and Teesdale Way. The area provides some renewable energy to the national grid from 82 MW wind turbines at Knabs Ridge, west of Harrogate.

Almscliff Crag is the area's only geological Site of Special Scientific Interest.

Key characteristics

- Side slopes of Pennine Dales uplands, predominantly sloping down to the east, but with locally varied topography formed by several significant river valleys running from west to east, including the Wharfe, Washburn, Nidd, Ure, Swale and the broad vale of the Tees.
- A transitional landscape between the Pennine uplands to the west and the low-lying fertile landscape of the Vale of York to the east; mainly pastoral in the west, with rough grazing on the moorland edge, merging into mixed farming, with arable on the lighter soils in the east.
- A well-wooded landscape, with woodland along valleys, many copses and plantations on the side slopes, and hedges with hedgerow trees in the lower-lying arable areas.
- Several historic parklands, with woodlands and veteran trees.
- Field boundaries of drystone walls on higher ground and hedges in lower areas.
- A generally tranquil and rural area, with a distinctly ancient character in some parts, with several small, historic market towns including Kirkby Malzeard, Middleham, Masham, Richmond and Barnard Castle, linked by a network of minor roads.
- Vernacular buildings predominantly built of Millstone Grit, mingling with Magnesian Limestone in the east, with roofs of stone flags, Welsh slate and some pantiles, creating strong visual unity to rural settlements and farmsteads.
- Many rivers, including the Tees, Ure, Nidd and Wharfe, forming important landscape features along with their broad, glacially widened valleys. Smaller rivers, such as the Burn, Laver, Kex Beck and the Skell flow through steep-sided valleys following courses cut by glacial meltwaters.
- The well-wooded valley of the River Washburn has been dammed to create a series of reservoirs, and provides a popular recreation destination for those living in the Leeds conurbation.
- Historically rich area with many parklands, abbeys and historic buildings, well visited by adjacent urban populations, as well as medieval and Roman earthworks.

Historic market towns are a feature of the area, many still with historic buildings belying their importance for local trade, such as Barnard Castle Butter Market.

Pennine Dales Fringe today

The landform slopes from west to east, incised by river valleys to form contrasting exposed plateaux, small enclosed valleys and broad river valleys. Topography and geology vary throughout the area, with Yoredale Series (limestones, sandstones and mudstones) in the north and Millstone Grit Series (sandstones and mudstones) in the south. Several major rivers run from west to east across the NCA, rising on the high ground of the Pennines and draining into the lowlands to the east. Narrower valleys tend to hold small-scale intimate landscapes with widespread woodland and, in the east, there is a dense hedgerow network with many mature trees. Broader valleys along the main rivers (Tees, Ure, Nidd and Wharfe), widened by glaciers and their meltwaters, create an open and gently undulating landscape with arable crops grown on the lower-lying, more fertile land to the east. The Washburn Valley, which joins the Wharfe near Otley, cuts deeply into the sandstone plateaux serving as host for the numerous reservoirs built along its course. The high exposed ridges, such as Forest Moor near Harrogate, have a more open, windswept feel as field sizes are larger, boundaries more compact (in the form of drystone walls), farmsteads more widely distributed and there are few trees.

Agriculture is dominated by livestock grazing on the higher, more marginal land to the west, where farmland is a mixture of rough grazing pasture on the moorland edge, and more improved grazing land and silage fields on lower land. To the east of the NCA the soils become lighter, better drained and more fertile, and climatic conditions are more suited to arable production, so the landscape is characterised by mixed and arable farming.

This is a well-wooded area, with woodlands along the river valleys, several small plantations and many historic parklands, although trees are largely absent from the ridges and plateaux. It has retained a large area of ancient woodland and has many plantations on ancient woodland sites. Woodland strengthens the visibility of the river valleys, making an important contribution to landscape character. The wooded river valleys also provide valuable wildlife movement corridors that

Many major rivers, such as the River Nidd, drain out of the Pennines to the west, to run through broad river valleys and into the lowland floodplains to the east.

link the lowlands in the east to the higher ground in the west. Veteran trees, in parkland, fields and hedgerows, are notable features in the landscape and of very high biodiversity value.

The NCA's river valleys support many small wetlands, which are of great value for biodiversity and to a small extent flood mitigation and protection of water quality, and a small number of very rare and species-rich hay meadows, the value of which is recognised by inclusion in the North Pennine Dales Meadows Special Area of Conservation (SAC). The lower slopes of the hills have large areas of rough grazing and unimproved pasture, some of which are important feeding grounds for wading birds. The highest ground to the west of the NCA includes further areas of unimproved rough grassland and upland heathland habitats. The importance of these is recognised through their inclusion in the North Pennine Moors Special Protection Area (SPA)/SAC, designated for its wading birds, hen harrier, merlin, moorland habitats and oak woods. The rivers and streams of the area are particularly important wildlife assets, supporting populations of otter and salmon. The area is particularly notable for three very rare species: the black grouse, the hen harrier and the chestnut-coloured click beetle (one of only two sites in England where it is known to occur).

Historic parklands, such as at Aske Hall and Harewood House, are particularly characteristic and important features of the area, both in terms of their historic cultural value and their importance for recreation, as well as for the rare wildlife that their ancient trees support. There are many grand country houses and castles, such as Ripley, Middleham and Richmond castles, which are very popular visitor attractions in the area. Due to its network of rivers the NCA is very rich in historic features such as water control structures, bridges and mill buildings, many of which are listed buildings. Traditional farm buildings built of local gritstone are distinctive features scattered along valleys and valley sides. The NCA is also rich in Romano-British and medieval sites, including the remains of shrunken and deserted villages and (as ridge and furrow) their field systems.

Settlement retains a very nucleated pattern, with hamlets and villages radiating out from historic market towns such as Masham, Richmond and Barnard Castle. Many are connected by a network of narrow, winding country roads and are alongside the area's major rivers. There are some areas of dispersed settlement, with isolated farmsteads and hamlets set within landscapes of 17th-century and earlier enclosure. The spa town of Harrogate is the NCA's most substantial settlement, with its grand Georgian buildings around a large open grassland common. Millstone Grit is predominantly used for buildings and walling, giving strong visual unity to villages, mingling with Magnesian Limestone as a building material to the east. Roofs are generally of stone flag (sandstone), Welsh slate and pantile. There is little primary industry in the area, with the exception of agriculture and aggregate extraction, with active quarries at Leyburn (Carboniferous Limestone) and Marfield (sand and gravel). Tourism and military training are important to the local economy, with Catterick Garrison, the British Army's largest training camp, situated in the NCA.

The Pennine Dales Fringe NCA provides excellent opportunities for recreation in an attractive, small-scale, verdant landscape. The beauty of a large part of the NCA (24 per cent) is recognised by inclusion in the Nidderdale and North Pennines Areas of Outstanding Natural Beauty (AONBs). The river corridors, historic parklands, woodlands, reservoirs and upland heathlands are particularly valuable assets that attract many visitors. Several long-distance routes pass through the area, including the Coast to Coast path, Ebor Way, Nidderdale Way and Teesdale Way long-distance paths. Around two-thirds of the NCA is classified as 'undisturbed', with river valleys, woodland and parkland particularly important for their sense of tranquillity.

The landscape through time

The NCA is underlain by Carboniferous strata in the form of the Bowland Shale Formation (Craven Group) in the Harrogate Anticline, the Yoredale Group (around Leyburn and north of Richmond), the Millstone Grit Group, the Pennine Coal Measures Group (around Winksley) in the west, and small outcrops of Permian Magnesian Limestone (Zechstein Group) in the east. Since most of this area was marginal to the ice of the last glaciations, the glacial influence on the landscape is large. Glaciation and weathering of the underlying Millstone Grit has resulted in wide, steep-sided valleys with sandstone steps along their sides. During the last glaciation the River Ure was blocked by ice and diverted into a more southerly course through Masham. Several other smaller rivers, in deep steep-sided valleys – such as the Burn, Laver, Kex Beck and the Skell – follow courses cut out and deepened by glacial meltwater. Erosive action by valley glaciers and their meltwater also widened the valleys of the Tees, Ure, Nidd and Wharfe.

Glacial till covers much of the land and increases in thickness and extent of cover towards the north and east of the NCA. Resistant sandstones cap the hills and form wide, open areas commonly covered in glacial boulder clay. Where the rocks are bare, erosion of sandstone has resulted in naturally sculpted forms such as Almscliff Crag. Landslips in the soft shales form hummocky ground along the Wharfe Valley east of Otley. The Washburn Valley, which joins the Wharfe near Otley, cuts deeply into the sandstone plateaux and forms an ideal host for the numerous reservoirs that have been built along it.

The early history of the area has been revealed in part by discovery of Mesolithic and Neolithic stone tools and flint scatters, and extensive and well-preserved evidence of bronze- and iron-age settlement. An impressive collection of prehistoric carved rocks is found on some of the moors in the NCA, particularly

Cistercian abbeys had a dramatic influence on the landscape in the Middle Ages. Fountains Abbey owned vast tracts of land across Yorkshire and beyond. It is now designated as a World Heritage Site along with Studley Royal Park.

in the south-west corner around Snowden Carr, Askwith Moor and Weston Moor. Earthworks and crop marks of enclosed and unenclosed farmsteads with round houses remain as evidence of increased settlement during the Iron Age/Romano-British period. Roman activity left its mark in the precursor to the A66 which ran through the north of the NCA crossing the Pennines via a series of forts at Carkin Moor, Greta Bridge and Bowes. There are remains of a large number of Roman settlements along the route, such as Cataractonium and Greta Bridge, and in adjacent river valleys.

The area retains a strong pattern of nucleated settlements (market towns surrounded by villages, hamlets and scattered farmsteads), with remains of many others still visible as earthwork in pasture. Some of the historic market towns have charters dating from the 12th and 13th centuries, indicating the longstanding importance of agriculture to the local economy. At that time, hunting forests, such as the Forest of Knaresborough, covered much of lower Nidderdale and the upper Washburn Valley. The Chase of Nidderdale covered much of the upper dale and Kirkby Malzeard area. Much of the remaining land was under the control of the abbeys of Fountains and Byland, which established extensive sheep walks and vaccaries (cattle ranches) in the higher valleys. Leasing of this land from the 14th century, and relaxation of traditional hunting forest, stimulated the development of individual farms and hamlets.

During the 17th century there was an expansion of small-scale, home-based linen and wool weaving, along with small-scale dairy farming. This led to the enclosure of small plots immediately adjacent to villages to enable a simple level of subsistence farming. A number of minor gentry houses, country houses and parklands also date from this time, including Constable Burton, located on a medieval deer park.

The area has many historic structures associated with rivers such as bridges and mill buildings.

The 18th century brought extensive planned enclosure of open land under the Parliamentary Enclosure Acts, with hillside pastures divided up into allotments for local farmers. In lowland areas this enclosure retained the shape of medieval furlongs (such as narrow rectilinear fields in Aske and Fearby) in thickly hedged boundaries; while in upland areas it resulted in new landscapes of straight roads and regular large-scale fields, predominantly framed by drystone walls. The spa town of Harrogate developed at this time around dispersed common-edge settlements, and expanded dramatically from the early 19th century, as visitors flocked to take the lime- and sulphur-rich water from springs originating in the Southern Magnesian Limestone, especially after the arrival of the railway in 1848.

The Pennine Dales Fringe NCA is dramatically different to the other areas on the eastern edge of the Pennine fringe, in that it never had significant industrial activity, primarily because of the lack of accessible coal reserves. Ironstone and lead mining did occur, but on a small scale, and were abandoned in the 19th century. Numerous historic limestone quarries can be found around Leyburn, and sandstone quarries west of Harrogate and north of Richmond. The textile industry reached a modest industrial scale in the gritstone valleys of the Tees, Nidd and Washburn, but could not compete with the industrial areas further south in the Pennines and declined from the start of the 20th century, leaving a small-scale legacy of mills and related structures. A number of breweries were established in the 19th and 20th centuries and are still in business, such as Theakston and Black Sheep at Masham, enabled partly by the high quality of the groundwater in the area. The relatively early decline of industry in this NCA means that it retains a much more agricultural and rural feel than similar Pennine fringe NCAs immediately to the north and south.

The narrow valleys, impervious rocks and greater rainfall at higher altitudes made the Nidd and Washburn valleys suitable for the construction of several reservoirs in the late 19th century, and at Thruscross in the 1950s and 60s, to supply the expanding towns and cities of Harrogate, Leeds and Bradford. Many conifer plantations were also planted throughout the 20th century.

The latter part of the 20th century, and early 21st century, have seen a number of small-scale changes in the urban and rural landscape. There has been scattered development around existing towns, particularly around Richmond to the north and the fringes of Leeds to the south, pressure for recreational developments such as caravan parks and golf courses, and conversion of traditional farm buildings to domestic use. Agriculture has intensified, with the loss of some permanent pasture and field boundaries and an increase in farm and field size. However, this is contrasted by restoration of landscape features on farms, such as hedgerows and meadows, funded by agri-environment schemes. There was a contraction in the local livestock industry between 2000 and 2009, with a particularly dramatic reduction in the number of pigs (reduced by 51 per cent) and dairy farms (reduced by 40 per cent).

Ecosystem services

The Pennine Dales Fringe 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 (under the constituent headings). Further information on ecosystem services provided in the Pennine Dales Fringe NCA is contained in the 'Analysis' section of this document.

Provisioning services (food, fibre and water supply)

- **Food provision:** Livestock farming is important in the NCA for meat and dairy production. There is arable farming on lower ground with more fertile, free-draining soils in the east of the area. A strong local market exists for food produced in the NCA with a large number of farm shops, farmers' markets and annual food festivals as well as restaurants and pubs specialising in local produce.

- **Timber provision:** The area is well wooded, although tree cover tends to be in smaller woodlands and plantations. There is one sawmill in the area. There is good potential for woodland expansion. Native broadleaved hardwood species would be most valuable for woodland expansion, in biodiversity terms, although the value of coniferous plantations (both existing and new) can be improved with the inclusion of broadleaved species in key areas, particularly along watercourses, rides, edges, and where they link existing native woodland.

- **Biomass energy:** In 2012 there were 4 wood fuel suppliers and 12 biomass boilers (with a capacity of 5,207 kWh) in the NCA. As the area is relatively well wooded there is also potential to generate woody biomass from the management and thinning of existing woodland, where this is consistent with nature conservation objectives, and also during restocking and felling of coniferous woodland.

This NCA has a high coverage of woodland, particularly along river valleys where areas of ancient native woodland survive.

- **Water availability:** The seven major rivers and several reservoirs, particularly along the River Washburn, provide a good supply of potable water to Harrogate, Leeds and Bradford. The majority of abstractions from the rivers in the NCA are for domestic drinking water supply. There are no major aquifers in the NCA.

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

- **Climate regulation:** The soils of this NCA are mostly of low carbon content (0–5 per cent) but it also has some areas of peaty soil, associated with upland habitats in the west and wetlands, which have a high carbon content of 20–50 per cent. The large areas of woodland will act as a significant carbon store, as will their soils and those associated with the large area of permanent grassland. Opportunities exist to improve the carbon storage in arable soils to the east of the NCA.

- **Regulating water quality:** Water quality in the area ranges from poor to excellent. Assets that help the NCA to maintain good water quality include riparian woodland, wetlands and the high coverage of grassland. The area has good potential for woodland expansion, particularly along river corridors which could help to reduce diffuse pollution and sedimentation of watercourses. New development should incorporate features to ensure that pollutants do not reach watercourses, such as sustainable drainage systems, and existing development and industry could be retrofitted with such features and encouraged to improve infrastructure to minimise risk of pollution incidents.

- **Regulating water flow:** Many of the watercourses within the NCA are associated with high flood risk. This can be attributed in part to the rapid rates of surface flow which occur in neighbouring NCAs to the west during heavy or prolonged periods of precipitation. Although Masham is the only residential area within the NCA with more than 100 houses at risk from flooding, such areas downstream of the NCA include Catterick, Ripon, Boroughbridge and York. Action to reduce flood risk could include restoration of flood plains and water-storing wetland habitats, and creation

A wealth of archaeological sites, along with a large number of historic parklands give the area a strong sense of history.

of riparian habitat with greater surface roughness (such as grassland and woodland) to slow run-off and grip blocking on upland sites, to restore both the hydrology and ecology enabling it to retain increased volumes of water.

Cultural services (inspiration, education and wellbeing)

- **Sense of place/inspiration:** The NCA is a transitional landscape that varies in topography and changes from a lowland to upland character from east to west. Despite this diversity, it has a strong sense of place afforded by the presence of green, rolling hills, many mature trees and small areas of woodland, and many estates and country houses. It is a landscape of inspiring vistas, with those associated with some of the designed landscapes being good examples of the vistas favoured by the 18th-century transition from formal to informal landscaping.

- **Sense of history:** The area is rich in archaeological sites, from prehistoric carved rocks, Roman roads and deserted medieval villages to 18th-century designed landscapes and light industry. Parts of the NCA have a very ancient feel due to large numbers of ancient trees and roads along ancient twisting hollow ways sunk between high banks as a result of centuries of use. The historic settlement pattern is unchanged in many areas, with nucleated villages of local Millstone Grit and limestone and numerous historic market towns, some originating from the 12th and 13th centuries.

- **Recreation:** The area is very popular for recreation, particularly walking, cycling, fishing, canoeing and swimming. It presents many high-quality opportunities for recreation associated with the quality of the natural environment, notably the river corridors, reservoirs, historic parklands and quiet lanes. Measures that could further improve its value for recreation include work to improve water quality in the major rivers, measures to improve safety and manage traffic pressures on smaller roads and provision/promotion of off-road routes for cycling and horse riding.

- **Biodiversity:** The NCA is particularly important for a number of bird species, including hen harrier, lapwing and red kite. The rivers are a very valuable wildlife resource and support a range of priority aquatic and riparian species such as otter, water vole and lamprey. The veteran trees are also important, in their own right, but also as habitat for a number of other species. The biodiversity value of the area could be further enhanced by establishing and strengthening connections between existing semi-natural habitats, particularly native woodland. Improving the management and condition of hedgerows and hedgerow trees could provide a simple and effective way of strengthening habitat networks in parts of the NCA. Creation of new habitats that provide opportunities for species to move to higher ground could prove particularly valuable in a changing climate. Management of existing habitats for their wildlife value could also be of great benefit, particularly in terms of native woodlands and restoration of plantations on ancient woodland sites.

Statements of Environmental Opportunity

SEO 1: Protect and connect native broadleaved woodland, parkland and veteran trees to maximise their value for wildlife, flood risk alleviation, water quality, climate regulation, recreation, sense of place and sense of history.

For example, by:

- Protecting, managing and expanding ancient woodland sites, linking isolated fragments where possible.
- Restoring plantations on ancient woodland sites and restocking conifer plantations with broadleaves.
- Conserving and managing historic parklands, including: appropriate management of ancient and veteran trees; retention of deadwood fauna and flora; establishment of new generations of trees appropriate for each parkland's historic character; and provision of access and opportunities for engagement where appropriate.
- Communicating the importance of sympathetic management of veteran trees on both arable and pastoral land, and encouraging the planting of replacement in-field and boundary trees.
- Targeting new woodland planting to locations where it can help to reduce flood risk (such as along the Ure and Swale rivers), reduce soil erosion and water pollution (particularly around the Tees and Nidd rivers and Oak Beck), buffer/connect existing woodland and enhance tranquillity, and where it will not have a negative impact on archaeology, priority habitats/species (such as wading birds) or amenity value. Links that allow species to move from lower to higher ground may be particularly valuable under a changing climate.
- Encouraging planting of native broadleaved woodland for timber and biomass where possible, ensuring that woodlands contribute to biodiversity and landscape character and do not undermine archaeology or priority species of open ground.
- Where conifers are planted, encouraging incorporation of broadleaved species in key areas to maximise their wildlife and landscape value.
- Encouraging use of best practice forestry techniques, and practices such as providing continuous vegetation cover especially on sites at particularly high risk of soil erosion or causing pollution of watercourses.
- Encouraging positive management of existing woodland to provide woody biomass, where this is consistent with nature conservation objectives.
- Providing public access for quiet recreation in new woodlands and opportunities for community engagement in development of the new woodlands.
- Using by-products from timber processing for energy generation, where appropriate.

SEO 2: Encourage management of farmland to retain the pastoral and mixed agricultural character and to benefit biodiversity and the wider environment while maximising the value of food production.

For example, by:

- Encouraging farmers to follow best farming practice, particularly in relation to soil quality, soil carbon, soil erosion and pesticide/nutrient use, in order to increase soil carbon stores, improve water quality, reduce soil erosion and flood risk, and safeguard long-term food provision.
- Encouraging farmers to retain and sympathetically manage (semi) natural features and habitats such as hedges and ponds in the lowlands to the east and drystone walls and field barns in the uplands to the west, for their contribution to sense of place, sense of history, biodiversity and geodiversity.
- Protecting permanent pasture, particularly in the mixed farming areas to the east.
- Encouraging farmers to create buffer strips of grassland and woodland along watercourses to protect water quality and strengthen habitat networks, particularly where this will enable species to move from lower to higher ground in response to climatic changes.
- Encouraging farmers to manage moorland habitats to maintain vegetative cover and peat soils, and to manage grassland around the moorland to provide good conditions for wading bird populations.
- Encouraging farmers to use modern technology and techniques (such as precision farming, controlled farm traffic, minimum tillage techniques) that help to protect agricultural soils, match nutrient application to crop demand and reduce the risk of environmental pollution/damage while optimising food production.
- In cases of severe soil erosion, encouraging conversion to practices such as spring (rather than winter) cropping, minimum tillage techniques and reversion of arable land to grassland.
- Encouraging less frequent cutting of hedges and managing the timing of cuts to road verges to allow more profuse flowering, thereby supporting more nectar-feeding insects (including pollinators and beneficial predator species), and providing fruit for insects, birds and mammals over winter.
- Encouraging the use of native breeds for grazing on semi-natural habitats of marginal agricultural productivity, where this will enhance biodiversity interest.
- Supporting farmers to produce food from local breeds and link it to the distinctive characteristics of the area to market their products.

SEO 3: Protect the area's rich historic environment and geodiversity and manage development pressure to preserve tranquillity, sense of place and sense of history, and to enhance recreational opportunities.

For example, by:

- Protecting the unity of the built environment, particularly in conservation areas and Areas of Outstanding Natural Beauty, by encouraging use of local and traditional materials and techniques, while allowing for innovative and sustainable design.
- Conserving and managing historic parkland, to maintain the historic integrity of the designed landscape while also providing opportunities for new uses and public access.
- Ensuring conservation, sympathetic management and high-quality interpretation of geological sites, and identification and designation of Local Geological Sites.
- Ensuring sympathetic management and high-quality interpretation of buildings and sites of historical interest, while recognising the high potential in this area for undiscovered archaeological remains.
- Encouraging retention and good management of grassland over archaeological earthworks.
- Protecting the significant concentrations of prehistoric carved rocks in the south-east upland of the NCA.
- Protecting the most tranquil areas from intrusion and inappropriate development.
- Managing increasing traffic levels to minimise intrusion through noise pollution and risk to other road users.
- Supporting improvement of communication links, particularly broadband, to maximise possibilities for people to work from home rather than commuting by car.
- Encouraging incorporation of features into new development which will help with adaptation to climate change and ensure efficient use of energy and other resources, such as renewable energy, trees for shading and rainwater harvesting.
- Planning for new development to include rainwater harvesting systems and other features to minimise water use.
- Encouraging appropriate retrofitting of features to existing development to maximise efficiency of water and energy use.
- Planning for appropriate tourism-related development to encourage sustainable use of the NCA, which minimises intrusion, disturbance and traffic while increasing understanding and enjoyment of the area's special qualities.
- Managing increasing traffic levels, particularly around towns/cities and on minor roads, to minimise risk to recreational road users (walkers, cyclists and horse riders).
- Enhancing provision of new off-road linear and circular routes suitable for horses, cyclists and walkers, and increasing promotion of existing and new routes to further promote outdoor recreation in the area.
- Seeking to further improve and protect water quality, particularly in the main rivers, to enhance the enjoyment and safety of recreational river users.
- Facilitating local businesses in using the special qualities of the area to market their tourism, food and craft products.

SEO 4: Protect and enhance the area's many major rivers, riparian habitats and wetlands to reduce flood risk, improve water quality and conserve the valuable contribution they make to sense of place, biodiversity, recreation and sense of history.

For example, by:

- Creating flood storage areas and establishing water-holding habitats such as wet woodland, ponds and other wetlands, where they can deliver benefits for pollution reduction, flood risk alleviation, biodiversity and landscape character.
- Protecting existing flood plains and, where feasible, seeking to reconnect them to their rivers and allow watercourses to return to more natural courses, allowing new freshwater habitats to develop and reducing the energy of the water flows.
- Encouraging adoption of good soil management and good farming practice that reduce soil erosion/sedimentation, chemical and nutrient run-off, and risk of pollution incidents.
- Supporting and encouraging the creation of grass/woodland buffer strips, in-field grass strips, sediment traps, ponds and wetland habitats to slow run-off and intercept sediments and pollutants from farmland, especially in arable areas in the east.
- Encouraging industry to update and improve infrastructure to minimise risks of pollution incidents.
- Protecting and sympathetically managing the many historic structures associated with the NCA's rivers such as mill buildings, bridges and water control structures.
- Removing structures, where possible, that limit movement of fish up river corridors, or installing features such as fish passes to enable fish migration.
- Planning for inclusion of sustainable drainage systems in new development and retrofitting of features to existing development, where possible.
- Enhancing and connecting semi-natural habitats in river corridors to improve the wildlife movement corridors between lowland and upland.
- Encouraging action on a catchment scale to slow run-off and store rainwater, thereby reducing peak flooding events and the erosive force of major rivers. Contributions can be made within the NCA, particularly along the Ure and Swale rivers, but the main opportunities lie upstream of the NCA in the Pennines, particularly for tree planting and increasing surface vegetation roughness to slow run-off and increase infiltration.

Supporting document 1: Key facts and data

Total area: 87,302 ha

1. Landscape and nature conservation designations

The Pennine Fringe is 87,302 ha and is a long, narrow zone between the Yorkshire Dales National Park and Nidderdale Area of Outstanding Natural Beauty (AONB) to the west and the Tees Lowlands, Vale of Mowbray and Southern Magnesian Limestone to the east. The northern tip borders the North Pennines AONB with the southern edge bordering the city of Leeds. 19,735 ha of Nidderdale AONB and 815 ha of the North Pennines AONB fall within the area (24 per cent of the NCA).

The management plan for the protected landscape can be found at:

- www.nidderdaleaonb.org.uk/
- www.northpennines.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)	Percentage of NCA
International	Ramsar			
European	Special Protection Area (SPA)	North Pennine Moors SPA	330	<1
	Special Area of Conservation (SAC)	North Pennine Meadows SAC	9	<1
National	National Nature Reserve (NNR)	n/a	0	0
National	Site of Special Scientific Interest (SSSI)	A total of 19 sites wholly or partly within the NCA	558	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.

Very small areas of upland moorland lie within the NCA at both the northern tip and the south-western tip which are designated SPA and SAC.

There are 177 Local Wildlife Sites in Pennine Dales Fringe covering 2,496 ha or 3 per cent of the NCA.

Source: Natural England (2011)

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

1.2 Condition of designated sites

A breakdown of SSSI condition as of March 2011 is as follows:

SSSI condition category	Area (ha)	Percentage of SSSI land in category condition
Unfavourable declining	0	0
Favourable	122	22
Unfavourable no change	0	0
Unfavourable recovering	433	78

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 NCA marks the transition between the high moorland to the west and the low-lying fertile ground to the east with the highest point of 383 m and lowest at 21 m.

Source: Natural England 2010

2.2 Landform and process

Side slopes of the Dales uplands, predominately sloping down to the east, with locally varied topography formed by several significant river valleys running from west to east including the broad vale of the Tees, the Swale, Ure, Nidd, Washburn and Wharfe. It is a transitional landscape lying between the upland, predominantly grassland, to the west and arable land to the east.

Source: Pennine Dales Fringe Natural Area Profile, Pennine Dales Fringe Countryside Character Area description

2.3 Bedrock geology

The underlying bedrock of the area is Millstone Grit and to a much lesser extent Coal Measures. These dip from west to east and account for the overall drop in altitude forming the flank of the Pennines. Very little bedrock is exposed but distinctive outcrops occur at Norwood and at Great Almscliff Crag. Limited exposures of Carboniferous Limestone occur near Leyburn and Richmond. The rocks comprise alternating sequences of hard, resistant sandstone and softer shales. These have been subjected to glaciation and weathering resulting in wide steep-sided valleys with sandstone steps along their sides. The bedrock geology of the area is mainly made up of two rock types; mudstone (including siltstone and sandstone) 41 per cent; and sandstone 37 per cent. There are smaller areas of limestone (15 per cent).

Source: Pennine Dales Fringe Natural Area Profile, Pennine Dales Fringe Countryside Character Area description

2.4 Superficial deposits

The majority of rock is overlain with boulder clay, sands and gravels of both glacial and riverine origin. The boulder clay, which predominates in the south and west, gives rise to slowly permeable soils. Glacial till covers much of the land and increases in thickness and extent of cover towards the north and east of the area.

Source: Pennine Dales Fringe Natural Area Profile, Pennine Dales Fringe Countryside Character Area description

2.5 Designated geological sites

Tier	Designation	Number
National	Geological Site of Special Scientific Interest (SSSI)	1
National	Mixed interest SSSI	0
Local	Local Geological Sites	1

Source: Natural England (2011)

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

2.6 Soils and Agricultural Land Classification

The upland peaty soils on the western fringe give way to the low-lying more fertile soils towards to the east. The glacial deposits on the wide-floored valleys produce lighter, more fertile land which is classified as Grade 3. Grade 4 agricultural land is found on the side slopes of the upland block to the west, with some areas of Grade 5 on the highest land.

Source: Pennine Dales Fringe Natural Area Profile, Pennine Dales Fringe Countryside Character Area description

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

Agricultural Land Classification	Area (ha)	Percentage of NCA
Grade 1	0	0
Grade 2	1,329	2
Grade 3	47,668	55
Grade 4	27,896	31
Grade 5	5,331	6
Non-agricultural	2,180	2
Urban	2,895	3

Source: Natural England (2010)

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

3. Key waterbodies and catchments

3.1 Major rivers/canals

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

Name	Length in NCA (km)
Greta	14
Tees	17
Swale	11
Ure	30
Nidd	18
Washburn	10
Wharfe	14

Source: Natural England (2010)

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

The main rivers draining the NCA include the rivers Greta, Tees, Swale, Ure, Nidd, Washburn and Wharfe, all of which flow from west to east.

3.2 Water quality

The total area of Nitrate Vulnerable Zone is 140,045 ha, 16 per cent of the NCA.

Source: Natural England (2010)

3.3 Water Framework Directive

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

4. Trees and woodlands

4.1 Total woodland cover

The NCA contains 8,390 ha of woodland (nearly 10 per cent of the total area), of which 1,861 ha is ancient woodland. The area is relatively well-wooded which contrasts with the open landscapes to the east and west. Some lower-lying arable areas in the north-east of the area have lower levels of tree cover. There has been a significant uptake of Woodland Grant Scheme agreements for management and specifically restocking within the character area. About 27 per cent of the woodland cover is on ancient woodland sites.

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

4.2 Distribution and size of woodland and trees in the landscape

Woodland is found along valley slopes, in copses and plantations in the lower agricultural landscape and along hedgerows. There are larger coniferous and mixed woodlands on the estates. Brignall Banks and Hackfall Woods are good examples of

semi-ancient woodlands with the latter being of particular interest both botanically and archaeologically with interesting features and buildings within it.

Source: Pennine Dales Fringe Natural Area Profile, Pennine Dales Fringe Countryside Character Area description

4.3 Woodland types

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

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

Woodland type	Area (ha)	Percentage of NCA
Broadleaved	4,550	5
Coniferous	2,811	3
Mixed	534	<1
Other	495	<1

Source: Forestry Commission (2011)

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

Woodland type	Area (ha)	Percentage of NCA
Ancient semi-natural woodland	662	<1
Ancient re-planted woodland (PAWS)	1,199	<1

Source: Natural England (2004)

5. Boundary features and patterns

5.1 Boundary features

Field boundaries include stone walls on higher ground and hedgerows on lower ground. In 2011, 731 km of hedgerows and 583 km of stonewalls were under Environmental Stewardship management.

Source: Pennine Dales Fringe Countryside Character Area description; Countryside Quality Counts (2003)

5.2 Field patterns

Early field patterns of small-scale irregular fields including strips of former open fields, surrounding villages and towns, are either of medieval origin or developed from the 17th century as weaver's subsistence plots, and can be seen in places especially near Barnard Castle. Late-18th to early-19th century enclosures resulted in regular large-scale fields divided by drystone walls, particularly noticeable to the west of Harrogate.

Source: Pennine Dale Fringe 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

There were 1,199 holdings, the majority of which (514) were livestock grazing, with 140 dairy farms, and 95 based on cereals. There were also 21 specialist poultry farms, and 14 specialist pig farms. Livestock holdings decreased in number by some 3 per cent since 2009, while arable holdings increased by 2 per cent in the same period to 123. There was an overall total of 1,119 farms (2009) compared to 1,232 in 2000, a decrease of some 113 farms (9 per cent).

Source: Agricultural Census, Defra (2010)

6.2 Farm size

Sixty per cent of the farms were below 50 ha in size, although farms over 50 ha accounted for 85 per cent of the farmed area (these figures do not take into account the access that many farms have to common grazing on moorland).

Source: Agricultural Census, Defra (2010)

6.3 Farm ownership

2009: Total farm area = 72,703 ha; owned land = 39,753 ha
2000: Total farm area = 68,700 ha; owned land = 43,874 ha

Source: Agricultural Census, Defra (2010)

6.4 Land use

The predominant (77 per cent) land use is for the grazing of livestock, including dairying, with 18 per cent of the land given over to cereal cropping, oilseeds and other arable crops. There was no significant change between 2000 and 2009.

Source: Agricultural Census, Defra (2010)

6.5 Livestock numbers

There are high numbers of sheep – 286,000 in 2009, although this number decreased from 356,600 in 2000. Numbers of cattle have shown a slight decrease; from 83,000 in 2000 down to 80,700 in 2009. The numbers of pigs have halved, from 68,048 in 2009 to 33,636 in 2009.

Source: Agricultural Census, Defra (2010)

6.6 Farm labour

Most farms are run by principal farmers (1,666 number), while the numbers of salaried managers almost doubled in the ten year period from 2000 to 2009 going from 29 to 54. Numbers of full-time workers dropped in the same period from 339 to 274, while part-time workers increased from 176 to 245. Numbers of casual workers dropped from 182 to 157.

Source: Agricultural Census, Defra (2010)

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

7. Key habitats and species

7.1 Habitat distribution/coverage

The majority of the Pennine Dales Fringe is made up of leys and improved grassland and there are few semi-natural habitats, apart from woodland. Unimproved neutral grassland is very scarce with less than 1 per cent designated SSSI supporting nationally scarce burnt orchid and thyme broomrape. All of the important upland heath areas are confined to the extreme western and northern fringes (adjacent to more extensive areas in the neighbouring Yorkshire Dales and North Pennines NCAs). Woodland cover is good by UK standards with wooded valley slopes and small woodlands covering some 10 per cent of the area.

Priority habitats are scarce in the NCA with upland heath being the most significant at 838 ha, of which 330 hectares has both SAC and SPA status. Much of this ground is close to reservoirs or part of the army training camp at Catterick. There is potential to expand this habitat on the species-poor acid grasslands nearby. There are also 17 ha of blanket bog near these areas.

Lowland mixed deciduous woodland covers some 2,364 ha which includes small areas of wet woodland (667 ha) and very small areas of upland ash/oak woods. These upland oak/ash woods are important for bird species like redstart, pied flycatcher, wood warbler and the introduced red kite population at the Harewood estate near Leeds. There is a small nightjar population near the conifer woodlands at Timble to the north of Otley in the south of the area.

There are very small areas of good grassland habitats with flood plain grazing marsh totalling 95 ha.

There are some smaller areas of upland calcareous grassland and purple moor grass on the side slopes.

The World Heritage Site of Fountains Abbey has 8 different species of bats which make their home in the vaulted ceiling of the cellarium. Both Daubenton's and Natterer's bats occur there in nationally important numbers.

Source: Pennine Dales Fringe Natural Area Profile

7.2 Priority habitats

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

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

Priority habitat	Area (ha)	Percentage of NCA
Broadleaved mixed and yew woodland (broad habitat)	2,364	3
Upland heathland	838	1
Coastal flood plain and grazing marsh	95	<1
Fens	765	<1
Upland calcareous grassland	55	<1
Reedbeds	29	<1
Lowland meadows	26	<1
Lowland dry acid grassland	18	<1
Blanket bog	16	<1

Source: Natural England (2011)

The figure given for 'Fens' includes some areas of open water, and is thus an over-estimate; these figures are currently being reviewed.

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

7.3 Key species and assemblages of species

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

8. Settlement and development patterns

8.1 Settlement pattern

The area has a number of small, historic market towns including Kirkby Malzeard, Middleham, Masham, Leyburn, Richmond and Barnard Castle, as well as the larger spa town of Harrogate. There is a strong pattern of nucleated villages and smaller settlements. Most settlements are located along the bottom of the foothills of the Pennines, within the more fertile lowlands of the area. Leyburn is considered more of a 'Yorkshire Dales' town being near the higher moorland area.

Source: Pennine Dales Fringe Countryside Character Area description; Countryside Quality Counts (2003)

8.2 Main settlements

The largest settlement is the spa town of Harrogate to the south of the area with smaller market towns roughly in order of size being Richmond, Barnard Castle, Leyburn, Masham and Bedale. Catterick Garrison is the largest army camp in Europe. The total estimated population for this NCA (derived from ONS 2001 census data) is: 139,849.

Source: Pennine Dales Fringe Countryside Character Area description; Countryside Quality Counts (2003), Natural England (2012)

8.3 Local vernacular and building materials

Villages, farms and larger settlements are all built in local stone which contributes greatly to the character of the landscape, particularly where stone walls are also present as field boundaries. Most of the buildings are built of Millstone Grit but limestone buildings occur especially in the east. The small, attractive historic market towns help to provide a strong sense of historical continuity and local identity. Most have a central market place but Masham is remarkable for its range of styles and inclusion of limestone as a building material. The spa town of Harrogate is the most significant settlement in the area with its fine hotels, arcades, many built with local sandstone, and parks.

Source: Pennine Dales Fringe Countryside Character Area description; Countryside Quality Counts (2003)

9. Key historic sites and features

9.1 Origin of historic features

Mesolithic and Neolithic activity is widely reflected by the discovery of stone tools and flint scatters, while there is also extensive and well-preserved evidence for bronze- and iron-age settlements with earthworks and cropmarks of enclosed and unenclosed farmsteads, and Roman forts and settlements along the A1.

Market towns were established from 12th and 13th centuries. Valleys and upland areas were used as hunting grounds and chases and as the estates of Fountains and Byland abbeys, with vaccaries (cattle ranches) established at the same time.

From the 17th century a home-based linen and wool weaving industry developed; this textile industry grew to a modest industrial scale in the valleys of Tees, Nidd and Washburn, but declined from the early 20th century.

Ironstone and lead mining on a small scale was abandoned by the mid-19th century.

The spa town of Harrogate developed rapidly after the arrival of the railway in 1848.

There are several monastic estates and designed landscapes often located at valley openings, for example, Harewood, Aske, Ripley, Hawnby, Fountains Abbey, Middleham, Norton Conyers and Temple Grounds Richmond, with several originating from medieval hunting grounds or castles.

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

9.2 Designated historic assets

This NCA has the following historic designations:

- 15 Registered Parks and Gardens covering 1,770 ha.
- 0 Registered Battlefields.
- 151 Scheduled Monuments.
- 2,622 Listed Buildings.

Source: Natural England (2010)

More information is available at the following address:

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

10. Recreation and access

10.1 Public access

- Nearly 3 per cent of the NCA (2,456 ha) is classified as being publically accessible.
- There are 1,245 km of public rights of way at a density of 1.6 km per km2.
- There is 1 National Trail within the NCA. A tiny section of the Pennine Way (less than 2 km) is found at the extreme northern tip at Bowes.

Sources: Natural England (2010)

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

Access designation	Area (ha)	Percentage of NCA
National Trust (Accessible all year)	76	<1
Common land	260	<1
Country parks	0	0
CROW Access Land (Section 4 and 16)	1,430	2
CROW Section 15	74	<1
Village greens	39	<1
Doorstep greens	0	0
Forestry Commission Walkers Welcome Grants	627	<1
Local Nature Reserves (LNR)	48	<1
Millennium greens	2	0
Accessible National Nature Reserves (NNR)	0	0
Agri-environment Scheme Access	54	<1
Woods for People	1,128	<1

Sources: Natural England (2011)

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

11. Experiential qualities

11.1 Tranquillity

Based on the CPRE map of tranquillity (2006) the area is reasonably tranquil, with the most tranquil areas being the upland slopes along the west side, and the least tranquil areas associated with the main urban areas such as Harrogate, Richmond and Catterick, and Barnard Castle.

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

Tranquillity	Tranquillity Score
Highest value within NCA	50
Lowest value within NCA	-66
Mean value within NCA	5

Sources: CPRE (2006)

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

11.2 Intrusion

The 2007 Intrusion Map (CPRE) shows the extent to which rural landscapes are 'intruded on' from urban development, noise (primarily traffic noise), and other sources of visual and auditory intrusion. This shows that since 1960 there has been an increase in disturbed areas arising from more road traffic, notably around Harrogate and towards Leeds in the south, but also along the A66 near Barnard Castle. There was also an increase in urban areas around the towns of Harrogate, Richmond (Catterick Garrison), Barnard Castle and a small increase in intrusion to the west of Ripon. A breakdown of intrusion values for this NCA is detailed in the table below.

A breakdown of intrusion values for this NCA is detailed in the table overleaf.

Intrusion category	1960s (%)	1990s (%)	2007 (%)	Percentage change (1960s-2007)
Disturbed	12	26	32	20
Undisturbed	85	71	65	-20
Urban	3	3	3	0

Sources: CPRE (2007)

Notable trends from the 1960s to 2007 are the slow increase in disturbance since the 1960s.

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

12. Data sources

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

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

Supporting document 2: Landscape change

Recent changes and trends

Trees and woodlands

- There has been significant uptake of Woodland Grant Scheme agreements for restocking of conifer plantations within the area, with the rate of uptake increasing after 1999 to around 80 ha/year.

- Recent survey work by the Forestry Commission (2011) indicates an increase in woodland cover to nearly 10 per cent cover, with an increase in the proportion of broadleaves. Where tree planting has taken place, this effort has been most concentrated in the south of the area around Harrogate, and in small areas along watercourses to the west of Ripon.

Boundary features

- Agri-environment schemes have supported substantial restoration and enhancement of the boundary network. In 2003 Countryside Stewardship agreements included 33 km of stone wall restoration and 82 km of hedgerow planting and restoration, as well as fencing to protect newly restored boundaries. Between 2005 and 2013 Environmental Stewardship agreements included 1.47 km of hedgerow restoration, 4.8 km of drystone wall restoration and creation of 1.52 km of new hedgerows and 12.54 km of fencing.

Agriculture

- Agricultural census figures for 2000–2009 show a reduction in the numbers of all livestock between 2000 and 2009: cattle numbers by 3 per cent; sheep numbers fell by 20 per cent and, pig numbers fell by 51 per cent.

- In general there was a reduction in the number of separate holdings between 2000 and 2009, and an increase in the average size of holding. Dairy units saw the biggest reduction in numbers of any farm type, from 234 holdings in 2000 to 140 in 2009 (a 40 per cent reduction). Over the same period the number of specialist poultry units fell by 25 per cent, lowland grazing livestock by 19 per cent and general cropping from by 17 per cent. The number of holdings greater than100 ha increased by 16 per cent, while the number of smaller farms fell.

- There was also a reduction in the area of land used for production of "cash roots"[5] by 41 per cent) and "fruit"[6] by 73 per cent, and an increase in the area used for "hardy nursery stock"[7] by 63 per cent, "other arable crops"[8] by 37 per cent and oilseeds by 23 per cent.

- There were substantial changes in farm labour from 2000 to 2009, with an 88 per cent increase in the number of salaried farm managers and a 39 per cent increase in part-time workers, with a decrease in the number of full-time workers by19 per cent and casual workers by 14 per cent.

[5] Sugar beet and potatoes

[6] Orchards and small fruits.

[7] Bulbs or flowers grown in the open.

[8] Field beans, peas, maize, miscanthus, short rotation coppice and all other crops not for stock feeding.

Settlement and development

- There is evidence of scattered development between 1990 and 2003, especially in the southern part of the area to the west of Darley, and in the northern part of the area, north of Richmond along the A66, and north of Barnard Castle.

Semi-natural habitat

- Agri-environment schemes have funded enhanced management and restoration of large areas of semi-natural habitat in the area. In 2003 Countryside Stewardship agreements included 482 ha of heathland management, management of 698 ha of lowland pasture on neutral or acid soils and management of 672 ha of upland in-bye pasture. Between 2005 and 2013 Environmental Stewardship agreements in the area included options to restore 773 ha of moorland, 337 ha of "rough grazing for birds", 214 ha of species-rich grassland and 70 ha wet grassland for breeding waders. They also included options to maintain 166 ha of "rough grazing for birds", 73 ha of species-rich grassland and 58 ha of woodland, as well as to create 5 new ponds covering an area of 10,590 m2.

- Between 2004 and 2012 the Ripon Multi-Objective Project facilitated various works on farms to reduce flood risk in Ripon, and minimise soil erosion and sedimentation of watercourses. Work carried out in the catchments of the River Skell, River Laver and Kex Beck, included watercourse fencing (1,810 m), woodland fencing (2 ha), low input grassland (71 ha), troughs and feeding sites (7), other stock fencing (674 m), hedgerow creation (122 m), hedgerow restoration (3710 m), woodland Creation (1.3 ha), ponds and wetland creation (3.82 ha), wet grassland (38 ha), low input grassland (160 ha), arable field margins (2.5 ha) and field corners (4.19 ha).

Historic features

- As of 2003, about 65 per cent of historic farm buildings remained unconverted, and about 95 per cent were intact structurally. Between 2005 and 2013 Environmental Stewardship agreements paid for the maintenance of 84 traditional farm buildings, thereby contributing to the continued survival and condition of these important historic features. Some barns were converted to domestic use, especially around Harrogate, Richmond and Leyburn, although the rate of conversion slowed from 2008 to 2013.

- This NCA is particularly important for its historic parkland, with 22 parklands, 15 of which are Registered Parks and Gardens and cover 1,771 ha (2 per cent of the NCA). The Countryside Quality Counts project ranked it as the 25th most important NCA for parkland in England. In 1918 about 5 per cent of the area was historic parkland, but by 1995 it was estimated that 41 per cent of this had been lost. In 2003 about 43 per cent of the remaining parkland was covered by an Historic Parkland Grant, and 16 per cent was included in an agri-environmental scheme.

Minerals

- Production of land-won aggregates has fallen across North Yorkshire as a whole in recent years. Between 2007 and 2011, sand and gravel production fell from 2.7 to 1.9 million tonnes per year, and crushed rock from 4.3 to 1.9 million tonnes per year. This NCA supplies both types of aggregate.[9]

[9] Local Aggregate Assessment for the North Yorkshire Sub-region, North Yorkshire County Council/York City Council/Yorkshire Dales National Park Authority/North York Moors National Park Authority (January 2013).

Drivers of change

Climate change

Climate change is likely to result in:

- More frequent and more extreme rainfall, leading to increased flooding and 'flashiness' of flows in river valleys, notably the rivers Ure, Swale, Nidd and Wharfe, resulting in increased bankside erosion and impacts on riparian habitats and species, increased risk of damage to agricultural soils through compaction and poaching, and increased flood risk for settlements and land downstream.
- Warmer winters leading to increased tree growth, increased suitability of new non-native species and an increase in pests and diseases.
- A longer growing season potentially leading to double cropping in arable areas.
- Drying out and oxidation of peatland soils, possibly leading to both wind and water based erosion, loss of carbon stores and coloration of water.
- Warmer climate leading to new crops.
- Species migration as climatic conditions change.
- Habitat stress leading to possible loss of small or isolated habitats.
- Increasing requirement for renewable energy generation which could result in increased demand for wind turbines and biomass.

Other key drivers

- Growth associated with the principal town of Richmond and the sub-regional city of Harrogate. Significant development is planned at Catterick Garrison, which may reduce development pressure at Richmond.
- The NCA has good potential for new woodland creation. New woodland could strengthen the provision of a number of ecosystem services in the area. The valleys associated with the River Ure, Swale, Nidd, and Wharfe are identified as areas suitable for large areas of 'Potential New Floodplain Woodland' – this could benefit both flood risk management and diffuse pollution control.[10]
- There is likely to be continued demand for sand, gravel and limestone, with the proposed extension at Marfield Quarry potentially allowing for the extraction of an additional 4 million tonnes of sand and gravel and submissions from mineral extractors to re-open dormant Carboniferous Limestone quarries near Leyburn.

[10] *Opportunity Mapping for Woodland to reduce Flooding in the Yorkshire and Humber Region*, Forest Research (2009), p. 23

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.

Military sites are a feature of the area and include Catterick Garrison and Menwith Hill Royal Air Force station, seen here in the distance across Stainburn Moor from Little Alms Cliff.

Statement of Environmental Opportunity	Ecosystem service: Food provision	Timber provision	Water availability	Genetic diversity	Biomass provision	Climate regulation	Regulating water quality	Regulating water flow	Regulating soil quality	Regulating soil erosion	Pollination	Pest regulation	Regulating coastal erosion	Sense of place / Inspiration	Sense of history	Tranquillity	Recreation	Biodiversity	Geodiversity
SEO 1: Protect and connect native broadleaved woodland, parkland and veteran trees to maximise their value for wildlife, flood risk alleviation, water quality, climate regulation, recreation, sense of place and sense of history.	↘ *	↗ **	↗ **	↔ *	↗ **	↗ **	↗ **	↗ **	↗ **	↗ **	↗ **	↗ **	n/a	↗ **	↔ *	↗ **	↗ **	↑ ***	↔ *
SEO 2: Encourage management of farmland to retain the pastoral and mixed agricultural character and to benefit biodiversity and the wider environment while maximising the value of food production.	↗ **	↔ *	↗ **	↗ **	↔ *	↗ **	↗ **	↗ **	↗ ***	↗ ***	↗ **	↗ **	n/a	↗ **	↗ **	↗ **	↔ *	↑ ***	↗ *
SEO 3: Protect the area's rich historic environment and geodiversity and manage development pressure to preserve tranquillity, sense of place and sense of history, and to enhance recreational opportunities.	↔ *	↔ *	↗ *	↔ *	↗ *	↗ *	↗ *	↔ *	↔ *	↗ **	↗ *	↗ *	n/a	↗ **	↑ ***	↗ **	↗ **	↗ **	↗ **
SEO 4: Protect and enhance the area's many major rivers, riparian habitats and wetlands to reduce flood risk, improve water quality and conserve the valuable contribution they make to sense of place, biodiversity, recreation and sense of history.	↗ *	↗ *	↗ **	↔ *	↗ *	↗ **	↑ ***	↗ **	↗ ***	↗ ***	↗ *	↗ *	n/a	↗ **	↗ **	↗ **	↗ **	↑ ***	↗ *

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

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

Landscape attributes

Landscape attribute	Justification for selection
Side slopes of Pennine uplands, predominantly sloping eastwards, but with locally varied topography formed by several significant river valleys running from west to east, including the Washburn, Nidd, Ure, Swale and the broad vale of the Tees.	■ Elevation in the NCA ranges from 21 m to 383 m. ■ The rivers are important landscape features, flowing through broad, glacially widened valleys. Smaller rivers flow through steep-sided valleys following courses cut by glacial meltwaters. ■ There is considerable variation in the landscape especially between the open, exposed plateaux and shoulders of the hills, the small and enclosed valleys and the broad river valleys. ■ Valleys of the smaller tributaries have steeper sides and are distinguished by small hedged or walled grasslands and pastures as well as belts of trees following streams. Some valleys are more densely wooded while the Washburn is more dramatic with steep valley sides, a string of reservoirs and extensive mixed and coniferous plantations.
A transitional landscape between the Pennine uplands to the west and the low-lying fertile landscape of the Vale of York to the east; mainly pastoral in the west, with rough grazing on the moorland edge, merging into mixed farming, with arable on the lighter soils in the east.	■ 77 per cent of agricultural land in the NCA is grassland or other uncropped land. ■ 55 per cent of the NCA's soils are Grade 3, 31 per cent Grade 4, with soils increasing in productivity from the poorer upland soils of the west to the richer lowland soils of the east. ■ Habitats of international significance include internationally designated moorland on the North Pennine Moors SPA/SAC and the North Pennine Dales Meadows SAC around Richmond, designated for its rare upland hay meadows. ■ Other semi-natural habitats include upland heathland, grazing marsh, calcareous and grasslands. ■ 23 per cent of the area falls within the Nidderdale AONB and 1 per cent in the North Pennines AONB.
A well-wooded landscape, with woodland along valley slopes, and copses and plantations in the lower agricultural landscape. Individual trees, often mature or veteran, are found in hedgerows and the area's numerous historic parklands. Some of the lower lying, arable areas in the north east of the area have lower levels of tree cover.	■ Nearly 10 per cent woodland cover (8,390 ha) with 4,550 ha of broadleaved woodland and 2,811 ha of conifer plantations. ■ 662 ha of ancient semi-natural woodland, and 1,199 ha of ancient woodland which has been planted up. ■ Broadleaved woodland largely found along steep sides of narrow valleys. ■ Many small woodlands and plantations in particular associated with parklands.

Landscape attribute	Justification for selection
Field boundaries of drystone walls on higher ground and hedges in lower areas. Fields are often small around villages, reflecting their medieval origins and larger and more regular on higher ground, dating from parliamentary enclosure.	■ Hedges are found more frequently on lower-lying areas where they grow well and form strong stock-proof boundaries. On higher more exposed ground drystone walls have historically been created in preference to hedges as hedge plants struggle and stone is in plentiful supply. ■ Both hedges and walls are in some areas suffering from neglect and being slowly lost from the landscape, often replaced by post and wire fences once they are no longer stock-proof.
A generally tranquil and rural area, with a distinctly ancient character in some parts and several small, historic market towns including Kirkby Malzeard, Middleham, Masham, Richmond and Barnard Castle, linked by a network of minor roads. Development pressure greater in the south and east, around the spa town of Harrogate and the northern fringes of Leeds.	■ Market towns, mostly dating as foundations from the 12th and 13th centuries developed on this lowland/upland fringe. ■ Minor gentry houses date from early 17th century. Some country houses and associated parks – such as Constable Burton on the site of medieval deer park. The spa town of Harrogate developed around dispersed common from 18th century, with major expansion in early 19th century and after arrival of railway in 1848.
Millstone Grit predominantly used for buildings and walling, giving strong visual unity to villages, mixing with Magnesian Limestone as a building material to the east. Roofs of stone flag (sand-stone), Welsh slate and pantile.	■ Millstone Grit is the primary underlying geology of the area and historically provided a plentiful supply of hard-wearing building material. ■ Limestone from the Southern Magnesian Limestone ridge adjacent to the east is also used for building.
Many rivers, including the Tees, Ure, Nidd and Wharfe, forming important landscape features along with their broad, glacially widened valleys. Smaller rivers, such as the Burn, Laver, Kex Beck and the Skell flow through steep-sided valleys following courses cut by glacial meltwaters. The River Washburn, a tributary of the Wharf, has been dammed to create a series of reservoirs.	■ Seven major rivers pass through the NCA, the: Greta (14 km), Tees (17 km), Swale (11 km), Ure (30 km), Nidd (18 km), Washburn (10 km) and Wharfe (14 km). ■ Four large reservoirs are located on the River Washburn: the Thruscross, Fewston, Swinsty, and Lindley Wood reservoirs. ■ The Washburn Valley is particularly rich in bird life with nightjar and nesting red kite in the mature woodlands near Otley, and large areas of grassland used as winter feeding grounds by wading birds such as curlew and lapwing. It is also particularly well used for recreation, particularly by local people and visitors from nearby conurbations. ■ The rivers are a very important resource in the area for recreation, particularly wildlife watching, walking, fishing and kayaking.

Landscape attribute	Justification for selection
Historically rich area with numerous parklands, abbeys and historic buildings as well as medieval and roman earthworks.	■ The world heritage site of Fountains Abbey, part of the Studley Royal Estate near Ripon, dating back to the 12th century, includes the largest abbey remains in the UK. This is also the site of the 12th-century abbey corn mill – the only one remaining in the UK and one of very few remaining in Europe. ■ 15 Registered Parks and Gardens covering 1,770 ha, one of which (Fountains Abbey) is a World Heritage Site. ■ Fountains Abbey is also notable as a SSSI designated for the eight species of bat that make their home in the abbey's cellarium. ■ Jervaulx Abbey, built in 1156 was the first monastic house built in the Ure Valley. ■ 18th-century Harewood House, in the south of the NCA, sits in 40 ha of grounds and is home to one of the UK's red kite release programmes. ■ Many of the parklands are well-used visitor attractions providing a diverse range of access and recreation opportunities. ■ Extensive and well-preserved evidence for Romano-British and prehistoric settlement including farmsteads and field systems, and extending to the 9th and 10th centuries.

Landscape opportunities

- Encourage sympathetic management of hedgerows with less frequent cutting, establishment of hedgerow trees and restoration through measures such as gapping up, coppicing and laying.
- Restore hedgerows with hedgerow trees along old boundary lines.
- Plant new broadleaved woodland, particularly where it will connect existing isolated woodlands, buffer ancient woodlands and offer reduced flood or pollution risk, and where it will strengthen landscape character, but not impact upon archaeological features or existing priority species/habitats especially upland heathland and species-rich grasslands.
- Ensure sympathetic management of veteran trees on agricultural land which avoids cultivation, application of chemicals/nutrients or compaction around the base of trees.
- Plant new in-field and hedgerow trees close to existing veteran trees to provide the veteran trees of the future.
- Protect and sympathetically manage historic parklands, retaining and restoring key historic features, protecting their veteran trees and ensuring that they provide access and recreation where possible by allowing adaptive management to adapt to changing needs of society while maintaining historic and ecological integrity.
- Encourage continued management of grassland by extensive grazing, low or nil applications of artificial fertiliser, and hay-cutting where feasible; look for opportunities to expand areas of species-rich grasslands and hay meadows.
- Protect and sympathetically manage semi-natural habitats such as hay meadows, neutral and acid grasslands and wetlands.
- Protect and sympathetically manage geological sites which act as key landscape features (such as Almscliff Crag).
- Encourage use of traditional building materials (particularly local Millstone Grit and limestone) and local building techniques in maintenance and repair of vernacular and historic buildings and structures.
- Maintain and restore drystone walls using local materials and styles.
- Protect and sympathetically manage the area's archaeology, particularly its important prehistoric, Roman and medieval sites and artefacts, and historic structures associated with the area's many rivers (bridges, mill buildings, water control structures).
- Protect the tranquil and rural nature of the NCA by minimising intrusion from traffic and development.

Ecosystem service analysis

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

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

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Food provision	Soils Semi-natural habitat	Only 1.5 per cent of the soils are grade 2, 55 per cent of the area is grade 3 and 31 per cent grade 4. In 2009 the area had: ■ 11,131 ha of cereals (15 per cent of NCA) ■ 1,580 ha of oilseeds (2 per cent of NCA) ■ 1,0 per cent, 7 ha of "other arable crops"[11] (1 per cent of NCA) ■ 55,853 ha of "grass and uncropped land" (77 per cent of NCA) ■ 80,720 cattle ■ 286,016 sheep ■ 33,636 pigs ■ 21 specialist poultry farms ■ 140 dairy farms (down from 234 in 2000). The area has a good range of outlets which use and sell local produce: from the restaurants and food shops of Richmond, Masham and Harrogate, to a number of well-known dining pubs and the local food centre to fodder, at the Great Yorkshire Showground in Harrogate. A number of livestock and dairy farms sell produce direct to consumers, through farm shops and box schemes. Unusual specialist food producers include deer and bison farms.	Regional	Much of the agricultural land in the area is primarily suited to livestock grazing, particularly that on higher ground and with heavy, low grade soils and higher rainfall rates. Much of this land would not be suitable for cultivation to produce other foodstuffs such as cereals, oilseeds or vegetables. Meat production is very important to the local economy and landscape, helping to maintain the pastoral scenery and giving a reason to retain and repair traditional field boundaries in the form of drystone walls and hedges. Grazing livestock are also crucial for management and retention of many of the area's priority habitats, particularly acid and neutral grasslands, moorland, hay meadows and some wetlands. Dairy production has been a strong feature of the area, but has declined in recent years, as it has done nationwide. **Continued over...**	Encourage farmers to follow best farming practice, to retain natural features and habitats on farms and to use modern technology and techniques to help maximise the value of food production while optimising environmental impact. Support farmers in using the distinctive characteristics of the area to market their products. Support continuity of traditional practices such as hay-making where these maintain important landscape features, and use of traditional breeds where these can help maintain wildlife-rich, but agriculturally marginal, habitats.	**Food provision** **Climate regulation** **Regulating water flow** **Regulating water quality** **Regulating soil quality** **Regulating soil erosion** **Sense of place / inspiration** **Sense of history** **Biodiversity**

[11] Includes field beans, peas, maize, miscanthus and short rotation coppice.

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Food provision continued				**...continued from previous.** There is likely to be demand for increased production of food. Where this happens farmers should be encouraged to minimise negative impacts for the local environment and local communities by: - using best farming practice to protect soil quality, avoid pollution, reduce greenhouse gas emissions, maximise animal welfare; - retaining landscape features such as hedges, copses, ponds, wetlands etc., particularly where these support food production; and - using modern technology and novel approaches such as precision farming, integrated pest management and minimum tillage cultivation. Many of these measures will also help to protect or enhance soil quality on agricultural land which can be beneficial for food production, climate regulation, water flow regulation, water quality and biodiversity. Where farmers are producing food in designated areas (AONB, SSSI, registered Park and Gardens) they should be encouraged to market their produce by linking it to the special environmental qualities of the area.		

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Timber provision	Soils Woodland	The NCA has nearly 10 per cent woodland cover, including 8,390 ha of woodland (4,550 broadleaved, 2,811 coniferous, large numbers of hedgerow and in-field trees, many veteran in age and one sawmill.	Regional	Many of the small woodlands on estates are under proactive management for timber production, in addition to management for firewood and shooting. Forestry activity can present a risk of soil erosion and water pollution, however following best practice guidelines, and using approaches such as continuous vegetation cover management, can avoid these risks. Forestry Commission research[12] has highlighted several areas within the NCA where new woodland planting could make a particularly valuable contribution to reducing diffuse pollution and flood risk. Woodland planting to address diffuse pollution is highlighted for an area in the far north of the NCA, near the River Tees, and along the River Nidd and Oak Beck. Woodland planting to reduce flood risk is highlighted around the Ure and Swale rivers in particular. Woodland creation could be accommodated within this area, as there is a local forestry industry to support it and new woodland could contribute to a number of other ecosystem services, such as: creating habitat networks; buffering ancient woodland sites; protecting/enhancing the sense of tranquillity. **Continued over...**	Target new woodland planting for timber to locations where it can help to reduce flood risk/erosion/pollution, buffer/ connect existing woodland, enhance tranquillity and where it will not have a negative impact on archaeology, priority habitats/species or amenity value. Encourage planting of broadleaved woodland, using native broadleaves where possible, to increase supply of hardwood and for the benefit of wildlife, sense of place and recreation. Encourage use of best practice forestry techniques, and practices such as continuous cover on sites at particularly high risk of soil erosion or causing pollution of watercourses. Production of softwood timber could be temporarily increased through restoration of plantations on ancient woodland sites to native broadleaved woodland.	**Timber provision** **Climate regulation** **Regulating water flow** **Regulating water quality** **Biodiversity**

[12] Woodland for Water, Forestry Commission (2013)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Timber provision continued				**...continued from previous.** Care should also be taken to ensure new woodland planting does not damage existing features and services such as archaeology, existing priority habitats/ species, landscape character and amenity value. Where possible production of hardwood timber from native broadleaved tree species should be encouraged. Where this is not feasible coniferous planting schemes that allow for strips of broadleaves along rides, watercourses and perimeters can help to maximise their environmental, landscape and recreation value.		
Water availability	Topography Semi-natural habitats Watercourses Minor aquifers Reservoirs	The rocks underlying the area have low porosities; storage and flow is within and through fractures and discontinuities such as joints and faults. The NCA does not overlay a major aquifer, however, the majority of the NCA is underlain by the minor Millstone Grit aquifer, which has good hydrological connectivity with surface water and its resource availability is assessed with surface water resources. North of Richmond, the NCA overlays the minor Carboniferous Limestone aquifer.[13] **Continued over...**	Regional	The high coverage of grassland, combined with the area's semi-natural habitat will help to encourage infiltration of rainwater and slow run-off, thereby ensuring minor aquifers an increased period in which to recharge and that water is retained in the NCA for longer before flowing into downstream NCAs. Where there is new residential, tourism or industrial development, the additional water demand created by these could be moderated by the inclusion of rainwater harvesting systems and features to minimise water use.	Maintain and improve infiltration of rainfall by ensuring that semi-natural habitats are well vegetated, agricultural soils are in good condition, and seek to expand the areas of heathland, woodland and permanent grassland where possible. Plan for new development to include rainwater harvesting systems and features to minimise water use. Encourage retro-fitting of features to existing development to maximise efficiency of water use.	**Water availability** **Regulating water quality** **Regulating water flow**

[13] Environment Agency, *Swale, Ure, Nidd and Upper Ouse Catchment Abstraction Management Strategy*, March 2004.

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Water availability continued		**...continued from previous.** The River Tees and one of its major tributaries, the River Greta, run across the north of the NCA. The availability of water from the River Tees and its tributaries is not assessed because the flow is regulated by the Cow Green Reservoir and Kielder Water.[14] There is no water available from groundwater or surface water resources in the catchments of the rivers Swale, Ure, and Nidd, in order to maintain flow downstream of the NCA.[15] The River Washburn is assessed as having 'water available' at low flows. However, this resource availability status is overridden to 'no water available' to ensure adequate flows further downstream, specifically at the 'critical assessment point' at Tadcaster (south-east of the NCA). The River Washburn has been dammed at several points in the NCA to create reservoirs providing potable water for Harrogate, Leeds and Bradford. The River Wharfe has 'no water available' along this stretch within the NCA.[16] The main water abstractions from the Swale, Ure and Nidd are for public water supply and cross-catchment transfers. In the Tees catchment, abstraction mainly takes place downstream of the NCA and is primarily for industry at Teeside. In the River Wharfe and Upper Ouse catchment the majority of abstractions are for public water supply and for fish farms, such as the trout hatchery at Lindley.				

[14] Environment Agency, *Tees Catchment Abstraction Management Strategy*, March 2008.

[15] Environment Agency, *Swale, Ure, Nidd and Upper Ouse Catchment Abstraction Management Strategy*, March 2004.

[16] Environment Agency, *Wharfe and Lower Ouse Catchment Abstraction Management Strategy*, March 2005.

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Genetic diversity	Traditional breeds Semi-natural habitats	5 Environmental Stewardship agreements include the supplement for using native breeds at risk to graze land (142 ha). The Masham breed of sheep originated in the area. There are some producers of meat, dairy and wool from rare-breed livestock, such as Island Heritage woollen clothing and Brymoor Guernsey ice cream, both at Masham.	Local	Native breeds could play a useful role in the area for management of marginal sites, particularly wetland and rough grassland, where small size, hardiness and ability to thrive on poor grazing make certain native breeds particularly suitable.	Encourage use of native breeds for grazing on semi-natural habitats of marginal agricultural productivity where this will enhance their biodiversity value. Encourage and facilitate marketing of products from conservation grazing with traditional breeds.	**Genetic diversity** **Biodiversity** **Food production** **Sense of place / inspiration**
Biomass energy	Soils Biomass crops Woodland	The NCA has a medium to high potential yield for short rotation coppice (SRC) throughout the NCA, with higher potential yield around Richmond in the north, and a medium potential yield for miscanthus.[17] As the area is comparatively well-wooded (9.6 per cent of NCA), there is good potential for woody biomass production. In 2012 there were 4 woodfuel suppliers, and 12 biomass boilers (with a capacity of 5,207 kWh).	Local	Woodfuel could be generated through clearance/ thinning/ restocking of conifer plantations, management of plantations specifically for fuel. There could also be more proactive management of existing woodland, where this would not undermine its wildlife value, particularly on ancient sites.	Encourage positive management of existing woodland to provide woody biomass, where this is consistent with nature conservation objectives and will not be detrimental to public access/recreation. Encourage use of by-products from timber processing for energy generation, where appropriate.	**Biomass energy** **Biodiversity**

[17] Opportunities and optimum sitings for energy crops, Natural England (November 2010) http://www.naturalengland.org.uk/ourwork/farming/funding/ecs/sitings/areas/015.aspx

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Climate regulation	Soils Semi-natural habitats Farmland	There is generally a low soil carbon content of 0 to 5 per cent throughout the NCA, although there are areas with a very high carbon content of 20 to 50 per cent underlying the moorland west of Harrogate and west of Catterick Garrison. There is higher carbon storage potential associated with 8,390 ha of woodland in the NCA (9.6 per cent of the NCA area), and the more than 1,000 ha of heathland, marsh, grassland, and wetland habitats.	Regional	Carbon stores in the area are likely to be in peaty soils associated with moorland and wetlands, woodland and its soils, and soils associated with permanent grassland. Existing woodland cover and agricultural land (grassland and arable) could also be managed to further enable carbon sequestration and storage. As a transitional landscape between lowland and upland areas, with good potential to develop a strong habitat network, the area has a particularly important role to play in helping wild species adapt to climatic change, particularly where conditions necessitate migration to higher land. River valleys could play a critical role as they already provide movement corridors between upland and lowland and they could be strengthened by increasing the width of riparian habitats and filling in gaps between existing semi-natural habitats.	Explore opportunities for tree planting to increase carbon sequestration/ storage, where in keeping with landscape character and not detrimental to nature conservation, food production or archaeology. Create networks of semi-natural habitats and improve existing wildlife corridors (especially along rivers) to facilitate movement of species as the climate changes, particularly by creating good movement corridors between upland and lowland areas. Encourage farming practices which maximise carbon content of agricultural soils, and minimise greenhouse gas emissions associated with farming activity (such as minimum tillage, incorporation of organic matter, combination machinery, precision targeting of fertiliser). Protect existing semi-natural habitats such as permanent pasture, heath/moorland and fens, particularly where on peat soils, for their carbon stores and for the contribution to ecological resilience. Encourage incorporation of features into new development which will minimise resource use, and therefore greenhouse gas production, and help with adaptation to climate change.	**Climate regulation** **Biodiversity** **Regulating water flow** **Regulating water quality** **Regulating soil quality** **Regulating soil erosion** **Sense of place / inspiration** **Biodiversity**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating water quality	Geology Soils Semi-natural vegetation Watercourses Farmland	14,045 ha (16 per cent of NCA) is covered by a Nitrate Vulnerable Zone. Two parts of the NCA fall within Catchment Sensitive Farming target areas, where in recent years the key focus of grants has been to reduce pollution of local watercourses with nutrients and sediments from farmyards and farmland. In the north of the NCA, the ecological potential of the River Tees and ecological status of its tributary the River Greta are 'moderate'[18] reflecting their heavily modified forms in this stretch. Further south, the ecological status or potential of surface waterbodies in the NCA, including the rivers Swale, Ure, Nidd and Wharfe, ranges from 'good' to 'poor'[19]. The River Washburn water quality is assessed as very good to excellent.[20] Groundwater chemical status in the north of the NCA is 'good'[21]. South of the rivers Tees and Greta, groundwater chemical status is 'poor' across the NCA.[22] Waterbodies classified as moderate, poor or bad fail to meet the standards set by the Water Framework Directive, so there are significant stretches within this NCA that are failing.	Regional	Issues affecting water quality include point source discharges from sewage works, water industry storm discharges and diffuse pollution from agriculture. Run-off of nutrients, sediment and herbicides from farmland are key issues. Watercourses adjacent to livestock farms may be at particular risk where stock have access to watercourses and where farms have insufficient slurry storage and/or poor farm infrastructure. Good farming practice to help reduce the risks of pollution in the NCA could include maintaining good soil structure, appropriate timing and application of slurry/ manure/ fertiliser (not on saturated or frozen ground) and fencing to exclude livestock from watercourses. In areas with a concentration of dairy farming, maize is a common fodder cop. Maize fields can be at high risk of soil erosion, particularly on sloping land. The risks can be mitigated by planting the crop across slopes, using grass buffer strips to slow and trap run off and by using a cover crop or rough surface cultivation after harvesting to prevent sediment being washed into water courses during winter. **Continued over...**	Encourage adoption of good soil management and good farming practice that reduces sedimentation and run-off from arable, mixed and livestock farms, such as incorporation of organic matter, avoiding heavy stocking and machinery use during very wet conditions, creation of buffer strips and keeping livestock away from watercourses. Encourage farmers and industry to update and improve infrastructure to minimise pollutant load to watercourses and risks of pollution incidents. Support and encourage the creation of grassland and woodland buffer strips alongside watercourses, especially where adjacent land is improved grassland or arable. Create sediment traps, ponds and wetland habitats to intercept pollutants from farmland, especially on cultivated land and improved grassland. **Continued over...**	**Regulating water quality** **Biodiversity** **Food production** **Regulating soil quality** **Regulating soil erosion** **Regulating water flow** **Recreation**

[18] *Northumbria River Basin Management Plan, Annex A: Current state of waters*, Environment Agency (December 2009).

[19] *Humber River Basin Management Plan, Annex A: Current state of waters*, Environment Agency (December 2009).

[20] *Wharfe and Lower Ouse Catchment Abstraction Management Strategy*, Environment Agency (March 2005).

[21] *Northumbria River Basin Management Plan, Annex A: Current state of waters*, Environment Agency (December 2009).

[22] *Humber River Basin Management Plan, Annex A: Current state of waters*, Environment Agency (December 2009).

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating water quality continued				**...continued from previous.** Creation of buffer strips along watercourses and slopes at high risk of surface run-off could help to protect water quality from sediment, nutrient and chemical run off. Buffer strips can either be of grassland or woodland, depending on which is more appropriate in relation to landscape character and riparian/aquatic species. Forestry Commission research suggests that woodland planting could play a particularly important role in reducing diffuse pollution of watercourses in areas around the Tees and Nidd and Oak Beck. Creation of sediment traps/ponds and creation of wetlands or reedbeds can also play an important role in intercepting pollutants from agricultural land. Advice and grants from the Catchment Sensitive Farming programme in the north of the NCA have sought to reduce sedimentation, nutrient and herbicide run-off by encouraging such good farming practice and funding improvements to farmyard infrastructure, cattle drinking/feeding points, and fencing of watercourses.	**...continued from previous.** Exclude stock from watercourses to avoid bank side erosion and sedimentation. Encourage inclusion of sustainable drainage systems in new development, and retro-fitting of features to existing development where possible.	

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating water flow	Geology Soil Semi-natural habitat (particularly riparian woodland, permanent grassland and wetlands)	Fluvial flooding in this NCA is generated from heavy rainfall in the Pennines where many of its rivers rise. Towns and villages in the NCA with more than 100 properties at risk of river flooding include Masham within the NCA, Ripon, Knaresborough, Catterick, Boroughbridge and York downstream of the NCA. There are significant storage reservoirs in the NCA and upstream, along the Ure, Nidd, and Washburn. In particular Fewston, Swinsty and Lindley Wood reservoirs, situated upstream of the Washburn's confluence with the River Wharfe, attenuate flood waters from the Washburn, and reduce flood risk downstream. Controlled washlands also contribute to flood management: washland along the River Wharfe at Harewood (in the south-east of the NCA) protects arable land in lesser floods, and contributes to flood protection downstream.[23] In the north of the NCA, the River Tees runs through a largely rural area and poses a 'low to moderate' risk of flooding; however, Barnard Castle and Staindrop are at risk of flooding from the Tees and its tributaries.[24] **Continued over...**	Regional	Flooding of residential areas, farmland and roads is a major issue in this NCA, as it has a large number of major rivers draining extensive upland catchments. A number of catchment-based initiatives to address flood risk have been set up in the area in recent years, but the biggest opportunities to resolve flooding within the area lie upstream in the Pennines, particularly in terms of measures to slow run-off, reduce synchronicity of peak flows and increase the water holding capacity of habitats and storage areas. The Ripon Multi-Objective Project was set up as a pilot, funded by Defra, to look at land use and land management within the catchments of the River Skell, River Laver and Kex Beck that could reduce the risk of flooding in Ripon, while also minimising soil erosion and sedimentation of watercourses. Action encouraged and funded under the scheme included: tree and hedge planting, fencing off woodland and watercourses, grip-blocking and ditch management.[25] The Environment Agency aims to promote agricultural land management changes to reduce run-off in the River Tees catchment, such as pond creation, buffer strips, and more sustainable drainage. **Continued over...**	Encourage and facilitate work on farms to slow run-off (such as tree planting, grass buffer strips, restoration of hedges, grip-blocking and the creation of water storage reservoirs). Secure good farming practice to slow run-off by enhancing soil structure, reducing soil erosion and increasing land surface roughness through either land cover or rough cultivation over winter. Encourage and facilitate creation of flood storage along river corridors, and establish water-holding habitats such as wet woodland, ponds and other wetlands, and manage them so that they provide benefits for biodiversity and enhance local landscape character. Protect existing flood plains, and where feasible, seek to reconnect them to their rivers, especially where heavily modified, for example along the Tees and Greta.	**Regulating water flow** **Regulating soil erosion** **Recreation** **Biodiversity**

[23] *Ouse Catchment Flood Management Plan*, Environment Agency (July 2010).

[24] *Tees Catchment Flood Management Plan, Summary Report*, Environment Agency (December 2009).

[25] Nidderdale AONB (URL: http://www.nidderdaleaonb.org.uk/nidderdale-57; accessed July 2013).

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating water flow continued		**...continued from previous.** Richmond and Catterick Garrisons are at risk of flooding from the River Swale, as levels rise quickly after high rainfall events on the Pennines. The River Ure also has large flows as a result of heavy rainfall in the Pennines. There are notable areas of agricultural land at risk of flooding, and the village of Masham (containing almost 400 properties) is at risk of flooding from the Ure and its tributary Swinney Beck. There is a risk of flooding from the Nidd in the area from Clint downstream to Ripley, north-west of Harrogate. In the south of the NCA, the River Wharfe responds rapidly to rainfall events. Flood peaks are generated by heavy rainfall in the upper catchment, and flood risk can become severe, having particular affect on communities downstream of this NCA. Major transport links at risk from flooding within the NCA include the A59 to Harrogate from the rivers Washburn and the Nidd, and the A6108 at Richmond and railway south of Catterick from the River Swale.		**...continued from previous.** In order to address flood risk, the Environment Agency aims to work with local authorities to identify and protect functional flood plains and reconnect flood plains to their rivers so as to reduce the risk of flooding to people and property. They also encourage the re-use of former mineral workings to deliver multi-purpose washlands for wildlife, flood management and local communities; and the creation of winter storage reservoirs by the agricultural sector. They also support moorland grip blocking and gill planting outside the NCA, to reduce the risk of flood generation upstream.[26] Forestry Commission research suggests that new woodland planting could be particularly helpful in reducing flood risk if focused around the Ure and Swale rivers. This is likely to be most effective along tributaries to the main rivers, rather than along the main rivers themselves. A modelling study predicted that planting flood plain woodland at four sites in the River Laver catchment totalling 40 ha in area (<1 per cent of catchment) could delay the progression of a 1 in 100 year flood by around one hour. This had the potential to reduce the flood peak at Ripon by 1 to 2 per cent by desynchronising the flood contribution from the adjacent tributary, the River Skell. A much greater reduction was expected with a larger planting area.[27]		

[26] *Ouse Catchment Flood Management Plan*, Environment Agency (July 2010).

[27] *Woodland for Water: Woodland Measures for meeting Water Framework Directive Objectives*, Forest Research (2011).

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating soil quality	Soils Soil flora and fauna Semi-natural habitat Farmland	Soil types range from peaty soils on the western upland fringe, heavy to more fertile loamy soils to the east. Glacial till covers much of the area, making the land slow-draining and prone to waterlogging. 55 per cent of the area is Grade 3 agricultural land, and 31 per cent is Grade 4.	Local	Much of the NCA is covered by soils that are prone to waterlogging, and so are particularly vulnerable to compaction, capping and poaching, all of which in turn can exacerbate run-off and lead to increased soil erosion. Soils on land used for arable production are at risk of: compaction, capping, reduction in organic matter and decline in soil flora and fauna. However much of this risk can be minimised through good farming practice and adoption of agri-environment options which help to maintain soil structure, organic matter and soil flora and fauna. Soil organic matter can be improved through measures such as incorporating compost/manure/ straw and use of green manures or winter cover crops. Soil structure also benefits from increased organic matter and can be further protected and improved through measures such as minimum tillage techniques, aeration and avoiding heavy stocking and use of machinery on fields during very wet conditions.	Encourage farming practices which protect and enhance soil structure and biodiversity in arable soils, such as minimum tillage techniques, incorporation of organic matter and aeration, and avoiding farm machinery use or heavy grazing levels during very wet conditions.	**Regulating soil quality** **Regulating soil erosion** **Regulating water quality** **Regulating water flow** **Recreation** **Biodiversity**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating soil erosion	Soils Soil flora and fauna Semi-natural habitat Farmland	Over half of the soils covering this NCA (58 per cent) have a low risk of soil erosion, namely the slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils (41 per cent), the slowly permeable seasonally wet acid loamy and clayey soils (14 per cent) and the freely draining flood plain soils (3 per cent). The freely draining slightly acid loamy soils (30 per cent) have enhanced risk of soil erosion on moderately or steeply sloping land where cultivated or bare soil is exposed. There is also potential for wind erosion on coarse textured variants. The slowly permeable wet very acid upland soils with a peaty surface (6 per cent) are at risk of gullying/ hagging (and loss of particulate organic matter) where surface vegetation is damaged or lost. The very acid loamy upland soils with a wet peaty surface (1 per cent) suffer from a combination of rapid runoff, easily damaged peat layers and steep slopes. Many of the slightly acid loamy and clayey soils with impeded drainage (3 per cent) are prone to capping/slaking, leading to increased risk of erosion. The Catchment Sensitive Farming target area that covers the northern section of the NCA has a specific priority to reduce loss of sediment from local farms.	Local	Lighter soils on more sloping ground, particularly where cultivated, are at most risk of soil erosion. Soils which have low levels of organic matter, or which have been damaged through compaction, capping or poaching, or where they are alongside spatey major rivers are also particularly prone to erosion. The large number of major rivers running through the NCA means that there are long sections of river banks which are at risk of erosion, particularly where livestock have access. Fencing livestock away from rivers would help to reduce soil erosion risk, although fencing should be focused so as to avoid accelerating the spread of invasive species (such as Himalayan balsam) and reducing the condition of habitats for priority species (such as water vole) by removing grazing. Upstream measures to reduce the velocity of the major rivers would also help and could take the form of tree-planting, habitat restoration to reduce the speed of run-off and increase infiltration, grip blocking and increasing storage capacity in both habitats and reservoirs. **Continued over...**	Encourage adoption of farm management practices, and agri-environment options, that minimise erosion risk, such as good soil management and incorporation of organic matter. On arable land encourage creation buffer strips of permanent grassland or scrub and woodland alongside watercourses and in-field grass strips, to slow run-off. In cases of severe erosion encourage conversion to practices such as spring (rather than winter) cropping, minimum tillage techniques and reversion of arable land to grassland. Fence livestock away from river banks to reduce erosion, where this will not encourage the spread of invasive species or displace priority native species, or encourage reduced levels of grazing adjacent to watercourses.	**Regulating soil erosion** **Regulating water quality** **Regulating water flow** **Food production**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating soil erosion continued				**...continued from previous.** Drainage of upland peaty soils may also result in increased oxidation of the peat and thus loss of carbon and soil wastage. Measures will be beneficial that retain water in situ, ensure good vegetative cover, and avoid over grazing/ trampling or damage by mechanised activities. Soil erosion may be exacerbated by climate change in some areas, particularly where soils are vulnerable to erosion by water during periods of high rainfall. Increased frequency and severity of peak flow events could also accelerate bankside erosion of major rivers, with possible implications for river morphology, sedimentation and loss of riparian habitats and farmland. Catchment Sensitive Farming priority capital items for 2013/14 grants include watercourse fencing, hard bases for livestock drinkers or feeders and sediment ponds and traps.		

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Pollination	Semi-natural habitats (heathland and moorland) Pollinator species	There is a lack of direct evidence about this service in the NCA. However, the lowland heath, upland moorland, hay meadows, hedgerows and flower-rich road verges will all act as valuable nectar sources for pollinating insects in the NCA. The proximity of these habitats to arable land means that there is good potential for this service to be provided within the NCA. Between 2005 and 2013 there were 9 Environmental Stewardship agreements in the NCA that included options for creation of nectar-rich and floristically enhanced field margins, covering 16.04 ha.[28]	Local	The most significant need for pollination of agricultural crops in this NCA is for the 1,685 ha of oilseeds. The remainder of the arable crops in the area are largely wind or self-pollinated, with the exception of some of the crops grouped into the "other arable crops" category of the June Census, which accounted for 169 ha in 2009 and includes insect-pollinated crops such as beans. The mixed nature of farmland, interspersed with hedges, in the east of the NCA will have good potential for pollination services. Hedgerows will be a particularly valuable food source and habitat for pollinating insects if they are left more than 1 year between cutting, and if they have flower rich margins alongside them.[29] Less frequent cutting of hedges will also allow shrub species to produce more fruit, thereby benefitting a range of insects, mammals and birds. Creating nectar-rich habitats to support pollinating insects benefits a range of other wildlife, particularly insectivorous small mammals and birds as well as bats.	Protect and restore existing flower-rich habitats, particularly unimproved grassland, meadows and heathland, and create new areas where possible, to provide additional nectar sources and habitat. Encourage use of integrated crop management techniques, particularly use of biological rather than chemical pest control, to avoid harm to non-target pollinating insects. Encourage less frequent cutting of hedges and manage the timing of cuts to road verges to allow more profuse flowering, thereby supporting more nectar feeding insects, and providing fruit for insects, birds and mammals over winter. Create strips and small areas of nectar-rich habitat on and next to arable land, in the form of nectar flower strips, flower-rich grass buffer strips, beetle banks, arable flora-rich headlands, particularly where these can provide links between isolated flower-rich grasslands and heathlands. Support research into the extent and value of natural pollination services, and communicate results to farmers.	**Pollination** **Food production** **Biodiversity** **Regulating water quality**

[28] *Genesis Schemes Reporting System (GENREP)*, Natural England (January 2013)

[29] *Ecosystem Services from Environmental Stewardship that benefit agricultural production*, Natural England (2012)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Pest regulation	Beneficial predator species Semi-natural habitats	There is a lack of direct evidence about this service in the NCA. However, good habitat likely to support beneficial predators next to arable crops, such as hedgerows/buffer strips/flower-rich road verges/beetle banks, act as valuable sources for pest regulating species in the NCA. The network of these habitats next to arable land, particularly in the more mixed farming landscape to the east, means that there is good potential for this service to be provided within the NCA.	Local	There is evidence to suggest that certain habitats (for example hedges, flower-rich buffer strips, unimproved grassland) can support populations of beneficial predator species which can help control common agricultural pests (for example, ladybirds regulating populations of aphids).[30] Habitats which provide a nectar source, shelter and additional prey species, such as the NCA's hedgerows, grasslands, woodlands and heathlands all have the potential to increase beneficial predator numbers. Where these, or temporary flower-rich habitats such as buffer strips or beetle banks, occur alongside arable crops, as they do in the east of the NCA, it is likely that they afford some pest control. If the approach could be built upon in this area, to maximise the agronomic benefits, it could play a valuable role in terms of increasing production of arable crops while reducing the use of pesticides and associated risk to water quality, human health and non-target species.	Encourage less frequent cutting of hedges and manage the timing of cuts to road verges to allow better habitat to develop for species of invertebrate and birds which can control crop pests. Encourage creation of buffer strips and beetle banks in arable fields, particularly through agri-environment schemes. Encourage use of integrated crop management techniques, particularly the use of biological rather than chemical control, to avoid harm to non-target beneficial predator species. Support research into the extent and value of natural pest control services, and communicate results to farmers.	**Pest regulation** **Food production** **Biodiversity** **Regulating water quality**

[30] *Ecosystem Services from Environmental Stewardship that benefit agricultural production*, Natural England (2012)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Sense of place/ inspiration	Semi-natural habitat (particularly native woodland and historic parkland) Geology Rivers Topography	The area's sense of place is derived from its position between upland and lowland, its ridges and hills, mixed farming and a well-wooded, traditional rural feel. The noticeable unity of the built environment, predominantly Millstone Grit and limestone, also contribute to this service. The area provides inspiration to many and its beauty recognised with the inclusion of 20,550 ha (24 per cent) within the Nidderdale and the North Pennines AONB. Senses of inspiration and escapism are provided by the open and expansive moorland tops along the western edge that contrast with the more small-scale, wooded landscapes in the valley bottoms, along with their historic settlements and rivers.	Regional	The sense of place varies somewhat throughout the character area: more upland, pastoral and treeless on the hill tops in the west, more mixed/ arable and well-wooded on the side slopes, with lowland farmland with hedges in the east. The whole area is united by its location on the eastern flanks of the Pennine uplands and its tranquil, rural character, which sets it apart from its more industrial neighbours to the north and south. Many of the vistas within the NCA are very picturesque – in the common sense of the word, but also in an academic sense in relation to "The Picturesque" art movement of the 18th century. William Gilpin, an 18th-century scholar who wrote widely about "The Picturesque", referred to the view from Mowbray Point at Hackfall Woods as "one of the grandest and most beautiful bursts of country that the imagination can form." One of the best known visitors to take inspiration from the area was the artist J M Turner who often stayed at Farnley Hall in Wharfedale; the River Greta was a favourite location for him to sketch.	Protect the area's well-wooded, pastoral and mixed farming character by: – Ensuring retention and sympathetic management/ renewal of hedgerows, hedgerow trees and woodland. – Communicate the importance of sympathetic management of veteran trees on both arable and pastoral land, and encourage planting of replacement trees. – Restore and manage historic estates and parkland, including restoring features like vistas and parkland trees. – Encourage retention of permanent pasture. – Encourage re-stocking of conifer woodland with broadleaved species. – Encourage new woodland planting where it is in keeping with landscape character and does not undermine nature conservation, food production or archaeology. **Continued over...**	**Sense of place / inspiration** **Tranquillity** **Sense of history** **Biodiversity** **Recreation**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Sense of place/ inspiration continued					**...continued from previous.** Protect the unity of the built environment, particularly in conservation areas and the AONB, by encouraging use of traditional materials and techniques, while allowing for innovative and sustainable design. Protect the rural, tranquil and ancient character of some parts of the NCA by managing development pressure and increasing levels of traffic to minimise their impact.	
Sense of history	Buildings Earthworks Field boundaries Veteran trees, ancient woodland and parkland Geology	The NCA has: ■ 15 Registered Parks and Gardens, covering 1,770 ha; ■ 151 Scheduled Monuments; ■ 2,622 Listed Buildings; ■ 1 World Heritage Site. There are currently 92 designated monuments at risk in the Pennine Dales Fringe. Important concentrations of pre-historic carved rocks can be found in the upland areas in the south-east of the NCA.	International	This area is rich in historic remains from many different periods of history. From its valuable collection of pre-historic carved rocks, through Roman roads (Dere St) and settlements to designed landscapes and grand country houses. There are several monastic estates and designed landscapes often located at valley openings, including Harewood, Aske, Ripley, Hawnby, Fountains Abbey, Middleham, Norton Conyers and Temple Grounds Richmond, with several originating from medieval hunting grounds or castles. The sense of history in the area is embodied not just in archaeological sites, listed buildings and historic parkland, but also in the well-preserved stone-built villages and market towns and the traditional hedgerow and stone wall networks that survive relatively intact in some areas.	Protect the unity of the built environment, particularly in conservation areas and the AONB, by encouraging use of traditional materials and techniques, while allowing for innovative and sustainable design. Ensure protection and sympathetic management of historic parkland, restoring key features, including veteran trees, whilst making them relevant to the needs of 21st century, providing access where possible. Ensure sympathetic management and high-quality interpretation of historic sites and archaeology, particularly where this protects and explains the wider context of historic landscapes.	**Sense of history** **Sense of place / inspiration** **Biodiversity** **Recreation** **Tranquillity**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Tranquillity	Topography Semi-natural habitat (particularly moorland and native woodland) Watercourses	65 per cent of the NCA is classified as 'undisturbed', a decline from 85 per cent in the 1960s. Scores for tranquillity in the area range from 50 to –66, with an average of 5.	Local	Tranquillity is most significantly affected in the south by Harrogate and the roads connecting it and rural commuter settlements to Leeds. In the north of the NCA Richmond, Gatterick Garrison, Barnard Castle and surrounding A-roads and the main A1 trunk road impact on tranquillity. Traffic pressure on main commuter routes around Leeds and Harrogate is increasing with negative implications for tranquillity, as well as safety of recreational users. Changing working patterns may help to alleviate some of this pressure, particularly if communication links, such as high speed broadband to rural areas can be improved to encourage more people to work from home. A sense of tranquillity is thus most likely to be found away from these areas, particularly within the wooded river valleys and where pastoral landscapes are reinforced by thick hedgerows and traditional features.	Protect the most tranquil areas from intrusion and inappropriate development. Manage increasing traffic levels to minimise intrusion through noise pollution and risk to other road users. Support improvement of communication links, particularly broadband, to maximise possibilities for people to work from home rather than commuting by car.	**Tranquillity** **Sense of place / inspiration** **Sense of history**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Recreation	Rights of way Watercourses Reservoirs Semi-natural habitat (particularly woodland and parkland)	Recreation and access are supported by 1,425 km of rights of way (equivalent to 1.63 km per km^2), including the Coast to Coast path, Ebor Way, Nidderdale Way, Way of the Roses, Walney to Wear or Whitby and Teesdale Way long-distance paths. Overall there are 2,456 ha of accessible land. Opportunities for angling are provided by the string of reservoirs along the Washburn valley in the south of the NCA, and some stretches of the major rivers. The NCA's numerous major rivers also provide additional high-quality opportunities for canoeing, kayaking and swimming and wildlife watching.	Regional	The area provides a pleasant setting for various forms of recreation. The verdant, well-wooded landscape is an attraction in its own right; the area also has many valuable assets for recreation in the form of historic parklands and country houses and major rivers and reservoirs. The Nidderdale AONB covers 24 per cent of the NCA and attracts many visitors and provides information about the area's special qualities. Cycling is a very popular sport in the area, with the national Cyclists Touring Club originally forming in Harrogate. The area is particularly well-suited to road biking because of its network of quiet lanes and many moderate to challenging hills. The River Washburn Valley, encompassing the reservoirs of Thruscross, Swinsty, Fewston and Lindley Wood is particularly important for water-based recreation. The reservoirs are open to the public with a variety of footpaths and picnic facilities for visitors. Bird watching is popular, with the reservoirs and the mixed plantations in the lower part of the valley supporting a variety of woodland birds and wintering wildfowl including mallard, teal and pochard. Thruscross Reservoir provides sailing facilities and an outdoor centre. Below the dam wall in the Washburn Valley, canoeists have an agreement with Yorkshire Water Services Limited whereby controlled releases allow canoe and kayak events to be held on a river course modified for the purpose.	Manage increasing traffic levels, particularly around towns/cities and on main commuter routes, to minimise risk to recreational road users (walkers, cyclists and horseriders). Enhance provision of new linear and circular off-road routes suitable for cyclists, horseriders and walkers, and increase promotion of existing off-road routes, to further promote outdoor recreation in the area. Improve access by ensuring that paths are well maintained and signposted and that some surfaced paths are provided to ensure easy access walks. Seek to further improve and protect water quality, particularly in the main rivers, to enhance the enjoyment and safety of recreational river users.	**Recreation** **Biodiversity** **Tranquillity** **Regulating water quality**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Biodiversity	Geology Soils Watercourses Semi-natural habitats (esp. native woodland and species-rich grassland)	There are two internationally designated sites within the NCA: a relatively small portion (less than 1 per cent) of the North Pennine Moors SPA/SAC, which holds much of the upland heathland and the major extent of blanket bog in England and is of International importance for several upland breeding bird species; and the North Pennine Dales Meadows SAC around Richmond, designated for its hay meadows. There are also 19 SSSI in the NCA, the largest of which is the West Nidderdale, Barden & Blubberhouses Moors SSSI in the north of the NCA, designated for its nationally important assemblage of moorland breeding birds including merlin, golden plover, snipe, curlew, redshank, teal and short-eared owl[33]. The majority of the other SSSI in the NCA are designated for their woodland, neutral grassland and fen. There is over 3,000 ha of BAP priority habitat within the NCA (3 per cent of the NCA), 40 per cent of which is comprised of lowland mixed deciduous woodland. Other BAP habitats include upland heathland, upland hay meadows and wet woodland. The NCA also has 177 Local Wildlife Sites, covering 2,496 ha (3 per cent of the NCA). **Continued over...**	National	The quality of rivers and riparian habitats are of critical importance to the biodiversity of the area. These areas are also particularly vulnerable to the spread of non-native invasive species, for example Himalayan balsam along the River Ure. River corridors also host a number of valuable habitats. The ancient woodland sheltered by the river valleys is a priority habitat in its own right, with some stretches designated as SSSI (including Lower Swaledale Woods and Grasslands, Hackfall Woods and Brignall Banks) as well as providing corridors for wildlife to move through. The wet grasslands, fen and meadows alongside some of the rivers are also some of the most valuable wildlife sites in the NCA, both for plants and birds. Woodlands are a very valuable wildlife resource in the area and could be enhanced through: appropriate management of existing woodland; restocking of conifer plantations with broadleaves (especially on PAWS sites); creation of buffers around ancient woodland sites; tree-planting to connect isolated fragments of woodland and extend existing sites. Veteran trees are a notable component of the area's biodiversity, providing nesting/ roosting sites and food for a large number of species including barn owls, tawny owls and species of, bat and rare dead-wood eating insects. Livestock and arable farming can have detrimental effects on veteran trees that can shorten their life expectancy. **Continued over...**	Create new broadleaved woodland where it will buffer, connect and extend existing sites (particularly ancient woodland) and where it can deliver benefits for water quality, flood risk reduction and recreation, without undermining archaeology, species of open ground or landscape character. Improve management of existing woodland for the benefit of wildlife and restock conifer plantations (particularly plantations on ancient woodland sites) with broadleaves. Incorporate broadleaved species into key areas within existing and new coniferous plantations to maximise their wildlife, landscape and recreation value. Create new wetland areas where they will connect, buffer or extend existing sites, and where they can help to reduce flood risk and pollution of watercourses. Create new grassland where they will connect, buffer or extend existing sites and where they will contribute to water quality, flood alleviation and landscape character. **Continued over...**	**Biodiversity** **Climate regulation** **Regulating water flow** **Regulating water quality** **Regulating soil quality** **Regulating soil erosion** **Sense of place / inspiration** **Recreation** **Tranquillity**

[33] Natural England website, SSSI citation (accessed December 2010), http://www.sssi.naturalengland.org.uk/Special/sssi/sssi_details.cfm?sssi_id=2000321

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Biodiversity continued		**...continued from previous.** The major rivers, along with associated river valleys, wetlands and reservoirs, are major wildlife assets. The rivers support populations of otter, water vole, trout, lamprey, white-clawed crayfish and freshwater mussel. The wooded river corridors are also important for bat species. The wet grassland alongside rivers in some of the more open valleys, particularly the Wharfe Valley, are important winter feeding grounds for wading birds, which nest in the Yorkshire Dales and Pennines to the west of the NCA. The Harewood Estate has been the location for a very successful red kite reintroduction project. Higher ground in the north and west parts of the NCA is home to black grouse. The NCA is ranked by Natural England specialists as in the top 5 in the country for hen harrier and top 10 for lapwing.		**...continued from previous.** Soil compaction, nutrient/herbicide application, cultivation and grazing and rubbing by livestock can all be very damaging. Arable farmers should be strongly encouraged to leave a large uncultivated buffer around trees (at least the extent of the canopy) where nutrients and agricultural chemicals are not applied. Livestock farmers should be encouraged not to apply nutrients or herbicides around the base of trees, and to avoid compaction by fencing off particularly sensitive trees where possible. On some estates young trees are being planted near veteran trees to replace them when they die. Hedgerows provide vital cover, nesting sites and food for wildlife in the NCA, particularly in arable and intensive dairy farming areas. Some hedgerows in the area are cut very short each year. The wildlife value of such hedgerows could be greatly increased by the addition of hedgerow trees and by being cut every third year, as flowers and fruit only occur on second year growth and less regular cutting would allow them to become taller and thicker and therefore more valuable as wildlife movement corridors. Hay meadows and unimproved grasslands are an important resource in the area, both for maintaining populations of rare plant species, but also supporting nectar-feeding insects as well as populations of ground nesting birds. Rough grazing land on the edge of Pennine moorlands is particularly important as breeding and feeding grounds for wading birds.	**...continued from previous.** Ensure positive management of existing grassland to maintain diversity of flora and fauna species. Create key linkages in semi-natural habitats where they will help wildlife move and adapt to a changing climate. Encourage less frequent cutting of hedges, preferably every third year, to increase flowering and berry production to provide food for insects, birds and small mammals, and to increase their size. Support restoration of hedgerows along old hedgelines, particularly where these connect up isolated patches of woodland, and gapping up of existing hedges. Control non-native invasive species to reduce the threat to priority habitats and species, particularly Himalayan balsam along major rivers. Encourage creation of flood storage areas in river valleys, and establish wet grassland and other wetland habitats with appropriate management to create favourable condition for priority species such as a wading birds and rare flowering plants, and to strengthen local landscape character. **Continued over...**	

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Biodiversity continued					**...continued from previous.** Allow rivers to follow more natural courses, to improve in-stream ecological diversity and create a range of fresh water habitats such as oxbow lakes and wetlands. Encourage best farming practice to protect/enhance soil quality, minimise soil erosion and minimise water pollution. Create buffer strips of grassland, scrub and woodland alongside watercourses to provide wildlife movement corridors and to protect watercourses from diffuse pollution from agriculture. Remove artificial barriers to fish-migration and install fish passes where removal of barriers is not possible.	

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Geodiversity	Geology	The NCA has 1 geological SSSI (Great Almscliff Crag), and 7 candidate Local Geological sites, in which all of the groups are exposed (Craven, Yoredale, Millstone Grit, Pennine Coal Measures and Zechstein) with several of the exposures representing British Geological Society type or reference sites.	Local	Very little bedrock is exposed but distinctive outcrops occur at Norwood and at Almscliff Crag, which is designated as a geological SSSI. Limited exposures of Carboniferous Limestone occur near Leyburn and Richmond.	Allow rivers to return to more natural courses, where feasible, enabling natural geomorphological processes to resume. Ensure sympathetic management, and high-quality interpretation, of geological sites.	**Geodiversity** **Recreation** **Sense of place / inspiration**

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