National Character Area profile:

21. Yorkshire Dales

NATURAL ENGLAND

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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.

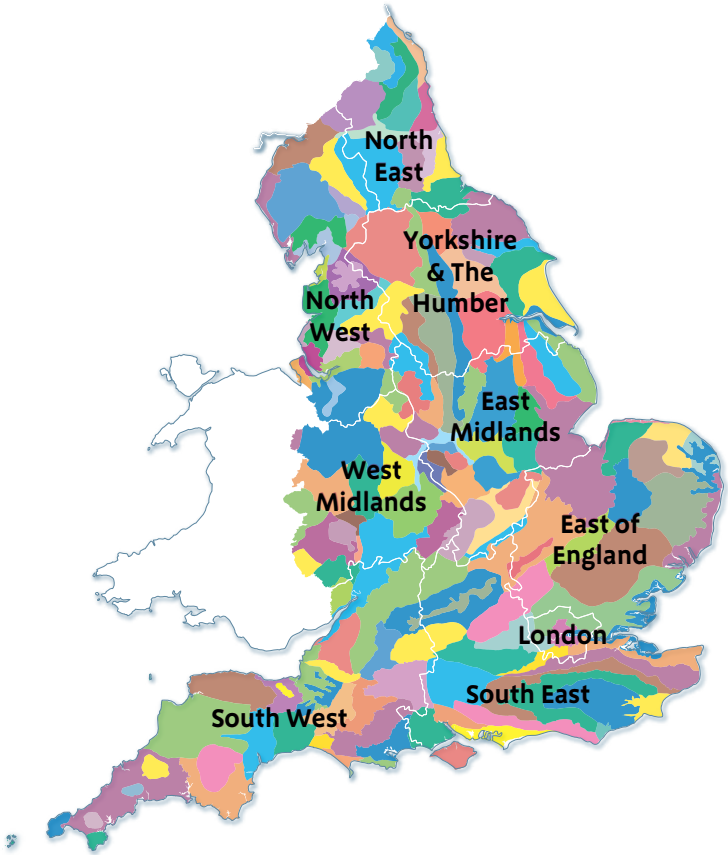
NCA profiles are guidance documents which can help communities to inform their decision-making about the places that they live in and care for. The information they contain will support the planning of conservation initiatives at a landscape scale, inform the delivery of Nature Improvement Areas and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

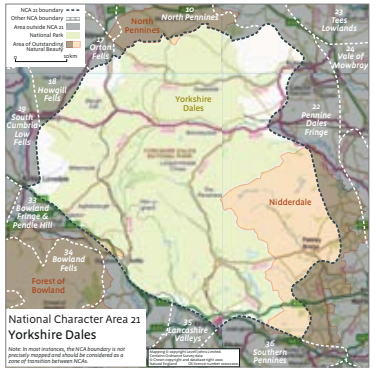
[3] European Landscape Convention, Council of Europe (2000; URL: http://conventions.coe.int/Treaty/en/Treaties/Html/176.htm)

Summary

The Yorkshire Dales National Character Area (NCA), situated in the Pennine uplands, is a landscape of high, exposed moorland dissected by sheltered valleys or dales, each with their own character. Geologically, the south-west of the area is considered to be outstanding for its 'karst' (limestone) landforms, cave systems and exposures of Carboniferous rocks. Over two-thirds of the area falls within the Yorkshire Dales National Park and 17 per cent of the area falls within the Nidderdale Area of Outstanding Natural Beauty.

The landscape is characterised by contrasts, especially between the dales below and the moors above. In the dales the environment is more sheltered and there are intricate patterns of walled fields, containing meadow grasses and wild flowers. Small villages and farmsteads, built of local stone, are tucked into sheltered corners, often with clumps of trees protecting them from the worst of the elements. On the dale sides, the network of walls continues with scattered stone field barns often appearing as distinctive features. The steepest slopes are frequently marked by the presence of sparse woodlands or sometimes open rock scree. There are large areas of actively managed grouse moorlands in the north and the east of the NCA. This enterprise makes a significant contribution to the local landscape character of areas such as Nidderdale and Swaledale.

Fast-flowing streams tumble down the slopes, forming dramatic waterfalls where the rock is harder and coarser. The NCA is the source of 21 major rivers. On the fell tops the grassland gives way to sweeps of heather moorland and cotton grass bog. Everywhere there are dramatic views of characteristic combinations of hillside, valley walls and barns, punctuated by outcrops of rock, streams and trees, and enlivened by the colours and textures of wild flowers. The area is distinctive for its well-preserved archaeology spanning from Mesolithic to modern industrial sites, its traditional architecture and its nationally and internationally rare habitats such as limestone pavement and upland hay meadows. Designated sites include Malham Tarn, which is designated as a Site of Special Scientific Interest (SSSI), Ramsar site, Special Area of Conservation (SAC) and National Nature Reserve; the North Pennine Moors, an SSSI, SAC and Special Protection Area (SPA); and Ingleborough, an SSSI and SAC. The area also has a high coverage of voluntary agri-environment agreements to improve the management of priority habitats and landscape features.



Click map to enlarge; click again to reduce.

The landscape is highly valued for its range and quality of recreational opportunities, with a number of well-used long-distance routes including the Pennine Way and Pennine Bridleway National Trails, the Dales Way and the Coast to Coast footpath and cycle route. The Three Yorkshire Peaks of Ingleborough, Pen-y-ghent and Whernside are distinctive features in the landscape and are heavily used for recreation.

The NCA has the potential to deliver a wide range of ecosystem services. Some have international reach, such as the potential to help to mitigate climate change, in that the vast expanse of peatland habitats in the NCA store and have potential to sequester large amounts of carbon, and to provide recreational activities to visitors from all over the world, as well as local residents and people from the UK. Some services are more local and regional in their impact, such as providing drinking water and regulating water flow, as a result of the large upland catchment and numerous major rivers, and food provision, as the NCA is an important area for meat and dairy production.

The future is likely to bring an increased number of visitors, along with an opportunity for the local economy to benefit from this, but there is also a need for careful management to stop increased traffic and other pressures detracting from the tranquillity and undeveloped character of the area. Many species will need better links between habitats to enable them to move to more suitable sites as the climate changes, and some species, particularly those at the southern extreme of their range or on highest ground in the NCA, such as black grouse and purple saxifrage, may be lost from the NCA as temperatures increase.

Statements of Environmental Opportunity

- **SEO 1**: Protect the glacio-karst landscape and important geological sites, such as Malham Cove, as well as the historical environment, including drystone walls and field barns, to retain sense of place and the strong relationship between the landscape and the underlying geology.
- **SEO 2**: Protect and enhance the distinctive pastoral character of the dales with its network of semi-natural habitats (including important upland hay meadows and wetlands along the numerous watercourses) to enhance water quality, strengthen connectivity, support rare species and allow for adaptation to climate change.
- **SEO 3**: Protect, enhance and restore the open moorland and blanket bogs to conserve their internationally important habitats and species, strong sense of place, history and remoteness, and peat soils, with their ability to sequester and store carbon and contribute to water quality.
- **SEO 4**: Plan for and sustainably manage high visitor numbers to maintain access to and enjoyment of the Dales landscape, including the heavily visited key features such as Gordale Scar, the Three Peaks, Brimham Rocks and How Stean Gorge, while maintaining a living, working landscape, and protecting the tranquillity valued by visitors and local residents.
- **SEO 5**: Protect, enhance and extend, as appropriate, existing native woodland in this largely unwooded landscape in order to improve habitat connectivity, benefit wildlife, improve water quality, reduce flooding and soil erosion, sequester carbon and provide wood fuel.

Description

Physical and functional links to other National Character Areas

The Yorkshire Dales are part of the chain of Pennine uplands that runs down the centre of northern England, forming a near continuous belt of moorland and upland pastures. The high ground of the National Character Area (NCA) provides impressive views of surrounding NCAs, and the dramatic topography, combined with high rainfall, gives the area an important role as the headwater of many of Yorkshire's major rivers.

The distinctive rounded hills of the Howgill Fells, with the lower Orton Fells beyond, are visible to the west from the higher land of the western Dales. There are geological links with the Orton Fells, with the same Carboniferous Limestone forming the pavements of Great Asby Scar. Looking north-west from the wide, windswept moors above Swaledale, Cross Fell, the highest point in the Pennines, is visible. Little Dunn Fell and Great Dunn Fell, with the distinctive radar station right on top, are also visible. To the east, the Yorkshire Dales gradually blend in with the more wooded side slopes of the Pennine Dales Fringe which drop down to the fertile farmland of the Vale of York and Vale of Mowbray. On a clear day, the hills of the North York Moors and the chimneys and industry of Teesside can be seen.

Most of the large rivers which have their source in the Yorkshire Dales flow to the east through the Pennine Fringe and into the Vale of York. The Swale, Ure and Nidd all feed into the larger River Ouse which flows through the City of York, with the River Wharfe joining the Ouse downstream at Cawood before then flowing out to sea through the Humber Estuary. The River Ribble flows south-west from the western Yorkshire Dales into the neighbouring Bowland Fringe area and beyond into the Irish Sea. Reservoirs in the south of the area supply water to the Bradford area.

Kilnsey Crag and River Wharfe from the Dales Way at Conistone showing the strong influence of local geology on buildings and walls.

Key characteristics

- Large-scale upland landscape of high, exposed moorland, with blanket bog and heath, dissected by dales which are often deep and have their own distinctive character.
- Plateaux of high moorland overlying Yoredale Group geology in the north and Millstone Grit in the east, forming typically stepped profiles to the dale sides and dramatic weathered features such as Brimham Rocks.
- Wide, glaciated valleys, with rough grazing on upper slopes, permanent pastures on dale sides and fields cut for hay and silage in the more fertile valley bottoms.
- Remnant semi-natural broadleaved woodland on valley sides and in gills, contrasting with large, rectangular blocks of conifers in some dales.
- Large numbers of characteristic stone field barns, particularly in Swaledale and Wensleydale, and strong patterns of drystone walls, with very large, rectangular enclosures on fell tops, much smaller enclosures in dales, and often older, irregular patterns around settlements.
- Evidence of historic land use from prehistoric times through to the present still highly visible as a result of relatively low levels of cultivation and development.

Valleys with stepped sides and strong patterns of stone walls, field barns and meadows, as seen at Swaledale.

Key characteristics continued...

A much-loved landscape full of opportunities for outdoor recreation.

- Great Scar Limestone in the south and west giving rise to a classic glacio-karst landscape with cave systems, outcrops, scars, gills, gorges and extensive limestone pavements.
- Gritstone, sandstone and limestone buildings including scattered farmsteads, particularly in the north and west, and small nucleated villages on valley floors, often close to river crossing points and transport routes.
- A number of major rivers rise on the high moorlands of the NCA and have made a defining contribution to the character of the area by carving out river valleys, gorges and waterfalls and forming a sinuous, dynamic focal point for many valleys and settlements.
- A strong sense of tranquillity and remoteness, with low levels of intrusion and light pollution.
- Dramatic topography with wide panoramic views, making a defining contribution to sense of place, from high mountain summits to sheltered valleys and gorges.
- A well-known landscape with many opportunities for outdoor recreation and enjoyment, including well-connected and maintained networks of access routes and open access areas, and widespread availability of information to enhance understanding and appreciation (such as interpretation panels and visitor centres).

The Yorkshire Dales today

The distinctive character of the Yorkshire Dales NCA has evolved over thousands of years through the interactions of humans and the environment. The dramatic topography of the area, combined with a relatively harsh climate, low population density and remoteness from major centres of population, has limited the opportunities for agricultural intensification and modern development, resulting in widespread semi-natural habitats and a well-preserved historic landscape with many visible reminders of the area's past.

Dry summer days provide vital opportunities for farmers to make their hay and silage crops.

The Yorkshire Dales NCA is a glaciated, upland landscape of rounded hills and moors separated by broad valleys cut into Carboniferous rocks of limestone, Millstone Grit and shale. The high moorland, which rises to over 700 m in the west, contrasts with deep, glacial valleys and provides dramatic summits with far-reaching views, such as those of the Three Peaks of Whernside, Ingleborough and Pen-y-ghent.

Geologically, the area is outstanding for its karst (limestone) landforms, cave systems and exposures of Carboniferous rocks. The Craven faults are responsible for dramatic parallel scars in the south, giving rise to well-known features such as Giggleswick Scar and Malham Cove. The area has 40 Sites of Special Scientific Interest (SSSI) either partly or wholly designated for their geological interest, as well as 7 Local Geological Sites. The geology of the NCA is complex, with areas of limestone juxtaposed against Ordovician, Silurian and Carboniferous sandstones and gritstones. Several areas, including Swaledale and Greenhow, have extensive networks of mineralised (particularly lead, fluorite and zinc) faults. These have been exploited by the use of adits, mines, pits, and hushes (a historic mining method using a flood or torrent of water to reveal mineral veins), producing distinctive industrial landscapes, which include mineral spoil heaps covered with metal-loving plants. Large areas of high ground in the NCA are overlain by peat soils, and a range of acidic and limestone clayey and loamy soils occurs on lower ground.

The area gives rise to numerous major rivers such as the Ure, Wharfe, Nidd and Swale, but there are few naturally occurring lakes and tarns, reflecting the predominance of highly permeable limestone. The principal exceptions occur where Carboniferous rocks have been eroded away to reveal impermeable rocks below, such as at Malham Tarn and Semerwater. Many dramatic features have been created by watercourses eroding rock over long

periods of time, such as Gordale Scar gorge in the Great Scar limestone and Hell Gill in the Yoredale Group limestone, Hardraw Force and Aysgarth Falls waterfalls, the Swale meanders at Reeth and river terraces in Wharfedale.

The landscape of the Yorkshire Dales today is the product of vast amounts of human endeavour, particularly at the hands of farmers, moorland keepers and craftspeople, such as in the construction and maintenance of thousands of kilometres of drystone walls, and the management of vegetation to create pastures, meadows and moorland. Although there is extensive evidence of past arable cultivation, farmland in the valleys of the NCA today is primarily used for keeping livestock, resulting in a strong bias towards grazing pasture and hay meadows, surrounded by dramatic networks of stockproof drystone walls and punctuated by large numbers of stone field barns that were once used for storing fodder and housing livestock over winter. Agriculture remains one of the most important industries in the area and is based on upland sheep, beef cattle and dairy farming, with a few entrepreneurs producing high-quality local food products, such as Wensleydale cheese. On higher land early clearance of woodland and sheep grazing led to the formation of large areas of open moorland, which from the 19th century has also been managed for red grouse, which includes rotational burning and predator control. Red grouse is native only to the UK, and during the grouse season each autumn the Yorkshire Dales attract sportspeople from all over the world.

The Yorkshire Dales NCA has large areas of rare and wildlife-rich habitats, which fill the landscape with colour in summer and autumn, as the hay meadows and heather moorlands bloom, and sound in spring, as the wading birds return to their breeding grounds. The upland hay meadows and limestone pavements are particularly distinctive and important; with over half the UK's resource of both occurring within this NCA, much of it protected by UK and European conservation designations (SSSI and Special Area of Conservation (SAC)). The upland hay meadows sustain scarce plants such as globeflowers and lady's mantle, and the large expanses of limestone pavement not only provide a dramatic, other-worldly landscape, but also support rare species such as baneberry and hart's tongue fern in their sheltered grikes (fissures). The range of moorland and moorland-edge habitats provides one of the most important areas in Europe for populations of birds including red grouse, merlin, golden plover and black grouse, and extensive areas designated as European Special Protection Areas (SPAs) in recognition of this.

Dramatic hills with distinctive profiles, such as Ingleborough, and outstanding karst features such as Southerscales limestone pavement.

The Yorkshire Dales NCA has limited tree cover; native woodland tends to be limited to fragments of ancient and semi-natural woodlands on the terraced dale sides, alongside steep gills and on areas of limestone pavement. Smaller areas of trees (commonly sycamore) are often found around villages and farmsteads to provide shelter. Some dales include large blocks of conifers, such as at Oughtershaw and in Wensleydale and Upper Nidderdale, which stand out in an otherwise open landscape with their unnatural rectangular shapes and non-native species. Other natural and semi-natural habitats such as scrub, flood plain wetlands and neutral grassland have been largely lost from the NCA, persisting only as tiny, isolated patches.

The landscape is rich with reminders of historical land use stretching back to Neolithic times including monuments such as Castle Dykes henge near Aysgarth and cup and ring stones on Askwith Moor overlooking the Washburn Valley. The area is also particularly rich in earthwork remains of prehistoric and later field systems such as those above Grassington, and extensive remains from the lead mining industry, such as those at Greenhow, Pateley Bridge and Grassington Moor. The Settle to Carlisle railway, with its iconic viaduct at Ribblehead, is also a prominent feature. The strong sense of history from well-preserved archaeology is enhanced by the high density of drystone walls, with the oldest examples enclosing small, irregular fields around settlements in valley bottoms and larger, rectangular 18th- century enclosures on the moorland edge. Some valleys, particularly Swaledale and Wensleydale, have a large number of field barns, many from the 18th and 19th centuries. Although the majority of land in the area is used for agriculture, there are also a small number of limestone and sandstone quarries.

Each of the valleys in the NCA has its own distinctive character. In the north, Swaledale is distinctive for its sweeps of heather moorland on the fell tops, its pattern of walls and field barns, flower-rich meadows and small, tight-knit villages. Wensleydale is wider, with a more varied landform, while Wharfedale and Littondale demonstrate the typical Dales character of strong patterns of walls and field barns on the valley floors, with woodlands surviving on the valley sides. Coverdale is quiet, dominated by rough grazing, with many small streams cutting down the hillsides, while Dentdale, in the north-west, shows the influence of wetter, milder conditions, with hedges rather than walls. The dales in the south and west reflect the influence of the underlying limestone; large limestone quarries can be seen along Ribblesdale, while Chapel-le-Dale reveals the underlying rock dramatically, with broad shelves of limestone and limestone pavement on both sides. The Upper Nidderdale, Washburn and Burn valleys are narrower, steeper-sided and more wooded in character, with numerous reservoirs, while the Middle Nidderdale Valley is broader and more settled.

Its distinctive landscape, with well-preserved historical elements and very high levels of tranquillity (96 per cent of the area is classified as 'undisturbed'), attracts large numbers of visitors and has provided inspiration to numerous artists and writers over the years. The NCA is one of the most important and well-used areas in the UK for outdoor access and recreation. It has a high density of public rights of way, including two National Trails, and an unusually high proportion of open access land (60 per cent of the NCA). Its dramatic topography and geology attract large numbers of hill walkers, climbers and cavers.

The landscape through time

The predominant rock of the southern Dales is the Carboniferous Limestone, formed about 330 million years ago. This is overlain by the Yoredale Group which is in turn overlain by Millstone Grit, forming a capping to some of the highest hills. The Yoredale Series consist of soft shales, hard sandstones and limestones, giving rise to the stepped profiles of the dale sides, as in Wharfedale and Wensleydale, and the dramatic profiles of Ingleborough and Pen-y-ghent. The Millstone Grit forms the plateaux of high moorland in the south-east. In the south-west the Carboniferous Coal Measures have been mined from the Ingleton Coalfield. Rocks have been eroded and smoothed by glacial activity. Wharfedale and Littondale show the classic U-shape of glacial valleys.

As the climate warmed after the last ice age the landscape changed from open tundra to dense woodland. Small clearings occurred naturally around waterbodies and were enlarged by Mesolithic hunters who burnt back the edge of the forest to attract large herbivores for hunting, and established summer camps, such as at Malham. Neolithic farmers cleared larger areas of forest for grazing animals and crops. They also built features, still visible today, such as stone-banked enclosures on Calverside Moor and henges at Castle Dykes and Yarnbury. Woodland clearance and settlement was continued by bronze-age people, who left dramatic monuments in the form of burial mounds such as Scale House barrow, and rectilinear field systems such as High Close field systems near Grassington.

The iron-age/Romano-British period saw acceleration in tree clearance and increasing settlement, particularly in Ribblesdale and Wharfedale, with earthworks of farmsteads and round houses still visible today. The first evidence of a Roman presence in the area is a temporary marching camp on Malham Moor. Although there is evidence of a long-term presence by the Roman military, particularly at Bainbridge and along main communication routes, and of their industry such as lead mining at Greenhow, their influence was arguably much less significant than in other parts of England.

The Norber Erratics are dramatic illustrations of geological processes.

The 9th to 11th centuries saw Norse settlers colonise the area, leaving a lasting influence on local place names and precipitating a reordering of the landscape; common fields were grouped around valley-floor settlements, close to cow pastures on the valley sides and with access to summer grazing, fuel and other products on the moorland. In the winter of 1069/70 the Normans undertook the 'Harrying of the North', which saw the estates and crops of the Yorkshire Dales destroyed as part of efforts to suppress the rebellious North, reducing much of the land to unproductive 'waste'. The Normans built a number of castles, such as Castlehaw, to help to maintain control over the area, and created hunting 'forests' in which to indulge their love of hunting.

During the 12th century large areas of the Dales came under the control of monasteries; for example, Jervaulx Abbey controlled much of Wensleydale, Byland Abbey had lands in Nidderdale, and Fountains Abbey had vast tracts of Airedale, Wharfedale and Nidderdale. The monastic lands took the form of vaccaries for rearing cattle in the valley bottoms and berceries for sheep rearing on the fell tops. The 12th to 13th centuries saw limited colonisation of remaining areas by peasant farmers, with isolated farmsteads developing from the 14th to 16th centuries, often on the sites of vaccaries and hunting lodges.

Landscape change accelerated as the ecclesiastical estates were broken up following the Dissolution of the Monasteries in the 16th century. Although some farmland and valley-side cow pastures were enclosed with walls and hedges during the 16th and 17th centuries leading to the appearance of new farmsteads and the early development of field barns, the rate of enclosure increased dramatically as a consequence of Parliamentary Enclosure Acts in the late 18th and 19th centuries, which resulted in all but the highest land being divided by networks of long, straight walls, most of which are still in place.

The Industrial Revolution swept through the Dales in the 18th century, leaving a very strong mark on the landscape in the form of textile mills, lead mines and stone quarries, particularly for limestone which was used for walls and buildings and processed in kilns to make lime. Remains of smelting mills, chimneys and spoil heaps in Swaledale and Arkengarthdale and above Grassington are still visible, as are lime kilns such as Old Pasture lime kiln above Conistone, Toft Gate lime kiln at Greenhow and Craven lime works at Langcliffe Quarry. The increase in the workforce needed to power such industry left its mark in the form of workers' cottages, often with smallholdings to supplement mining incomes. The growth of industrial cities nearby, such as Bradford and Leeds, led to the creation of several reservoirs in Nidderdale and associated buildings to house and serve the construction workers.

Transport was crucial for both the Industrial Revolution and earlier agricultural trade, and today the remaining network of stone-wall-lined roads and tracks is a legacy of drovers' routes and pack-horse tracks. The Settle to Carlisle railway, opened in 1876, and the advent of the Victorian railways made the Yorkshire Dales, and other rural parts of the country, accessible to urban visitors, enabling early tourism to the area.

In the 19th century management for grouse shooting joined livestock grazing in influencing the extensive tracts of moorland above the fell wall, including prescribed heather burning and creation of structures such as stone grouse butts and remote shooting huts. Rotational burning and extensive grazing today help to retain the open landscape of internationally recognised sweeps of heather moorland reaching from Lower Wharfedale to the upper reaches of Swaledale and Arkengarthdale.

The 20th century saw a reduction in industrial activity, although limestone and gritstone quarrying for construction and road building is still carried out in a few large quarries in Ribblesdale and Lower Wharfedale. Agriculture remained one of the major land uses, and experienced significant change. During the post-Second World War push to produce more food, farmland in the Yorkshire Dales underwent significant drainage and 'improvement', with stock numbers rising to a peak in the 1980s and 1990s. This era of rapid increases in agricultural productivity, while highly beneficial for food production, also resulted in loss and modification of semi-natural habitat, particularly wetlands and unimproved grasslands, and dereliction of field barns, many of which were too small to remain useful for farms managed with large machinery.

During the 1990s and 2000s a change in the emphasis of public funding from production-based subsidies to payments for environmental enhancements on farms saw a reduction in cases of overgrazing and increased restoration of landscape features and habitats. Substantial public funding, through nationwide schemes and National Park initiatives, has gone towards restoring the drystone walls and stone field barns that are so distinctive of parts of the Dales, with Upper Swaledale, Arkengarthdale and Littondale designated as Barns and Walls Conservation Areas. Many field barns do, however, remain at risk and in need of maintenance and/or repair. Although a large proportion of the NCA is covered by agri-environment agreements, there are still habitats in need of restoration, including blanket bogs, and others that are vulnerable to loss due to financial pressure on farming, such as traditional hay meadows.

Since the 1990s a number of large-scale conservation projects have had a significant impact on local habitats. The Yorkshire Peat Partnership has been instrumental in getting peatland restoration measures carried out, such as, during 2011/12, the blocking and re-profiling of 970 km of grips; blocking of 140 km of gullies; re-profiling and re-vegetating of 930 km of hags and gully sides; and re-vegetating of 50 ha of bare peat. The Hay Time Project has helped farmers to restore over 200 ha of traditional hay meadow, and has organised numerous events and produced publications to boost public appreciation of this valuable habitat. The NCA has a very active group of Rivers Trusts, which in the late 2000s/early 2010s carried out a number of river restoration projects involving measures such as river bank fencing, tree planting and bank side stabilisation. Broadleaf woodland cover has increased, with over 1,000 ha planted between 1995 and 2012. Some conifer plantations have been restocked with native trees and many are now managed for nature conservation and recreation.

Recent changes in the built environment have included an increase in the number of slurry tanks and large farm buildings needed for overwintering livestock, and barn conversions, with over 100 in the last 10 years. Although demand for houses continues, development activity and conversion of farm buildings slowed around 2008 with the onset of an economic downturn.

Ecosystem services

The Yorkshire Dales NCA provides a wide range of benefits to society. Each is derived from the attributes and processes (both natural and cultural features) within the area. These benefits are known collectively as 'ecosystem services'. The predominant services are summarised below. Further information on ecosystem services provided in the Yorkshire Dales NCA is contained in the 'Analysis' section of this document.

Provisioning services (food, fibre and water supply)

- **Food provision**: The majority of the food produced in the NCA consists of meat from sheep and cattle. The area also produces small quantities of dairy produce. The number of dairy farms in the area is declining, with the remaining dairy enterprises generally getting bigger and more intensive.

Swaledale sheep originate from the NCA and are still an important breed in the area.

- **Water availability:** The NCA is the source for several notable rivers such as the Wharfe, the Ribble and the Ure, which supply water for abstraction downstream. There are a number of reservoirs in the south of the NCA, which supply drinking water to conurbations to the south. There are few naturally occurring lakes and only two minor aquifers. Headwaters are stored in much of the blanket bog which covers 22 per cent of the NCA.

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

- **Climate regulation**: Large expanses of upland peat soils in the NCA are a significant carbon store, and have the potential, depending on their condition, to sequester further carbon. Research has shown that more active peatlands are vital for carbon sequestration and storage. However, estimates suggest that in their current state peat soils within the Yorkshire Dales NCA are a net source of carbon. The amount of carbon stored in peat soils and the rate at which carbon is sequestered from the atmosphere by peat-forming habitats could be increased through the restoration of habitats such as blanket bog and wet heath by means of sensitive land management practices. Tree planting in other parts of the NCA, in appropriate quantities and locations, could also help to increase carbon sequestration and storage potential.

- **Regulating soil erosion:** The soil in the area is primarily made up of upland peat soils and much thinner calcareous soils. Higher areas of deep peat are especially vulnerable to erosion as they are non-cohesive and very prone to both water and wind erosion. Re-vegetating exposed peat can reduce rates of water run-off by increasing surface roughness (particularly in the case of sphagnum-dominated peat), thereby helping to reduce erosion. The NCA has a lot of steep land at high risk of erosion,

particularly where vegetation cover is sparse or stressed due to past land management activities. The coverage of semi-natural habitat, especially woodland on steep slopes, helps to reduce the scale of erosion in some areas.

- **Regulating soil quality:** The NCA has eight main soil types, including large areas of peat soils on higher ground and a range of clayey and loamy soils on lower ground. The functioning of peat soils and blanket bog has been degraded in some areas through a combination of acidification resulting from historical industrial atmospheric pollution, heavy grazing, burning and drainage. Restoration of degraded peat, and protection of existing, more intact peat, is key to soil quality itself (pH, carbon content, structure, nutrient status etc) and in turn may have positive impacts on water flow paths and carbon sequestration and storage potential. Semi-natural vegetation cover on non-peat soils, combined with traditional farming/low-intensity grazing and soil flora and fauna, help to maintain soil structure, organic matter and nutrient cycling within the NCA.

- **Regulating water quality:** The ecological status of the waterbodies in the NCA is mostly good to moderate, with a few notable exceptions classified as poor and bad. Semi-natural habitats and limestone geology help to maintain water quality, but the ability of the area to provide clean water is somewhat limited by problems with diffuse water pollution from agriculture (sediment, chemical and bacterial) and chemical water pollution from the remains of the lead industry. The variable condition of peat soils leads to additional problems in the form of sediment and colouration by dissolved organic carbon, which can be reduced through grip blocking and restoration of sphagnum-dominated vegetation. The NCA is the source of a number of major rivers and the home to several reservoirs so the high quality of the water is of benefit to local and regional communities alike. Good water quality is also of significant value to water-based recreation in the NCA.

- **Regulating water flow:** Steep topography and high rainfall events can result in localised flooding both in the NCA and downstream, along the course of some of the major rivers originating from the area. There is potential to mitigate some of this risk through catchment-scale measures such as blanket bog and wetland restoration, improvement of agricultural soil structure and returning streams and rivers to more natural fluvial pathways, but evidence on the effectiveness of these measures at a catchment scale is currently limited.

Cultural services (inspiration, education and wellbeing)

- **Sense of place/inspiration**: This NCA has among the strongest sense of place and capacity for inspiration of any NCA in the country. Its landscape is extremely distinctive, from the open, sweeping moorlands to the pastoral valley bottoms with their hay meadows, strong pattern of drystone walls and field barns. The karst limestone features such as outcrops and limestone pavement and the rivers that run through dramatic gorges and waterfalls, combined with well-preserved and legible historic landscapes, make the area internationally recognisable and a source of inspiration for writers and artists over the centuries. The special nature of the landscape is reflected in the fact that almost all of it falls within either the Nidderdale Area of Outstanding Natural Beauty (AONB) or the Yorkshire Dales National Park.

- **Sense of history**: Pastoral land use dominates much of this NCA, ensuring that visible evidence of historical land use and settlement remains unusually intact and provides a highly legible reminder of the history of the area and its people. Archaeological sites of national importance range from bronze-age burial mounds to settlements and field boundaries from pre-Roman to medieval periods, and industrial monuments such as lead mines from various periods. Exposed geological features also give a sense of history on a geological timescale.

- **Tranquillity**: Vast stretches of open, undeveloped moorland, combined with low levels of noise and light pollution, offer a real sense of tranquillity; 96 per cent of the area is categorised as undisturbed, and the sense of tranquillity is highly valued by visitors and locals alike.

- **Recreation**: The area is internationally renowned for the quality and wealth of access opportunities. It has a dense and well-maintained network of public rights of way (2,941 km), an unusually high proportion of open access land (60 per cent) and many long-distance walking routes and bridleways, such as the Pennine Way and Bridleway National Trails. There are also excellent opportunities for other outdoor recreation, including caving, climbing and shooting. Recreational access is encouraged and carefully managed by the Yorkshire Dales National Park Authority and Nidderdale AONB. There is an extensive programme of footpath/route maintenance carried out to avoid erosion and other damage to the landscape, and exceptionally high numbers of visitors along key routes such as the Three Peaks make this maintenance essential in order to prevent severe erosion.

- **Biodiversity**: 96,205 ha (40 per cent) of the NCA is made up of priority habitats. Some 30 per cent of the NCA is designated as SSSI, over four-fifths of which also carries a European nature conservation designation. Habitats of international importance include limestone pavements, limestone grasslands, blanket bog, upland heath and upland hay meadows. Iconic species include black grouse, red grouse, hen harrier, red squirrel, globeflower, lady's slipper orchid and heather species. Many semi-natural habitats in the NCA are highly fragmented, and in some areas relatively uniform and lacking in structural and biological diversity. However, much work is ongoing to improve the condition of priority habitats and increase their coverage. This NCA has very good potential to enhance the network of habitats and their resilience to climate change due to its residual semi-natural habitat and high capacity for conservation action (in terms of the AONB/National Park, number and range of active conservation organisations, and, most critically, the willingness and enthusiasm of many landowners).

- **Geodiversity**: Outstanding for its glacio-karst landscape, the NCA holds 50 per cent of the UK's limestone pavement and has numerous other limestone features such as dolines (as at High Mark) and gorges (such as Gordale). The area is very significant for its cave network, with around 2,000 caves deeper or longer than 5 m. The NCA's wealth of geodiversity provides an excellent educational resource and has had a strong influence on the cultural heritage of the area through past quarrying and mining activity, and by providing materials for the distinctive traditional buildings and structures of the area.

Statements of Environmental Opportunity

SEO 1: Protect the glacio-karst landscape and important geological sites, such as Malham Cove, as well as the historical environment, including drystone walls and field barns, to retain sense of place and the strong relationship between the landscape and the underlying geology.

For example, by:

- Preventing damage to archaeological and geological features from people, livestock or land use, by encouraging sympathetic land use/management and managing public access with suitable information, direction and access routes. Further interpretation of sites could be provided to promote understanding of geological processes and historical context.
- Encouraging specialist groups (such as cavers and climbers) to help with monitoring difficult- to-reach sites and associated species.
- Preserving the evidence of past quarrying operations and making redundant quarries accessible for visitors, naturalists, geologists and local communities to enjoy, and by encouraging designation of Local Geological Sites.
- Protecting and managing geological features, particularly those associated with the karst area such as limestone pavements, cliffs and gorges, for their eloquent expression of geological processes and associated rare flora and fauna species, such as baneberry on limestone pavements and peregrines on cliffs and outcrops.
- Encouraging restoration of built structures, particularly field barns and drystone wall networks, using local stone and traditional techniques wherever possible and allowing sympathetic conversion to new uses where appropriate. Where restoration is not possible, efforts should be made to make good records of the structures and their historical interest.
- Maintaining through appropriate land use, and where appropriate restoring, the area's distinctive and well-preserved archaeology of land use, settlement and industrial activity, such as: Neolithic, bronze-age and iron-age features (for example burial mounds, earthworks, hill forts and rectilinear field systems); extensive medieval field systems (for example around Castle Bolton) and remains of granges; industrial archaeology (for example lime kilns and lead mines); and features associated with reservoirs in Upper Nidderdale (for example the school, cinema and hospital built for workers and their families, and water control structures).
- Maintaining the area's traditional buildings and structures and the link to underlying geology by encouraging use of local materials and supporting training in traditional skills, such as drystone walling, and historic building restoration.
- Managing semi-natural habitat to enhance the visibility and condition of distinctive geological and archaeological features.

SEO 2: Protect and enhance the distinctive pastoral character of the dales with its network of semi-natural habitats (including important upland hay meadows and wetlands along the numerous watercourses) to enhance water quality, strengthen connectivity, support rare species and allow for adaptation to climate change.

For example, by:

- Encouraging continuation of low-intensity grazing and traditional hay meadow management in the valleys to produce high-quality food products and employment while also: preserving traditional breeds, rare species and characteristic habitats; protecting soil structure, carbon content and permeability; maintaining the purpose and function of typical landscape features such as walls, hedges, traditional farmsteads and field barns; and protecting water quality. Environmental schemes and support for marketing of local farm produce could play an important role.
- Protecting, enhancing, extending and linking semi-natural habitats, particularly upland hay meadows, calcareous grasslands and native woodland, to form resilient, well-functioning habitat networks. This will help to maintain the strong sense of place in the valleys, increase populations of rare species, help species to adapt to climate change and protect carbon stores in unimproved soils.
- Designing and using future environmental schemes in such a way that existing meadows and other habitats can be preserved and extended, and use of traditional breeds supported, while allowing farmers to run viable businesses.
- Restoring wetland habitats such as fens, wet grassland and water meadows to create areas that will not only support rare species of plants, birds and invertebrates but will also help to hold back floodwater, filter water pollutants and provide seasonal grazing for livestock.
- Encouraging low-input management of grassland on farms for the benefit of plant and insect diversity, soil condition and water quality.
- Managing farmland adjacent to watercourses to enhance water quality, for example with buffer strips, good soil management and fencing to control livestock access, and aid flood alleviation, for example by allowing rivers to return to more natural, meandering courses, where this does not threaten important archaeology or habitats.
- Ensuring sympathetic management of species-rich grassland on road verges and tracks to ensure continued survival of these highly visible refuges for rare plants.
- Managing development within the built environment and encouraging sensitive restoration of existing buildings to maintain historical features and the distinctive character of the area's settlements.
- Controlling the spread of invasive species which are a threat to native species and habitats.

SEO 3: Protect, enhance and restore the open moorland and blanket bogs to conserve their internationally important habitats and species, strong sense of place, history and remoteness, and peat soils, with their ability to sequester and store carbon and contribute to water quality.

For example, by:

- Restoring areas of blanket bog and wet heath by grip blocking, re-vegetating bare areas and encouraging establishment of sphagnum, thereby reactivating peat formation processes. This will help to: improve downstream water quality by reducing sedimentation and colouration; slow down surface run-off; prevent loss of stored carbon to the atmosphere and improve carbon sequestration; and preserve biodiversity and archaeology.
- Enhancing the full range of moorland habitats by working with land managers to develop moorland management plans that provide for sustainable land management which secures a network of habitats that: are ecologically robust; have optimal resilience to climate change; support livestock production and sporting use; preserve the valuable archaeological record; and support the internationally important habitats and bird species for which they were designated as European Special Protection Areas and Special Areas of Conservation. Working with land managers to secure sympathetic management of adjacent land and habitats will also help to improve the condition of moorland and provide the range of habitats needed by priority species.
- Preventing and responding to uncontrolled fires through a collaborative fire control plan and quick response when such fires occur.
- Encouraging and managing responsible recreational use so as to minimise soil erosion, disturbance to wildlife and wildfire risk, while increasing understanding of the moorland environment.
- Encouraging continued production of traditional food products, such as lamb, mutton, beef and game, using methods which support a healthy moorland environment and marketing them with reference to the special landscapes their production helps to support.
- Maintaining open, undeveloped moorland areas to retain the tranquillity, sense of remoteness and panoramic views by encouraging maintenance of hefted flocks and considering the landscape impact before introducing new fences, tracks and other infrastructure.

SEO 4: Plan for and sustainably manage high visitor numbers to maintain access to and enjoyment of the Dales landscape, including the heavily visited key features such as Gordale Scar, the Three Peaks, Brimham Rocks and How Stean Gorge, while maintaining a living, working landscape, and protecting the tranquillity valued by visitors and local residents.

For example, by:

- Enhancing signage, paths, parking and other facilities to minimise congestion, erosion and other problems, as well as continuing to provide information to help visitors to understand the importance and vulnerability of the area. This will be particularly important at popular sites such as the Three Peaks, Malham Cove, Ribblehead Viaduct and Upper Nidderdale.
- Exploring opportunities for 'green' tourism and voluntary 'visitor pay back' to ensure that increased tourism has a net positive impact on the local environment and economy.
- Minimising light pollution at night through careful lighting design.
- Enhancing access points to popular open access areas by providing stiles and other infrastructure, thereby preventing damage to walls.
- Maintaining access to the landscape through open access land and footpaths, and promoting new links to the Coast to Coast path, Dales Way, Ribble Way, Nidderdale Way, Pennine Way and Pennine Bridleway.
- Enhancing public transport systems to ensure that increased numbers of visitors and locals can move around the NCA and access shops and services, in a sustainable way.
- Enhancing access opportunities for less mobile people such as wheelchair users and people with pushchairs.
- Encouraging and facilitating more recreational and educational visits from groups which are poorly represented among existing visitor numbers (for example individuals from ethnic minorities).
- Encouraging people to use the Dales as an 'Outdoor Classroom' for schools and colleges by supporting outdoor activity centres, educational access farm visits, and access to Ingleborough National Nature Reserve and educational activities there.
- Helping farmers, craftspeople and other primary industries to make high-quality products from their local environment and use the special qualities of the area to help to market their produce.
- Supporting training in traditional land management skills such as shepherding, coppicing, drystone walling and hedging.
- Encouraging voluntary groups and local people to help with monitoring climate change and its impacts on local wildlife.

SEO 5: Protect, enhance and extend, as appropriate, existing native woodland in this largely unwooded landscape in order to improve habitat connectivity, benefit wildlife, improve water quality, reduce flooding and soil erosion, sequester carbon and provide wood fuel.

For example, by:

- Protecting existing semi-natural woodland, wood pasture and scrub and encouraging appropriate management including fencing to exclude livestock, and planting with native broadleaf tree species of local provenance.
- Restocking cleared conifer plantations with broadleaf trees, particularly on Plantations on Ancient Woodland Sites, or restoring to priority open habitats such as grassland or heath where appropriate.
- Managing remaining conifer plantations for the benefit of red squirrels, to improve access and recreational opportunities and to enhance the plantations' shape and species composition in order to improve the way in which they fit into the landscape.
- Encouraging management of existing woodland to create local sources of wood fuel in quantities compatible with woodland conservation.
- Encouraging tree planting to create woodland and wood pasture in places and quantities that are sympathetic to the pattern and scale of the local landscape and enhance its wildlife value, for example on steep slopes, along streams, and away from priority wading bird habitat, without detriment to historical features. Tree planting could be most beneficial along eroding riverbanks, between existing isolated areas of woodland or alongside fields at high risk of soil erosion or run-off into watercourses.

Supporting document 1: Key facts and data

Total area: 239,983 ha

1. Landscape and nature conservation designations

71 per cent of the area or 170,809 ha falls within the Yorkshire Dales National Park (YDNP). 17 per cent of the area or 39,195 ha falls within the Nidderdale Area of Outstanding National Beauty (AONB).

Management plans for the protected landscape can be found at:

- http://www.yorkshiredales.org.uk
- http://www.nidderdaleaonb.org.uk

Source: Natural England (2011)

Please note: Part of this NCA is affected by an Order extending the Yorkshire Dales National Park. This will not take effect unless confirmed by the Secretary of State. Please see www.naturalengland.org.uk/lakestodales *for current status.*

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	Malham Tarn	287	<1
European	Special Protection Area (SPA)	North Pennine Moors SPA	47,944	20
	Special Area of Conservation (SAC)	Malham Tarn SAC; North Pennine Moors SAC; Ingleborough Complex SAC; Craven Limestone Complex SAC; North Pennine Dales Meadows SAC; Ox Close SAC; Asby Complex SAC; River Eden SAC	59,385	25
National	National Nature Reserve (NNR)	Ingleborough NNR; Malham Tarn NNR; New House Farm, Malham NNR; Scoska Wood NNR Ling Gill NNR	1,214	1
	Site of Special Scientific Interest (SSSI)	A total of 113 sites wholly or partly within the NCA	71,088	30

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.

Designations of SPA and SAC are underpinned by SSSI status. For example, Malham Tarn is a Ramsar site, SAC and NNR, and the Ingleborough NNR falls entirely within the SAC. The majority of the SSSIs lie within the SAC.

There are 173 local sites in Yorkshire Dales covering 3,070 ha or 1 per cent of the NCA.

Source: Natural England (2011)

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

1.2 Condition of designated sites

SSSI condition category	Area (ha)	Percentage of SSSI in category condition
Unfavourable declining	744	2
Favourable	15,071	21
Unfavourable no change	4,857	7
Unfavourable recovering	49,743	70

Source: Natural England (March 2011)

- Details of SSSI condition can be searched at: http://www.sssi.naturalengland.org.uk/Special/sssi/reportIndex.cfm

2. Landform, geology and soils

2.1 Elevation

Elevation ranges from 39 m to 736 m (summit of Whernside).

Source: Yorkshire Dales Countryside Character area description

2.2 Landform and process

Large-scale upland landscape of high, exposed moorland dissected by dales which are often deep and broad. Distinctively 'stepped' sides to some of the valleys resulting from the Yoredale series are characteristic. Millstone Grit caps some of the higher hills, especially those in the north and east. There is a typical karst landscape to the west and south with limestone outcrops, limestone pavements, scarps and gritstone erratics. The Craven Fault lines in the south and west create dramatic landforms where the limestone uplands lie on top of the Askrigg block showing unconformity. Distinctive drumlins formed during the last ice age can be found at the top of Ribblesdale.

Source: Yorkshire Dales Countryside Character area description

2.3 Bedrock geology

The Yorkshire Dales are a glaciated, upland landscape of rounded hills and moors separated by broad, often U shaped, valleys cut into Carboniferous rocks of limestone, millstone grit and shale. Geologically the south-west of the area is considered to be outstanding for its 'karst' (limestone) landforms, cave systems and exposures of Carboniferous rocks.

Source: Yorkshire Dales Countryside Character area description; Yorkshire Dales Natural Area Profile; British Geological Survey maps

2.4 Superficial deposits

There are no drift deposits across much of the higher land. Diamicton covers 28 per cent, while peat and peaty soils (17 per cent) cover much of the high ground. On ground below 300 m shallow, free-draining loamy soils cover much of the limestone. In areas to the north and west, more associated with sandstone, sandy and loamy soils are found.

Source: Yorkshire Dales Countryside Character area description; Yorkshire Dales Natural Area Profile; British Geological Survey maps

2.5 Designated geological sites

Tier	Designation	Number
National	Geological Site of Special Scientific Interest (SSSI)	27
National	Mixed Interest SSSIs	13
Local	Local Geological Sites	7

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

There is strong distinction between the northern gritstone dales and the moorland with their predominately acidic soils, with deeper soils of the western fringe area and the limestone to the south and west. The shallow lime-rich soils have developed over underlying limestone rocks. The thin soils, high altitude and high annual precipitation all contribute towards very poor soils thus almost 75 per cent of the soils are grade 5, as noted in the Agricultural Land Classification.

Source: Yorkshire Dales Countryside Character area description; Yorkshire Dales Natural Area Profile

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	n/a	n/a
Grade 2	n/a	n/a
Grade 3	5,508	2
Grade 4	55,745	23
Grade 5	175,054	73
Non-agricultural	3,120	1
Urban	557	<1

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)
River Aire	16
River Nidd	17
River Ribble	28
River Skirfare	14
River Swale	37
River Ure	41
River Wharfe	53

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 NCA is the source of 21 major rivers and becks totalling 293 km. Most of the large rivers in the Yorkshire Dales NCA flow west to east and eventually feed into the River Ouse. Other rivers rise and flow to the west, such as the River Dee through Dentdale and Clough River through Garsdale. The largest river in the west is the Ribble which flows in a south-westerly direction to eventually flow into the Irish Sea. The valleys are wide and deep, typically U shaped, although in places the upper reaches of the rivers cut through very narrow gills with steep cliffs such as at Ling Gill (a tributary of the Ribble) and Pen-y-ghent Gill, a tributary of the River Skirfare which runs through Littondale.

3.2 Water quality

The total area of Nitrate Vulnerable Zone is 17,056 ha of the NCA, 7 per cent of the NCA.

Source: Natural England (2010)

3.3 Water Framework Directive

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

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

4. Trees and woodlands

4.1 Total woodland cover

The NCA contains 10,624 ha of woodland, 4 per cent of the total area, of which 2,582 ha is ancient woodland.

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

4.2 Distribution and size of woodland and trees in the landscape

Many of the remnant ancient woodlands are confined to the steep valley sides with some of the larger woodlands found in the upper reaches of rural dales such as upper Wharfedale, Littondale and Wensleydale. Native species consist mainly of ash, sessile oak, rowan and hazel and smaller areas of juniper. Many woods are in a poor condition due to lack of management and grazing pressure from sheep and rabbits. There are also remnant ancient woodlands on limestone pavement and small pockets on the steep gill sides such as at Ling Gill NNR. There are a few large

blocks of conifer plantations on the moorland sides especially in the western dales of upper Ribblesdale and Widdale and upper Nidderdale. Some plantations have been totally removed and are being replanted with mixed species whereas some are not being replanted, such as on the Malham Estate on Darnbrook Fell. This area is being left to regenerate back to blanket bog.

Source: Yorkshire Dales Countryside Character area description; Yorkshire Dales Natural Area Profile

4.3 Woodland types

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

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

Woodland type	Area (ha)	Percentage of NCA
Broadleaved	4,268	2
Coniferous	5,262	2
Mixed	382	<1
Other	712	<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	1,661	1
Planted ancient woodland sites (PAWS)	921	<1

Source: Natural England (2004)

5. Boundary features and patterns

5.1 Boundary features

Field boundaries are generally distinctive drystone walls, enclosing large, rectilinear fields on the higher fells and smaller, older and irregular fields within the dales and particularly around villages. The estimated boundary length for the NCA is 8,987 km. Hedgerows are the more typical field boundary in Dentdale. There has been an increase in the number of drystone walls with top wire attached to them to heighten the wall to stop sheep jumping over. Walls often stretch up the valley sides at right angles to the valley which is a characteristic feature of the dales. There is a strong pattern of wall styles throughout the dales.

Source: Yorkshire Dales Countryside Character area description; Yorkshire Dales Natural Area Profile; Countryside Quality Counts (2003)

5.2 Field patterns

The fell tops are largely unenclosed although some have been divided into large allotments with the lower slopes having larger enclosed fields. Fields are typically large and rectilinear on the higher fells with smaller, older and irregular shaped fields within the dales and particularly around villages.

Source: Yorkshire Dales Countryside Character area description; Yorkshire Dales Natural Area Profile; Countryside Quality Counts (2003)

6. Agriculture

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

6.1 Farm type

This NCA is predominately a livestock rearing area on Less Favoured Area land with 727 holdings in 2000 increasing to 875 in 2009. Dairy holdings fell from 252 to 140 during the same period.

Source: Agricultural Census, Defra (2010)

6.2 Farm size

Almost 40 per cent of farms are over 100 hectares and account for 85 per cent of the agricultural area. 17 per cent of farms are between 50 and 100 hectares and cover 9 per cent of the area. The remaining holdings, less than 50 hectares, only account for 5 per cent of the agricultural area. This does not include access to common land.

Source: Agricultural Census, Defra (2010)

6.3 Farm ownership

2009: Total farm area = 162,806 ha; owned land = 85,480 ha
2000: Total farm area = 155,248 ha; owned land = 81,204 ha

Source: Agricultural Census, Defra (2010)

6.4 Land use

The dominant land use is grass with 152,000 ha in 2000 increasing to 158,000 ha in 2009.

Source: Agricultural Census, Defra (2010)

6.5 Livestock numbers

Sheep are by far the most numerous with 778,021 animals in 2009, a decrease from 924,182 animals in 2000. There were 70,018 cattle in 2009 decreasing from 82,380 animals in 2000 and 3,418 pigs, again a decrease from 3,681 in 2000.

Source: Agricultural Census, Defra (2010)

6.6 Farm labour

In 2009 there were 2,682 agricultural workers a decrease from 2,863 in 2000, of which 74 per cent are principal farmers, 10 per cent part time workers, 9 per cent casual/gang workers, 7 per cent full time workers and 1 per cent salaried managers.

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

Blanket bog and upland heath cover large expanses of the uplands of the NCA. Lowland calcareous grasslands are found on the shallow lime-rich soils usually over limestone rocks, mostly in the south and west of the area together with limestone pavement with smaller areas dotted elsewhere. Upland calcareous grasslands are generally found in the south-west of the area and above 250 m and are managed by grazing. The sheltered valleys have more fertile soils and grasses, grazed for silage and cropped for hay. Upland hay meadows are mostly restricted to the valley bottoms at an altitude of between 200 and 400 m,

Wensleydale, Wharfedale, Littondale and Swaledale all having fine examples of this important habitat. Broadleaved woodland is restricted to the steeper slopes of some of the upper valleys and narrow gills and gorges. Some notable woods are found in Upper Wensleydale, Littondale, Swaledale and Colsterdale in Upper Nidderdale.

Much of the habitat is priority habitat covering 96,205 ha or 40 per cent of the NCA. On the high ground, over one third of the area is blanket bog with extensive areas of upland heath, 14 per cent, interspersed with small areas of dry acid grassland, 7 per cent, upland calcareous grassland, 3 per cent, and smaller areas of purple moor grass, just 190 ha. Upland hay meadows are also a priority habitat with 399 ha found in the area. The blanket bog consists of typical upland species with sphagnum mosses and in the wetter, calcareous flushes in lower areas, birds-eye primrose is common.

The Craven area has large areas of limestone pavement – some of the best in the UK – with smaller areas of pavement elsewhere. Limestone pavement is a key habitat of international importance covering nearly 1 per cent of the NCA; half of the UK's limestone pavement is found in this area.

Woodlands are confined to the steep valley sides and limestone pavements, where grazing is restricted. Broadleaved woodland covers 4,268 ha or 2 per cent of the area and is mostly fragmented upland woodland of ash and oak with hazel understorey. There are larger woodlands of mixed species such as Grass Wood near Grassington and Strid Wood part of the Bolton Abbey Estate. Conifer woodland covers more than 5,000 ha, again 2 per cent of the area, but is gradually being felled and replaced with mixed species or not replanted.

Internationally important assemblages of birds are found on the high moorland with curlew, golden plover and merlin while black grouse are found in the northern areas on the valley slopes. Peregrine falcon and raven are found on the cliffs and old quarries while lapwing and the decreasing yellow wagtail is still found in the valleys where cattle feed.

Source: Yorkshire Dales 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:

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

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

Priority habitat	Area (ha)	Percentage of NCA
Blanket bog	52,734	22
Upland heathland	33,946	14
Lowland dry acid grassland	16,246	7
Upland calcareous grassland	7,644	3
Lowland calcareous grassland	5,987	2
Broadleaved mixed and yew woodland (Broad Habitat)	2,503	<1
Fens	1,728	1
Limestone pavement	835	<1
Lowland meadows	617	<1
Upland hay meadows	399	<1
Purple moor grass and rush pastures	190	<1
Lowland raised bog	46	<1

Source: Natural England (2011)

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

7.3 Key species and assemblages of species

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

8. Settlement and development patterns

8.1 Settlement pattern

Villages tend to be nucleated and focused on key transport routes and at bridging points. Most of the dales have villages and settlements in them with isolated farmsteads in the upper parts of the dales. Key villages, such as Hawes and Kettlewell, are situated in the heart of the NCA. Larger settlements – Settle, Grassington and Pateley Bridge – are situated at the lower ends of the dales where access is easier than remote areas higher up the dales. On the borders with other NCAs are market towns and larger settlements, such as Ingleton, Settle and Skipton.

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

8.2 Main settlements

The main settlements within the NCA are: Skipton, Settle, Pateley Bridge, Hawes, Grassington, Ingleton, Gargrave, Long Preston, Hellifield, Threshfield, Embsay, Kettlewell, Horton–in–Ribblesdale, Reeth, Dent, Starbotton and Austwick.

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

8.3 Local vernacular and building materials

There are many traditional farm buildings distributed throughout the NCA, many dating from the 16th century and some even earlier. The main building materials tend to be local stone commonly found in the area; millstone grit, sandstone or limestone, with sandstone flags used for roofing materials. There are some fine traditional barns still in use, many with intricate stone work around doorways. Some buildings constructed with timber frames, often cruck-framed buildings, survive such as the pub in Appletreewick in Wharfedale.

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

9. Key historic sites and features

9.1 Origin of historic features

The Yorkshire Dales were extensively cleared of woodland with the first evidence of settlement dating back to the Mesolithic period particularly around Swaledale and Malham. Neolithic and bronze-age settlers extended the process further and there is evidence of Neolithic henge monuments at Castle Dykes and Yarmbury.

Extensive and well preserved evidence from the Bronze Age is found in the shape of burial mounds and rectilinear field systems visible near Grassington.

Evidence of late iron-age/Romano–British settlements can be seen, especially at Ribblesdale and Wharfedale with earthworks of farmsteads and strip lynchets field systems dating to before the 10th century.

The 9th to 11th centuries saw fields grouped around valley floor settlements and from the 12th century, colonisation by peasant farmers with isolated farmsteads developed and extended across the area.

Remains of ore workings are visible around the northern dales of Swaledale and Arkengarthdale especially spoil heaps from lead mining activities dating back to the Roman and medieval periods. There is further evidence of coal mining and lime burning in the shape of lime kilns active up to the end of the 19th century.

Source: Countryside Quality Counts; Yorkshire Dales Draft Historic Profile; Yorkshire Dales Countryside Character Area description

9.2 Designated historic assets

This NCA contains the following numbers of designated heritage assets:

- 1 Registered Park and Garden covering 9 ha.
- 0 Registered Battlefield/s.
- 376 Scheduled Monuments.
- 2,252 Listed Buildings.

Source: Natural England (2010)

- More information is available at the following address: **http://www.english-heritage.org.uk/caring/heritage-at-risk/**

10. Recreation and access

10.1 Public access

- 59 per cent of the NCA or 142,805 ha is classified as being publically accessible.
- There are 2,941 km of public rights of way at a density of 1.2 km per km^2.
- There are 2 National Trails within the NCA, the Pennine Bridleway (93 km) and the Pennine Way (81 km).

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)	172	<1
Common Land	56,939	24
Country Parks	157	<1
CROW Access Land (Section 4 and 16)	142,805	60
CROW Section 15	6,694	3
Village Greens	275	<1
Doorstep Greens	0	0
Forestry Commission Walkers Welcome Grants	493	<1
Local Nature Reserves (LNRs)	84	<1
Millennium Greens	2	<1
Accessible National Nature Reserves (NNRs)	1,209	<1
Agri-environment Scheme Access	1,888	1
Woods for People	1,275	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.

Waterfalls are a typical feature of the NCA and have inspired many artists over the years.

11. Experiential qualities

11.1 Tranquillity

Based on the CPRE map of Tranquillity (2006) the vast majority of the NCA and higher ground are very tranquil. Less tranquil areas are those associated with settlements like Pateley Bridge, and along the south and west sides close to main roads.

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

Tranquillity	Score
Highest value within NCA	135
Lowest value within NCA	-55
Mean value within NCA	35

Sources: CPRE (2006)

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

11.2 Intrusion

The 2007 Intrusion Map (CPRE) shows the extent to which rural landscapes are 'intruded on' from urban development, noise (primarily traffic noise), and other sources of visual and auditory intrusion. This shows that the vast majority of the NCA and higher ground are very tranquil. Less tranquil areas are those associated with settlements like Pateley Bridge, and along the south and west sides close to main roads.

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

Intrusion category	1960s (%)	1990s (%)	2007 (%)	Percentage change (1960s-2007)
Disturbed	1	4	3	2
Undisturbed	99	96	96	-2
Urban	0	0	<1	n/a

Sources: CPRE (2007)

Notable trends from the 1960s to 2007 are that little changed, most notable changes being associated with the larger conurbations to the south of the NCA.

- 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 Forest Inventory, Forestry Commission (2011)
- Countryside Quality Counts Draft Historic Profiles, English Heritage (2004)*
- Ancient Woodland Inventory, Natural England (2003)
- BAP Priority Habitats GIS data, Natural England (March 2011)
- Special Areas of Conservation data, Natural England (data accessed in March 2011)
- Special Protection Areas data, Natural England (data accessed in March 2011)
- Ramsar sites data, Natural England (data accessed in March 2011)
- Sites of Special Scientific Interest, Natural England (data accessed in March 2011)
- Detailed River Network, Environment Agency (2008)
- Source protection zones, Environment Agency (2005)
- Registered Common Land GIS data, Natural England (2004)
- Open Country GIS data, Natural England (2004)
- Public Rights of Way Density, Defra (2011)
- National Trails, Natural England (2006)
- National Tranquillity Mapping data, CPRE (2007)
- Intrusion map data, CPRE (2007)
- Registered Battlefields, English Heritage (2005)
- Record of Scheduled Monuments, English Heritage (2006)
- Registered Parks and Gardens, English Heritage (2006)
- World Heritage Sites, English Heritage (2006)
- Incorporates Historic Landscape Characterisation and work for preliminary Historic Farmstead Character Statements (English Heritage/Countryside Agency 2006)

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

Supporting document 2: Landscape change

Recent changes and trends

Trees and woodlands

- The NCA contains 10,624 ha of woodland, 4 per cent of the total area, of which 2,582 ha is ancient woodland.

- The rate of new woodland planting has increased since 1995, with more than 1,000 ha of new broadleaf woodland being planted, a large proportion of which is ash /oak woodland. Conifer plantations are slowly being restocked with broadleaf species or managed to a greater extent for conservation, particularly for red squirrels.

- The uptake of the Woodland Grant Scheme has increased since 1999, with the uptake of Annual Management Grants doubling to 160 ha of woodland per annum between 1999 and 2003 and more recently new planting of over 80 ha per year.

Boundary features

- Agri-environment schemes have made a significant contribution to maintaining and restoring hedges and walls in the NCA. Countryside Stewardship agreements included 170 km of boundary restoration, Environmentally Sensitive Area agreements included restoration of 119.6 km of walls, Environmental Stewardship agreements between 2005 and 2012 included restoration of 51 km of walls and 7.5 km of hedges. The Yorkshire Dales National Park Barns and Walls Conservation Scheme has also helped to maintain and restore walls, particularly in Swaledale, although many still remain at risk.

- Walls and hedges along roads and farm boundaries are generally being maintained but some internal boundaries, particularly those on higher land, are falling into neglect or being replaced with post and wire fencing.

Agriculture

- Agricultural land cover types have remained relatively unchanged in recent decades, with the majority of agricultural land (95 per cent) categorised as permanent or rough grassland.

- The vast majority of the NCA is classified as 'Less Favourable Area' and continues to be dominated by sheep and beef cattle farming, with a recent decrease in dairy farming, by 35 per cent of holdings between 1990 and 2003.

- Grazing intensity decreased by just over 20 per cent between 1990 and 2003, and between 2000 and 2009 there was a 15 per cent decrease in both cattle and sheep numbers. This more recent decrease was set against a background of record high stock numbers in the early 1990s. For Great Britain as a whole, sheep numbers rose from 8 million in 1860s to 44 million in 1993[4], and this increase was particularly pronounced in the uplands, driven partly by lucrative "headage payments".

[4] *Drivers of Environmental Change in Uplands*, Aletta Bonn, Tim Allott, Klaus Hubacek and Jon Stewart (2009)

- Between 1990 and 2003 Defra's June Census showed an increase in farm holdings of more than 100 ha in size and a decrease in the number of holdings between 20 and 50 ha.

- Widespread uptake of agri-environment schemes from 1990s to2010s has not only helped to maintain and restore habitats, boundary features and archaeology, it has also made a significant contribution to the financial viability of local farm businesses.

Settlement and development

- Development activity slowed during the recent economic downturn, with a marked decrease in new developments, extensions and barn conversions between 2008 and 2012 in both the Nidderdale AONB and the Yorkshire Dales National Park.

- The number of small-scale renewable energy projects has increased particularly wind and hydro power.

- Construction of farming and sporting infrastructure, such as large modern sheds for cattle housing and surfaced tracks across moorland, has increased and these features are highly visible in the landscape.

Semi-natural habitat

- Ongoing financial pressure on farming to intensify combined with increased frequency of wet summers continues to encourage a change from hay making to silage, with loss of flower rich hay meadows and greater use of herbicides and fertilisers, which may have negative implications for plant, insect and bird diversity as well as water quality and carbon storage.

- Calcareous limestone grasslands are now recovering in some areas following the introduction of native cattle and modifications to sheep grazing regimes.

- Substantial peatland restoration work has been undertaken by the Yorkshire Peat Partnership.

- 68,889 ha (97.4 per cent) of the SSSI area in the NCA are classed as favourable/recovering.

- A lot of work has been done throughout 1990s and 2000s to improve habitat quality for black grouse and the population increased from 51 males in 1997 to 171 by 2007.

- There has been an increase in population size and range of red squirrels in the north-west of the NCA, particularly in the Widdale and Greenfield reserves.

Historic features

- A large number of rabbits cause ongoing soil erosion, suppression of vegetation and damage to archaeology.

- Localised damage to historic features from stone being removed for other uses or stones dislodged from walls at popular access points to open access areas.

- The number of Listed Buildings and Scheduled Monuments at risk decreased significantly in late 2000s and early 2010s, primarily due to public investment through agri-environment schemes and targeted conservation activity.

Rivers

- Between 1995 and 2000 the biological quality of 6 per cent of rivers improved and 28 per cent declined. The chemical water quality remained constant, although the high heavy metal content of some river catchments is still being investigated.

- River restoration work is being carried out by a number of projects, which have funded work such as: bank-side fencing to exclude livestock for the benefit of riparian ecology (especially otters) and water quality; tree-planting to slow run-off and erosion; and stabilisation of riverbanks.

Minerals

- Several of the large quarries in the west and south of the NCA have applied for extensions. Dry Rigg and Arcow Quarries in Ribblesdale, and Pateley Bridge Quarry in Nidderdale, have all been granted time extensions, with Dry Rigg also having permission to deepen its extraction. Restoration agreements are also in place at both quarries.

- Swinden quarry near Cracoe is due to remain in use for another 80 years.

- Three quarries have ceased operating in the last ten years and have nature conservation restoration agreements: Giggleswick quarry, Ribblehead quarry (now part of Ingleborough NNR) and old Ingleton quarries. Nature conservation work at other quarries includes a pond created at Threshfield for translocation of white clawed crayfish.

Drivers of change

Climate change

- Average temperatures are predicted to increase by more than 3°C by 2100, and precipitation is predicted to fall by nearly 25 per cent in summer but increase by 15 per cent in winter[5].

- Extreme rainfall events are expected to increase in severity and frequency across the whole NCA.

- Increased temperatures will accelerate soil moisture stress, with moorland a particularly vulnerable habitat at risk of wildfires during dry conditions.

- Lowland wet meadows, already under threat from drainage, are likely to deteriorate further due to drought and enhanced abstraction.

- Warmer, drier summers may benefit many butterfly species which are very susceptible to wet summers.

- More frequent storm events could exacerbate the erosion of peat bogs and upland watercourses and cause more flash flooding downstream of the NCA. This could in turn cause damage to houses, infrastructure and transport routes, water colouration, and sedimentation of water courses.

- Species and habitats could be lost where they cannot adapt quickly to a changing climate and where they are near the southern or low altitude extremes of their range: such as purple saxifrage which may struggle to adapt to rising temperature as there is no ground at higher altitude for it to move to.

[5] *Adapting to Climate Change in the Yorkshire Dales National Park,* Yorkshire Dales National Park Authority (2011)

Other key drivers

- It is likely that visitor numbers will continue to increase, with potential benefits for the local economy, but putting further pressure on habitats and infrastructure, with increased risks of footpath/bridleway erosion, damage to vegetation, wildfires and greater demand for parking. Further opportunities for green tourism and voluntary visitor payback could be explored in order to ensure that increased tourism has a net positive impact on the local environment and economy.

- There is likely to be increased movement of species as the climate changes, with potential for local extinction of species, greater incidence of pests and diseases and in-migration of new species from further south. Habitat creation and restoration will need to be designed with this in mind.

- There is likely to be further investment in small-scale renewable energy, particularly community projects, in order to reduce fuel costs and carbon dioxide emissions. Solar panels, small hydro-electric generators, small-scale wind turbines, woodchip boilers and ground source heat pumps are all gaining in popularity in the area. Public funding is likely to continue to encourage small-scale renewable energy projects.

- The upland rural community could continue to struggle to retain rural services such as village shops, schools, libraries and post offices. Environmental schemes are likely to continue to provide support for the farmed environment, farming community and contractors/rural craftsmen but there may be a need for further support for other sectors of the community.

- Demand for housing is likely to continue, driven by the popularity of the Yorkshire Dales and population increase, despite a slowing down of development during the recent economic downturn.

- Difficulty of maintaining and finding appropriate uses for the large numbers of field barns and historic buildings may continue to put them at risk of dilapidation, especially if there is a lack of or continued reduction in public funding for their restoration.

The NCA receives large numbers of visitors, particularly to popular sites such as Brimham Rocks.

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.

Many major rivers rise in the Yorkshire Dales NCA and are an important source of water beyond the NCA boundary.

Statement of Environmental Opportunity	Ecosystem service																	
	Food provision	Timber provision	Water availability	Genetic diversity	Biomass energy	Climate regulation	Regulating water quality	Regulating water flow	Regulating soil quality	Regulating soil erosion	Pollination	Pest regulation	Regulating coastal erosion	Sense of place/inspiration	Sense of history	Tranquility	Recreation	Biodiversity	Geodiversity
SEO 1: Protect the glacio-karst landscape and important geological sites, such as Malham Cove, as well as the historical environment, including drystone walls and field barns, to retain sense of place and the strong relationship between the landscape and the underlying geology.	↔ **	↔ **	↔ **	↔ **	↔ **	↔ **	↗ *	↔ **	↗ **	↗ **	↔ **	n/a	n/a	↑ ***	↑ ***	↗ **	↗ **	↗ **	↑ ***
SEO 2: Protect and enhance the distinctive pastoral character of the dales with its network of semi-natural habitats (including important upland hay meadows and wetlands along the numerous watercourses) to enhance water quality, strengthen connectivity, support rare species and allow for adaptation to climate change.	↗ **	↔ **	↗ *	↗ **	↔ **	↗ *	↗ **	↗ **	↗ **	↗ **	↗ **	n/a	n/a	↑ ***	↗ **	↗ **	↗ *	↑ ***	↗ **

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

Dark plum = national importance; mid plum = regional importance; light plum = local importance

Statement of Environmental Opportunity	Ecosystem service																	
	Food provision	Timber provision	Water availability	Genetic diversity	Biomass energy	Climate regulation	Regulating water quality	Regulating water flow	Regulating soil quality	Regulating soil erosion	Pollination	Pest regulation	Regulating coastal erosion	Sense of place/inspiration	Sense of history	Tranquility	Recreation	Biodiversity	Geodiversity
SEO 3: Protect, enhance and restore the open moorland and blanket bogs to conserve their internationally important habitats and species, strong sense of place, history and remoteness, and peat soils, with their ability to sequester and store carbon and contribute to water quality	↗ **	↔ **	↗ **	↗ **	↔ **	↗ **	↗ **	↗ **	↗ **	↗ **	↗ **	n/a	n/a	↑ ***	↗ **	↗ ***	↗ **	↗ ***	↗ **
SEO 4: Plan for and sustainably manage high visitor numbers to maintain access to and enjoyment of the Dales landscape, including the heavily visited key features such as Gordale Scar, the Three Peaks, Brimham Rocks and How Stean Gorge, while maintaining a living, working landscape, and protecting the tranquillity valued by visitors and local residents.	↗ *	↔ **	↘ *	↗ *	↔ **	↘ *	↘ *	↔ **	↔ *	↘ *	↔ **	n/a	n/a	↔ *	↔ *	↘ *	↑ ***	↔ *	↔ *
SEO 5: Protect, enhance and extend, as appropriate, existing native woodland in this largely unwooded landscape in order to improve habitat connectivity, benefit wildlife, improve water quality, reduce flooding and soil erosion, sequester carbon and provide wood fuel.	↔ **	↗ **	↗ *	↔ **	↑ ***	↗ ***	↗ **	↗ **	↗ *	↗ **	↗ *	n/a	n/a	↗ **	↔ **	↗ ***	↗ *	↑ ***	↔ **

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

Dark plum = national importance; mid plum = regional importance; light plum = local importance

Landscape attributes

Landscape attribute	Justification for selection
Large-scale upland landscape of high exposed moorland, with blanket bog and heath dissected by pastoral valleys and small areas of woodland.	■ Wide, open landscapes with distant views giving a real sense of wilderness and remoteness especially the less visited moors of the northern areas. ■ Upland heath covers 14 per cent of the NCA (33,946 ha) and blanket bog covers 22 per cent (52,734 ha). ■ 35 per cent is notified as SPA because of its nationally important assemblages of upland breeding birds. ■ The high fells in the western area of the NCA are dominated by the very popular three peaks of Ingleborough, Pen-y-ghent and Whernside. ■ Distinctive outcrops of gritstone are often found on the moorland tops which break up the skyline and add interest to an otherwise featureless landscape. ■ The mosaic of moorland edge grassland and woodland provides valuable habitat for the UK's most southerly population of the iconic black grouse.
Wide, glaciated valleys, with distinctive field boundary patterns, mosaics of grassland habitats and field barns.	■ Valleys show a good cross-section of the glacial history of the area showing the classic wide and deep 'U' shape with some valleys having limestone outcrops running along the 'shoulders of the valleys. Good examples of limestone outcrops include those near Chapel-le-Dale near Ingleton. ■ The lush fertile valley bottoms contrast sharply with the rougher, more marginal, grassland on higher ground.
Characteristic stone buildings and farmsteads together with a strong pattern of drystone walls which run from the valley bottoms to the high tops.	■ The typical Yorkshire Dales buildings are built using local stone, commonly limestone in the south and west, and sandstone in the north. ■ The small field barns tucked into field corners are an iconic feature of many Dales' landscapes, particularly Swaledale and Wensleydale. Estimates suggest there over 8,000 stone field barns in the Yorkshire Dales National Park alone, and many more in Upper Nidderdale. ■ Small villages are clustered on the valley floors often around river crossing points and main transport routes. ■ Drystone walls run up from the valley bottoms to the high tops, often snaking their way around limestone outcrops and cliffs. Some of these walls date from medieval times and are of great historical importance. In many areas, both the valley bottoms and the higher in-bye and allotment land have distinctive regular patterns of drystone walls. The walls form very large rectilinear enclosures on the higher fell tops with smaller enclosures in the dales and irregular patterns around settlements.

Landscape attribute	Justification for selection
Dramatic geological features of limestone and Millstone Grit, including outcrops, caves, gorges, waterfalls and limestone pavements.	■ The NCA contains a diverse range of geological features illustrating many different phenomena and processes, and has some of the most important geological sites in the UK. ■ The NCA is separated from the North Pennines by the Stainmore Trough faults and from the Southern Pennines by the Craven Fault, which gives rise to some dramatic features such as Malham Cove and Giggleswick Scar. ■ Much of the south of the NCA has a classic glacio-karst landscape. It has some of the UK's best potholes and cave systems such as the iconic Gaping Gill pothole near Ingleborough. Some of the limestone caves in the NCA are of national importance for swarming and hibernating bats. ■ Dramatic illustrations of glacial deposition such as the Norber Erratics (boulders of Silurian greywacke sandstone deposited by glaciers on younger strata of limestone which has eroded to form small plinths where protected by the boulders) and the Wensleydale and Ribblesdale drumlin swarms (small rounded hills of glacial till). ■ The area's limestone pavements are of international importance for geology and nature conservation. 50 per cent of the UK's limestone pavement is found in the Yorkshire Dales. Around 80 per cent is designated as Site of Special Scientific Interest (SSSI); large sections are designated as Special Areas of Conservation (SAC) under the EC Habitats Directive, such as Scar Close in the Ingleborough Limestones Complex SAC. They also receive additional protection through Limestone Pavement Orders which prevent their removal. A variety of rare and scarce plants, including rare ferns, are found growing within the grykes of the limestone pavement, which have their own micro-climate. ■ The southern and western areas of the NCA have some of the finest geological examples of Carboniferous Limestone outcrops and cliffs in the UK. Probably the best known are Malham Cove and Kilnsey Crag for climbing and Gaping Gill and Alum Pot for caving. ■ There are some dramatic features concealed in the limestone areas: impressive limestone gorges where water has carved a passage for thousands of years, such as the River Twiss and River Doe near Ingleton and the impressive Gordale Scar near Malham, and waterfalls such as Thornton Force, Ingleton. Gorges have also formed in a range of other rock types such as the Strid (Millstone Grit). ■ The Yoredale Group consists of soft shales, hard sandstones and limestones, giving rise to the stepped profiles of the dale sides, as in Wharfedale and Wensleydale, and the dramatic profiles of Ingleborough and Pen-y-ghent.

Landscape attribute	Justification for selection
Evidence of historical land use spanning from the Neolithic and bronze-age to lead-mining activities of the 18th and 19th centuries.	■ The whole area is very important from an archaeological perspective as it retains a good record of land use over a long time-period. Earliest records relate to use of caves by prehistoric man, such as at Victoria and Kinsey Cave, and provide nationally important records of the earliest human re-colonisation of north-west Europe after the last glacial maximum. The area contains good examples of iron-age and bronze-age settlements, medieval field systems and ridge and furrow, with good examples in Wharfedale and Upper Ribblesdale. ■ There are 376 Scheduled Monuments, the largest being the multi-period lead mines and processing works and 20th century barytes mill on Grassington Moor, which cover 203 ha. The Gunnerside Gill lead mines and ore workings are among the most impressive anywhere and cover 32 ha. In contrast to these large scale monuments, there are many smaller sites such as ring cairns and other earthworks, right down to cup and ring marked stones.
Remnant semi-natural broadleaved woodland on valley sides and in cloughs, contrasting with blocks of conifers in some dales.	■ The remaining semi-natural woodland in the NCA is very important, but only covers a tiny proportion of the area. Total woodland covers 10,624 ha, only 4 per cent of the area, with only 1 per cent of the NCA covered by native broadleaf woodland (2,432 ha). Many of the native woodland fragments are on inaccessibly steep ledges and gill sides, which have saved them from cultivation and grazing by livestock. Pot hole entrances and shake holes often have trees like rowan and ash growing in them, safe from browsing. ■ Scattered conifer plantations punctuate some valleys, often in regular-shaped large blocks that stand out from the surrounding landscape. While of limited wildlife value in many cases, some of the conifer plantations in Wensleydale, Upper Langstrothdale and the Cumbrian Dales support red squirrel populations.
Flower-rich hay meadows and in the valley bottoms enclosed by drystone walls and extensive areas of calcareous grassland.	■ Flower-rich traditional hay meadows are an iconic feature of the NCA, filling the valley bottoms with swathes of colour in summer. The meadows are of great value for wildlife, not only for the rare plants to be found in them (such as globeflower, lady's mantle species and spignel), but also for the invertebrates that come to feed on the plentiful nectar supply (such as bees and butterflies) and bird species that nest in them in spring (such as curlew and grey partridge). ■ The Yorkshire Dales NCA has nearly 10 per cent (157 ha) of the UK's upland hay meadows. Many are of international importance and are protected within the North Pennine Dales Meadows SAC. ■ Perhaps less famous, but equally important for biodiversity, are the calcareous grasslands of the area. Generally grazed, rather than cut for hay, these rare grasslands are found on shallow, lime-rich soils, and contain an exceptionally diverse number of plant species, including rare flora such as carline thistle and bird's eye primrose.

Landscape attribute	Justification for selection
Dramatic topography makes a defining contribution to sense of place; from high mountain summits to meandering river courses, waterfalls and gorges.	■ The most famous mountains are The Three Peaks; consisting of Ingleborough, Whernside and Pen y gent. The three summits offer far-reaching views to the Irish Sea and over the Settle-Carlisle railway, and are visited by over 250,000 people each year. The area has in the past suffered serious erosion problems on access routes, but a lot of work was undertaken in 1990s and 2000s to address problems and improve the stability of the routes. ■ Considering that the NCA has a relatively low density of water courses and water bodies, they make a disproportionately significant contribution to the sense of place. The smaller limestone rivers are very distinctive; with their dramatic waterfalls, gorges and exposed limestone beds that run dry in times of prolonged low rainfall. The larger rivers, bordered by settlements, woodland and large estates, offer dramatic vistas and leisure opportunities. These, combined with reservoirs and the natural lakes of Malham Tarn and Semerwater, provide a strong draw for large numbers of tourists and have inspired many artists over the years, including JMW Turner. ■ Rivers and streams have a large number of historic stone crossings associated with them, including fords, pack horse bridges and clapper bridges. Bow Bridge near Askrigg is one of the oldest surviving bridges; it was thought to have been built in the early 13th century. ■ The water bodies in the NCA are generally of good water quality and support a number of rare species such as the native white-clawed crayfish, otter and freshwater mussel.
A strong sense of tranquillity and remoteness, low levels of intrusion and light pollution.	■ The sense of tranquillity and remoteness created by the open, sparsely populated landscape and far-ranging views is enhanced by low levels of intrusion (96 per cent of the NCA "undisturbed" according the CPRE). Most of the area has the lowest classification of light pollution at night and is classified as "dark" by CPRE.

Landscape opportunities

- Conserve characteristic historic structures (such as field barns, farmsteads and villages of local stone, historic bridges and drystone walls networks), and encourage the use of traditional local materials and techniques, for the benefit of the landscape, local economy, traditional skills and wildlife associated with the structures such as bats and barn owls.
- Protect the area's rich and diverse archaeology; from Mesolithic, bronze-age and iron-age earthworks and field systems, through to lead mines from various periods and the 19th century Settle-Carlisle railway, including the Ribblehead Viaduct.
- Protect the area's high levels of tranquillity, sense of remoteness, far-reaching views and dark night skies, by considering impacts on tranquillity of potential development within, on and just outside the area's boundary.
- Protect, manage and enhance the good rights of way network, linking with iconic sites and interpretation material, allowing people the freedom to explore the area, increase their understanding of it and enjoy its tranquillity and wildlife.
- Manage and enhance existing broadleaved woodland. Conifer plantations could be enhanced for biodiversity, recreation and visual amenity by restocking of some areas with native tree species and/or management for the benefit of red squirrels.
- Encourage the maintenance of traditional land management practices, particularly where of benefit to the environment, such as hay-making, shepherding, hefting, drystone walling, hedge-laying and coppicing.
- Protect, and encourage sympathetic management and enhancement of moorland habitats to improve their value for: biodiversity, flood alleviation, clean water supply and carbon sequestration.
- Protect, manage and enhance existing valuable grassland habitats, particularly grazed calcareous grassland, traditional hay meadows and flower-rich road verges.
- Protect and manage geological features and associated habitats for their expression of geological processes and associated rare flora and fauna species such as baneberry on limestone pavements, and peregrines on limestone cliffs and outcrops.
- Plan for climate change mitigation and adaptation in upland habitats, in particular restoration of peatland habitats and of eroding soils.
- Plan for extension and creation of broadleaved woodlands in ways that: are appropriate to the landscape and its wildlife and archaeology; maximise benefits to biodiversity, flood alleviation and water quality; and, connect existing fragmented areas of woodland. Riparian and gill woodland, in particular, may deliver the greatest benefits.

Ecosystem service analysis

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

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

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Food provision	Soils Semi-natural habitats (grassland and moorland) Water courses Livestock (meat and dairy)	70,000 cattle (beef and dairy) and 778,000 sheep. 73 per cent of the land is Agricultural Grade 5.	Regional	Livestock farming is an important activity in the area, contributing to employment, economy and maintenance of rare habitats. Poor soils, topography and the harsh climate give very little opportunity for growing arable crops. Almost 73 per cent of the NCA is grade 5 with over 23 per cent grade 4. Various projects and schemes have given support to traditional livestock production in the area, to secure a range of benefits. A large proportion of land has been in agri-environment schemes since the late 1980s. The Limestone Country project, from 2002-2007, encouraged local farmers to graze with traditional cattle breeds rather than sheep, to benefit grassland flowers and helped farmers **Continued on next page...**	Ensure that future agri-environment schemes are used to best effect to preserve the wildlife-rich habitats and traditional skills associated with meat and dairy production. Support farmers in promoting the environmental value and high quality of meat and dairy products from traditional systems, emphasising the special qualities of the area. Promote the use of new technology and best practice, to increase food production and farm profitability while reducing/avoiding potential detrimental impacts on the local environment.	**Food provision** **Biodiversity** **Genetic diversity** **Climate regulation** **Sense of place/ inspiration** **Biodiversity** **Regulating soil erosion** **Regulating water quality**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Food provision				**... continued from previous page** market the beef as a premium food product. A few entrepreneurs market value-added products locally, but it is not a widespread phenomenon. Small quantities of dairy produce are still produced in the area, some of which are well-recognised and sold around the UK (such as Wensleydale cheese). Ongoing economic pressure is causing a continued reduction in the number of dairy farms, with small farms in particular going out of business. Other livestock farms are undergoing a period of amalgamation and loss of small units, as well as loss of manpower to carry out more labour intensive traditional practices such as shepherding and hay making. Traditional breeds have increased in popularity in 21st century, particularly cattle breeds. The NCA has several local traditional breeds including Swaledale, Wensleydale and Masham sheep. The economic performance and financial viability of livestock businesses are to a large extent dictated by market prices for breeding sheep stock and store cattle. **Continued on next page...**	Explore opportunities to encourage production of honey from heather moorland.	

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Food provision				**... continued from previous page** Agri-environment schemes have comprised a significant proportion of farm income in the area, and any reduction in future funding could hit the farming sector in this NCA harder than most. There is a small industry of heather honey production, by beekeepers who bring hives up to the heather moorland. This could be encouraged further particularly in view of current declines in bee numbers.		

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Timber provision	Soils Existing woodland High levels of precipitation due to topography	Limited timber industry and poor growth rates. 5,262 ha of coniferous woodland (2 per cent of NCA). Very little woodland on higher ground, but substantial conifer plantations in some dales such as Oughtersaw. Limited timber extraction opportunities.	Local	Many conifer plantations are now being felled and replanted with broadleaf or mixed forests. Some felled areas are not being replanted, to allow for restoration of blanket bog and other priority habitats. Clearance of timber from some conifer plantations could have significant biodiversity benefits where combined with broadleaf woodland creation or restoration of open semi-natural habitats (for example blanket bog, calcareous grassland or upland heath). Thinning of plantations could allow for timber/biomass extraction while also improving conditions for red squirrels. The potential for timber production in the area is limited. This may improve marginally as temperatures increase with climate change, but the area is more likely to be a significant source of wood fuel than timber. Some of the timber extracted from the area is taken by train to pulp mills in Wales; some is transported by road for a range of uses. Some of the larger plantations in the west of the NCA are being thinned to benefit red squirrels, in combination with grey squirrel control, with a view to linking small isolated populations with more viable populations nearby.	Restock cleared conifer plantations with broadleaf trees, particularly on Planted Ancient Woodland Sites, or restore to priority open habitats such as grassland or heath where appropriate. Manage remaining conifer plantations for the benefit of red squirrels, to enhance access and recreation opportunities and enhance their shape and species composition to improve the way they fit in to the landscape.	**Timber provision** **Biodiversity** **Climate regulation** **Recreation** **Regulating soil erosion** **Regulating water quality**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Water availability	High levels of precipitation due to topography Geology Soils Semi-natural habitats Water courses	The NCA has 10 reservoirs. It has few natural lakes, with the exception of Malham Tarn, Birkdale Tarn and Semerwater. Within the NCA a series of vast upland catchments drain into a number of major rivers (Wharfe, Ure, Nidd, Ribble, Swale, Aire and Skirfare. The NCA has 2 minor aquifers: Carboniferous Limestone and Millstone Grit aquifers.	Regional	The NCA receives high levels of rainfall due to its location and topography. It forms the headwaters for many major rivers and the site of two minor aquifers. The large extent of semi-natural habitats allows for good overall rainwater retention and increases opportunity for groundwater recharge. The rivers Ure and Nidd, as well as the underlying Carboniferous Limestone and Millstone Grit aquifers, are classified as 'no water available' for additional licensed abstraction, in order to protect flow levels downstream at York. [6] The River Washburn (only the upper reaches of which lie within the NCA) is assessed as having water available, but has been overridden as 'no water available' to maintain flows for downstream abstraction. The River Wharfe is 'over licensed' within the NCA.[7] The River Aire catchment is classified as 'water available', including from underlying Carboniferous Limestone. [8]	Seek opportunities to restore other habitats which are effective at retaining water, such as wet woodland, wet grassland, flushes and mires. Promote good farming practice to improve the structure of agricultural soils, thereby improving infiltration of rainwater and reducing surface flow.	**Water availability** **Biodiversity** **Regulating water quality** **Sense of place/ inspiration** **Regulating soil erosion** **Climate regulation**

[6] *Swale, Ure, Nidd and Upper Ouse Catchment Abstraction Management Strategy*, Environment Agency (2004)
[7] *Wharfe and Lower Ouse Catchment Abstraction Management Strategy*, Environment Agency (2005)
[8] *Aire and Calder Catchment Abstraction Management Strategy*, Environment Agency (2007)

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Genetic diversity	Local and traditional livestock breeds. Semi-natural habitats.	Several native breeds originate from the NCA: Swaledale, Wensleydale and Dalesbred sheep; and, Dalesbred pony. As of August 2012, 44 Environmental Stewardship Agreements included the Native Breeds at Risk supplement, with 3,700 ha of land under this option being grazed by traditional native breeds. [9] Most of the land under this option will be semi-natural habitat of biodiversity importance that benefits from grazing by hardy traditional breeds.	Regional	Many native breeds are hardier than continental breeds and particularly well-suited to the climate, vegetation and topography of the Dales NCA. As well as being the area of origin for a number of traditional breeds, it also holds significant populations, with an increase in popularity of traditional cattle breeds such as shorthorn, highland, belted Galloway, and crosses of traditional breeds such as blue grey. Many of the traditional breeds used in the area are recognised for high quality meat and dairy produce and thrive better than modern breeds on poorer pasture and in harsher weather conditions.	Continue to encourage the use of traditional breeds for conservation grazing. Support farmers in attempts to capitalise on the environmental value, heritage/ genetic value and high quality of meat and dairy products from traditional breeds.	**Genetic diversity** **Biodiversity** **Food provision** **Sense of place/ inspiration**

[9] Genesis reporting data, Natural England (2012)

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Biomass energy	Soils High rainfall Woodland	Limited woodland cover (4 per cent of NCA). The NCA has medium to low potential for miscanthus, and low potential for short rotation coppice. [10]	Local	The potential for the NCA to produce biomass crops is limited by the poor potential of the ground for miscanthus, limited opportunities for short rotation coppice and high sensitivity of the landscape to the introduction of both. The potential for the production of wood biomass is also limited by the low woodland cover and landscape sensitivity to new large plantations, although demand for local wood fuel is increasing. During 2000s and 2010s there have been a number of small scale initiatives for biomass production and use. For information on the potential landscape impacts of biomass plantings within the NCA, refer to the tables of 'opportunities and optimum sitings for energy crops' on the Natural England website. [11]	Opportunities for small -scale production of wood fuel from existing and new broadleaf woodlands, through harvesting and by getting existing woodland under better management, for example by coppicing and thinning.	**Biomass energy** **Biodiversity** **Climate regulation**

[10] *Opportunities and optimum sitings for energy crops*, Natural England (2010)

[11] **http://www.naturalengland.org.uk/ourwork/farming/funding/ecs/sitings/areas/021.aspx** (accessed January 2013)

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Climate regulation	Peat soils Woodland Semi-natural grassland	The NCA has a very high soil carbon content of 20 to 50 per cent, mostly because of the large expanses of peat soils (~41,000 ha). Woodland (10,624 ha) and soils associated with semi-natural grassland and (to a lesser extent) wetlands, are also important stores of carbon in the NCA.[12]	International	Research has shown that more active peatlands are vital for carbon sequestration and storage.[13] The large areas of peatlands within this NCA have potential to retain a significant store of carbon. However their capacity to act as carbon stores depends on the peat and associated habitats being in good biological condition. Some of the NCA's blanket bog has been damaged by: acidification from historic industrial pollution, and certain types of land management including drainage, overgrazing and burning, with estimates suggesting that only 57 per cent of blanket bog in the Yorkshire Dales National Park is in good biological condition.[14,15] Estimates suggest that in their current state peat soils within the NCA are a net source of carbon.[16] **Continued on next page...**	Seek opportunities to restore areas of blanket bog and wet heath through sustainable land management practices and programmes of work to restore the hydrology and ecology of the habitats. Ensure that peatland habitats which are in good biological condition remain under optimal land management regimes. Encourage woodland management and planting in appropriate areas where it would also benefit water quality, flood alleviation and biodiversity without detracting from the landscape, historic environment and recreation opportunities. Protect existing semi-natural grassland to maintain the carbon stored in agricultural soils.	**Climate regulation** **Biodiversity** **Regulating water quality** **Regulating water flow** **Regulating soil quality** **Regulating soil erosion** **Timber provision** **Biomass energy**

[12] *National Soils Resources Institute (NSRI) National Soils Map for England and Wales*, Environment Agency (2009) [13] *Peatbogs and Carbon: A Critical Synthesis*, Richard Lindsay (2010)
[14] *Nature in the Dales: 2020 Vision – Blanket Bog Habitat Action Plan*, Yorkshire Dales Biodiversity Forum (2011) [15] *Nidderdale Area of Outstanding Natural Beauty Evidence Base to Management Plan*, Nidderdale AONB (2008) [16] *Low Carbon Land Management in Our National Parks*, David Thompson, Natural England (2010)

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Climate regulation				**... continued from previous page** Restoration of degraded peatlands, through measures such as grip blocking and sphagnum seeding, coupled with sensitive land management should be secured to avoid the release of stored carbon to the atmosphere. In some locations these measures may enable the habitats to sequester carbon. [17] The Yorkshire Peat Partnership has carried out extensive peatland restoration within this NCA since 2009 and there has also been widespread uptake of Environmental Stewardship on moorland, with 59,586 ha under restoration options and 22,098 ha under maintenance options in late 2012. Trees and woodland shading watercourses would help regulate conditions for aquatic species under a changing climate, by reducing water temperature and thereby maintaining available oxygen levels. Trees and woodland in all locations also sequester carbon, help to regulate the impacts of severe weather events and provide potential sources of wood fuel.		

[17] *IUCN Commission of Inquiry on Peatlands*, IUCN UK (2011)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating water quality	High rainfall Extensive semi-natural vegetation (especially peat bogs) Low intensity farming Fast flowing water courses	Environment Agency classifications for waterbodies in 2009 included: Surface water - ecological status mostly 'good' or 'moderate', with the chemical quality not requiring assessment. Ground water - chemical status generally 'poor' throughout the NCA. Malham Tarn and Semerwater are of 'moderate' ecological status, and their chemical status 'does not require assessment'. All reservoirs in the NCA (with the exception of Winterburn Reservoir, for which data was not available) have a 'moderate' ecological potential, and their chemical status 'does not require assessment'. [18, 19, 20] A few lengths of rivers within the NCA are rated as poor or bad for ecological status, such as the River Wharfe above Grassington. [21]	Regional	As it is largely upland in nature, relatively extensively managed and with low population density, this landscape has generally good overall water quality in comparison with many NCAs. Threats to water quality in the area do however include: sedimentation and colouration as a result of erosion and damage to the integrity of peat soils; diffuse water pollution from agriculture, particularly in terms of run-off of manure, fertiliser and chemicals; soil erosion due to overgrazing and stock access to watercourses; severe riverbank erosion at peak flows due to active networks of drains on moorland and lack of vegetation on bank sides; leaching of lead, zinc and other pollutants from historic mining sites; and outflows from water treatment plants. [22] **Continued on next page...**	Promote land management practices that prevent water pollution, such as application of manure/fertiliser at appropriate levels/times/locations, buffer strips along watercourses, stock fencing along river banks, good soil management and carrying out farming operations in appropriate weather conditions. Restore riparian/wetland habitats and plant trees along watercourses to help stabilise bank sides, reduce erosion and filter pollutants, while benefitting riparian and riverine wildlife. Restore blanket bogs to help reduce peak flows, water coloration and erosion. Minimise the pollution from water-treatment plants, quarries and industrial plants to receiving water bodies.	**Regulating water quality** **Regulating water flow** **Biodiversity** **Regulating soil erosion**

[18] *Humber River Basin Management Plan, Annex A: Current state of waters,* Environment Agency (2009) [19] *North West River Basin Management Plan, Annex A: Current state of waters,* Environment Agency (2009) [20] *Lakes datasearch, Environment Agency (accessed November 2010;* **http://maps.environment-agency.gov.uk/wiyby/dataSearchController?lang=_e&textonly=off&topic=wfd_lakes** [21] *Surface water bodies – classification status and objectives for Water Framework Directive Cycle 1,* Environment Agency (updated January 2011) (accessed January 2013; **URL: www.environment-agency.gov.uk/research/planning/124803.aspx)** [22] *River Basin Management Plan: Humber River Basin District,* Environment Agency (2009)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating water quality		Stretches of river classified as bad, poor or moderate all need to be improved in order to meet the requirements of the Water Framework Directive. 17,056 ha (71 per cent) of the NCA are classified as Nitrate Vulnerable Zone (NVZ). [23]		**... continued from previous page** Peatland restoration activity can play an important role in reducing pollution from degraded peat soils. Dissolved organic carbon (DOC) has doubled in the last 30years in UK catchments.[24] Grip blocking can reduce DOC in streams.[25] Eroding peat can cause lead mobilisation which can be detected in the fluvial system. Intact peat can absorb heavy metals. [26] Restoration of sphagnum-dominated habitats can help "filter" water. Good farming practices to help reduce the risks of pollution in the NCA include maintaining good soil structure, appropriate timing and application of manure and fertiliser and fencing to exclude livestock from watercourses. Farms in the area have historically struggled to find capital for investment in farm infrastructure such as slurry stores, leaving them at high risk of pollution incidents, particularly in times of heavy rainfall. Protection of receiving water bodies can include grass buffer strips, sediment trap ponds and creation of wetland/riparian habitats.	Explore opportunities to help farmers update aged and inadequate farm infrastructure, to lower risk of pollution events.	

[23] Natural England (2012) [24] The impact of peatland drain-blocking on dissolved organic carbon loss and discolouration of water: results from a national survey, Alona Armstrong, Joseph Holden, Paul Kay et al., *Journal of Hydrology*, 381: 112–120 (2010) [25] Ditch blocking, water chemistry and organic carbon flux: Evidence that blanket bog restoration reduces erosion and fluvial carbon loss, Lorraine Wilson, Jared Wilson, Joseph Holden et al., *Science of the Total Environment*, 409: 2010–2018 (2011) [26] Sediment–water interactions in an eroded and heavy metal contaminated peatland catchment, Southern Pennines, UK, J.J. Rothwell, M.G. Evans and T.E.H. Allott, *Water, Air & Soil Pollution: Focus*, 6: 669–676 (2006)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating water flow	Reservoirs and lakes Rivers and streams Semi-natural vegetation (esp. peat bogs, riparian woodland and wetlands) Soil Geology	Steep topography, high levels of rainfall, dense patterns of moorland drainage and some degraded habitats result in a catchment that drains very quickly into rivers causing flash flood events. Flows generated within the NCA contribute to flooding events outside the area, particularly along the Aire in Leeds and the Ouse in York. There are few residential areas at risk of fluvial flooding within the NCA, although there is some flood risk around Settle, Gargrave, Skipton and Pateley Bridge.	Regional	The NCA has some of the fastest rising rivers in the country, with implications for erosion and downstream flooding. The extent of flood risk in the NCA is predicted to increase with climate change. Grip-blocking and other blanket bog restoration, such as the work carried out by the Yorkshire Peat Partnership, could help reduce speed of water run-off, particularly where subsequent land management creates suitable conditions for bryophytes and other wetland vegetation to increase in coverage. Improvement of soil structure on agricultural land would enhance infiltration of rainwater, reducing rates of run-off and increasing rates of groundwater recharge through permeable soils. There are plans for the Environment Agency to investigate opportunities to create flood storage areas (particularly in the Cover Valley, Bishopdale and historic mineral workings), and for using storage reservoirs to reduce peak flows.	Seek opportunities to restore rivers to more natural meandering course. Seek opportunities to create new flood storage areas/features; Promote good soil management on farms to improve infiltration of rainwater into agricultural land. Seek opportunities to restore peat forming habitats and other wetlands.	**Regulating water flow** **Biodiversity** **Regulating water quality**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating soil quality	Geology Soils Semi-natural vegetation Soil flora and fauna	There are 8 main soilscape types in this NCA: ■ Slowly permeable wet very acid upland soils with a peaty surface (30 per cent of NCA). ■ Blanket bog peat soils (25 per cent). ■ Very acid loamy upland soils with a wet peaty surface (15 per cent). ■ Freely draining slightly acid loamy soils (10 per cent). ■ Slowly permeable seasonally wet acid loamy and clayey soils (8 per cent). ■ Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils (4 per cent). ■ Shallow lime-rich soils over limestone (3 per cent). ■ Freely draining slightly acid but base-rich soils (2 per cent).	Local	The large extent of semi-natural habitat on uncultivated ground that is under low-intensity management will help to maintain soil quality within the NCA, in combination with the range of soil flora and fauna that persist in unimproved ground. The large areas of peat soils in the NCA are at risk of losing organic matter through drying and erosion. This has been exacerbated by past land management practices including drainage, grazing and burning and climate change. All soils within the NCA are vulnerable to erosion and compaction, but 'very acid loamy upland soils with a wet peaty surface', that cover 15 per cent of the NCA, have low strength when wet and are easily damaged by grazing and trafficking, particularly in winter. The freely draining, slightly acid, loamy soils have potential for increased organic matter content.	Restore peat-forming habitats and encourage sustainable grazing and burning regimes, to improve the condition, structure and carbon content of upland soils. Promote good farming practices to improve the organic matter content and structure of agricultural soils and protect soil biodiversity (for example mychorrizal fungi and soil invertebrates).	**Regulating soil quality** **Regulating water quality** **Climate regulation**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating soil erosion	Semi-natural vegetation cover Soils - peat and calcareous limestone soils	85 per cent of the soils in the NCA are at some risk of erosion. The peat soils that cover more than half of the NCA are largely non-cohesive and easily eroded by water.	Regional	The steep topography and high rainfall of the NCA mean that soil in many areas is at risk of water erosion. Soil erosion has been exacerbated in some areas by overgrazing and inappropriate moorland burning. Downstream erosion has also been exacerbated by moorland gripping which increases the rate of run-off and the level of peak flows. There is some evidence of peat 'blowouts' - where the top layer has been removed by wind and rain, leaving areas of bare peat which become further eroded by the wind. Re-vegetating exposed peat can reduce rates of water run-off by increasing surface roughness (particularly in the case of sphagnum- dominated peat) thereby helping to reduce erosion. [27] There is erosion associated with popular access routes, particularly green lanes and illegal routes used by off-road vehicles. The erosion is exacerbated by rainfall. Examples of particularly bad access route erosion have included the track from Whernside to Dentdale, and the Pennine Way from Cam Fell.	Secure good grazing and burning management of moorland to reduce erosion of peat soils, and encourage development of vegetation that will retain water for increased periods of time, thereby reducing levels and the erosive force of rivers at peak flows. Secure good grazing and cutting management of in-bye land and meadows to maintain good soil structure, improve infiltration and prevent channelling, run-off and flooding. Encourage active restoration of peat bogs and restoration/creation of riparian woodland and wetlands – to reduce peak flows and erosive force of rivers and stabilise eroding riverbanks. Encourage planting of trees on eroding steep slopes and land-slippage areas, where appropriate, to stabilise ground. Continue management of visitor pressure and access routes to minimise erosion, particularly where caused by illegal vehicular access, and create access routes with stable surfaces.	**Regulating soil erosion** **Regulating water quality** **Regulating water flow** **Biodiversity** **Recreation**

[27] Upland Hydrology', Joseph Holden, in *Drivers of Environment Change in Uplands,* Aletta Bonn, Tim Allott, Klaus Hubacek and Jon Stewart (2010)

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Pollination	Semi-natural habitats (moorland and hay meadows) Pollinating insects	Although the area provides a vast food source for pollinators in the form of flower-rich moorland, calcareous grassland and hay meadows (3,515 ha or 3 per cent of the NCA), these are of limited value for pollination of commercial crops as there is such a small area of crops grown in the immediate vicinity.	Local	N/A	N/A	**Pollination** **Biodiversity**
Pest regulation	Not applicable to this NCA					

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
A sense of place/ inspiration	Topography (particularly dramatic mountains, open moorland, broad river valleys and water courses) Semi-natural habitats Karst limestone geology and features Local stone used in historic structures, buildings and drystone walls Climate Local livestock breeds Local food products Well-preserved archaeological features	High number of designations for the distinctive and unusual natural and cultural features (71 per cent National Park, 17 per cent AONB, 30 per cent SSSI, 376 Scheduled Monuments, 2,252 Listed Buildings). Iconic and internationally recognised sites, habitats, landscapes and products - such as the Three Peaks, Swaledale Hay Meadows, Malham Cove, Aysgarth Falls, limestone pavement and Wensleydale cheese. The landscape of the NCA has been an inspiration to many well-known artists and writers - historic and contemporary. Strong sense of identity among local communities.	International	The well-loved landscapes, cultures and traditions of the NCA have evolved over thousands of years through the interactions of humans with the environment. Although the NCA may in places feel wild and remote, all but the most inaccessible areas have been managed or influenced by humans and their livestock and depend on active management for their continued survival. The maintenance of existing character and sense of place depends on a strong local economy and the perpetuation of traditional rural skills and knowledge. It also depends on the protection of the most valuable habitats and historic features. Many national and international visitors come to the NCA each year. The very distinctive character that draws people to the area is also vulnerable to change as a result of high levels of tourism and in migration. **continued on next page...**	Protect sites designated for their natural and historic interest. Retain characteristic features such as drystone walls, field barns, traditional buildings and hay meadows. Explore opportunities for sustainable tourism initiatives that will increase visitors' environmental awareness and improve profitability of local businesses, while protecting the special qualities of the area. Encourage appropriate development, accessible to local people, and using local materials and traditional techniques where appropriate. Support the use of traditional land management techniques in ways which have the optimum impact on the landscape and environment.	**Sense of place/ inspiration** **Sense of history** **Recreation** **Biodiversity**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
A sense of place/ inspiration				**... continued from previous page** Commercial use/management of the NCA is vital to maintaining the sense of place, and public access vital to its appreciation, but both can be a threat to it. Future pressures of energy generation, fuel supply and increased levels of tourism will increasingly need to be woven into the delicate balancing act between different influences on the NCA, with the National Park and AONB having vital roles to play to help the area evolve without losing what makes it unique.	Encourage appropriate and targeted use of modern farming techniques and technology to achieve efficient food production that makes maintenance of the traditional farmed landscape economically viable. Recognise and maintain the distinctive character of each of the valleys in the NCA.	

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Sense of history	Well-preserved archaeological remains Geological features	High density of well-preserved archaeological sites (376 Scheduled Monuments, 2,252 Listed Buildings), partly because development and cultivation has been somewhat limited by climate and topography. Strong continuity of traditional farming and construction methods, illustrated by distinctive drystone wall boundaries and wealth of traditional style buildings.	National	The history of the landscape is evident in extensive prehistoric remains including Neolithic henge monuments at Castle Dykes and Yarnbury, early bronze-age burial mounds and middle-late bronze-age rectilinear field systems (for example Grassington), iron-age / Romano-British earthworks of enclosed and unenclosed farmsteads with round houses thickly clustered around Ribblesdale and Wharfedale, plus distinctive parallel strip lynchets on some dale sides of early medieval origin. This is supported by the network of walled fields that spread across the valleys and hillsides, ranging from small irregular fields close to settlements that date from the 16th century to the larger, regular enclosures on higher land of Parliamentary origin, with medieval ridge and furrow also surviving on dale slopes. Lead mining has also been a feature of the landscape since Roman times, with most visible evidence relating to the 18th and 19th century and ranging from the ruins of smelting mills and chimneys to shaft mounds and spoil heaps, notably in Swaledale and Arkengarthdale and **Continued on next page...**	Protect important archaeological and geological sites and traditional buildings and structures, particularly from inappropriate development, damaging farming practices and erosion resulting from public access. Ensure positive management of archaeological features and historic structures, particularly field barns, and encourage the survival of associated traditional skills. Field barns and traditional farm buildings should be restored or maintained wherever possible, but where not possible a record of them should be kept. Provide interpretation and education to enhance the understanding of the history of the area and its sites.	**Sense of history** **Biodiversity**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Sense of history				**... continued from previous page** above Grassington in Wharfedale. Small lime kilns built into the hillside are also common. Possibly the most well-recognised historic features are the stone walls and associated stone field barns, the 19th century railway viaducts, the most spectacular being the 24-arch viaduct at Ribblehead, and the dramatic geological features that evokes a sense of history on a geological timescale. [28, 29, 30] The historic features and structures of the area also support a range of rare species, particularly birds and bats. Historic features are at risk from a number of activities, including: damage and erosion from inappropriate farming, development and land use activities; erosion along public access routes; dereliction and neglect; deliberate damage and theft.		

[28] *The Yorkshire Dales: Landscapes Through Time*, English Heritage (1997)
[29] *Countryside Quality Counts Yorkshire Dales Draft Historic Profile*, English Heritage (2004)
[30] www.outofoblivion.org.uk/, Yorkshire Dales National Park Authority (2012)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Tranquillity	Topography Climate Semi-natural vegetation	High levels of tranquillity throughout the NCA, with 96 per cent classed as 'undisturbed'. There has been very little intrusion since the 1960s with 98 per cent classed as undisturbed.	Regional	The topography and climate of the area are important contributors to the high levels of tranquillity, in that they limit the opportunities for development, major transport routes and intensive agriculture. The high land and mountain summits accentuate this by allowing far-reaching views of sparsely populated and un-developed land covered in semi-natural habitats. The designation of 87 per cent of the NCA as either National Park or Area of Outstanding Natural Beauty will also have afforded substantial protection for the aspects that make the area so tranquil. The tranquillity of the area is of major benefit to wildlife, allowing large, relatively undisturbed areas, of particular importance for breeding birds.	Protect the area from the introduction of inappropriate development and infrastructure that would detract from the sense of remoteness and tranquillity of the area, particularly on open moorland and mountains. Continue to manage visitor access to enable enjoyment of the tranquillity without eroding it for other visitors and local communities.	**Tranquillity** **Biodiversity** **Recreation** **Sense of place/ inspiration**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Recreation	Topography (especially mountains, uplands and water courses) Geology Semi-natural habitats	142,805 ha (59 per cent of the NCA) is designated as open access land. 2,941 km of public rights of way, equivalent to an average density of 1.23 km per sq km. A number of well-used long distance routes cross the NCA including the Pennine Way and Pennine Bridleway National Trails, the Dales Way and the Coast to Coast footpath and cycle route.	National	The area is nationally renowned for the quality and wealth of access opportunities. It has a dense and well-maintained network of public rights of way, an unusually high proportion of open access land and many long distance walking routes and bridleways. There are also excellent opportunities for rock-climbing, caving, fell-running, canoeing, paragliding, fishing, horse riding, shooting, mountain biking, bird-watching and open-water swimming. Appropriate recreational access is encouraged and carefully managed by the Yorkshire Dales National Park Authority and Nidderdale AONB. There is an extensive programme of footpath/route maintenance carried out to avoid erosion and other damage to the landscape.	Maintain and improve the quality of recreational access facilities and infrastructure. Plan for and manage potential increases in visitor numbers so as to avoid physical damage to the landscape and/or erosion of the area's tranquillity and sense of place. Further opportunities for green tourism and voluntary visitor pay back could be explored in order to ensure that increased tourism has a net positive impact on the local environment and economy.	**Recreation** **Sense of place** **Tranquillity**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Biodiversity	Soils Geology Topography Semi-natural Vegetation High rainfall Traditional farming techniques	96,205 ha of Biodiversity Action Plan habitat (40 per cent of the NCA) - particularly blanket bog, heathland, calcareous grassland and limestone pavements. 25 per cent of the NCA is protected by European conservation designations (Special Protection Area for birds and Special Area of Conservation for habitats). 30 per cent of the NCA is designated as Site of Special Scientific Interest (some of which overlaps with European designations). 1 Ramsar site at Malham Tarn.		The NCA is of particularly high value for biodiversity, reflected in the large proportion of the area that is protected through national, European and international nature conservation designations. Many of its semi-natural habitats only occur in isolated pockets, but these provide a good foundation for restoration and re-connection of priority habitats. There is a long history of nature conservation in the area undertaken in conjunction with landowners and land managers by the National Park, Nidderdale AONB, National Trust, Yorkshire Wildlife Trust, government agencies and local organisations. These organisations (and their members/volunteers) are in a strong position to help monitor upland biodiversity and the impacts of climate change. A high proportion of farms have been financed to conserve and enhance biodiversity through agri-environment schemes. Many of the local species and habitats rely on traditional farming techniques. The high nature conservation value of the NCA could provide biodiversity offsetting opportunities, creating a habitat bank of high quality offset investment opportunities in strategic locations designed to link existing semi-natural habitats. Iconic species include black grouse, red grouse, hen harrier, red squirrel, globeflower, lady's slipper orchid and heather species.	Protect and restore priority habitats and designated sites, and ensure appropriate management of adjacent land, to increase the area considered to be in good biological condition. Creation and restoration of habitats, particularly grassland and woodland, in locations that link existing isolated habitats and allow species to move more freely through the landscape. Maintenance of suitable habitats and appropriate conditions for priority species. Explore opportunities for biodiversity offsetting. Explore opportunities to work with voluntary groups and local people to monitor climate change and upland biodiversity.	**Biodiversity** **Sense of place/ inspiration** **Genetic diversity** **Tranquillity** **Regulating water quality** **Regulating soil quality**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Geodiversity	Geology High rainfall Topography	40 geological SSSI. 50 per cent of UK's limestone pavement, 80 per cent of which is designated SSSI. 7 local geological sites.	International	The NCA has some of the best geodiversity in the UK, with a classic glacio-karst landscape in much of the NCA and some of the best potholes and cave systems, including Gaping Gill pothole near Ingleborough. The limestone pavement is of international importance. 50 per cent of the UK's limestone pavement is found in the Yorkshire Dales. The range of geological features and former quarries provide an excellent educational resource. Many of the geological features also provide outstanding recreational opportunities such as caving and climbing. Some geological features also host priority habitats and rare species.	Continued protection of limestone pavements through statutory designations, Limestone Pavement Orders and use of payment schemes for farmers to reward sympathetic management. Identify opportunities for enhanced access to and understanding of geological features. Collaboration with caving clubs/climbers to monitor geological SSSI.	**Geodiversity** **Biodiversity** **Sense of place/ inspiration** **Sense of history** **Recreation**

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