National Character Area profile:

36. Southern Pennines

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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.

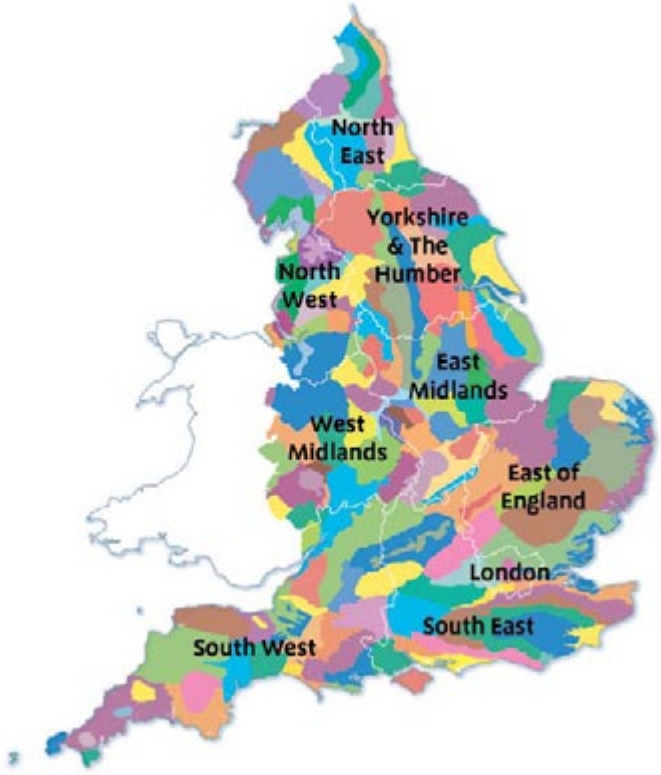
NCA profiles are guidance documents which can help communities to inform their decision-making about the places that they live in and care for. The information they contain will support the planning of conservation initiatives at a landscape scale, inform the delivery of Nature Improvement Areas and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



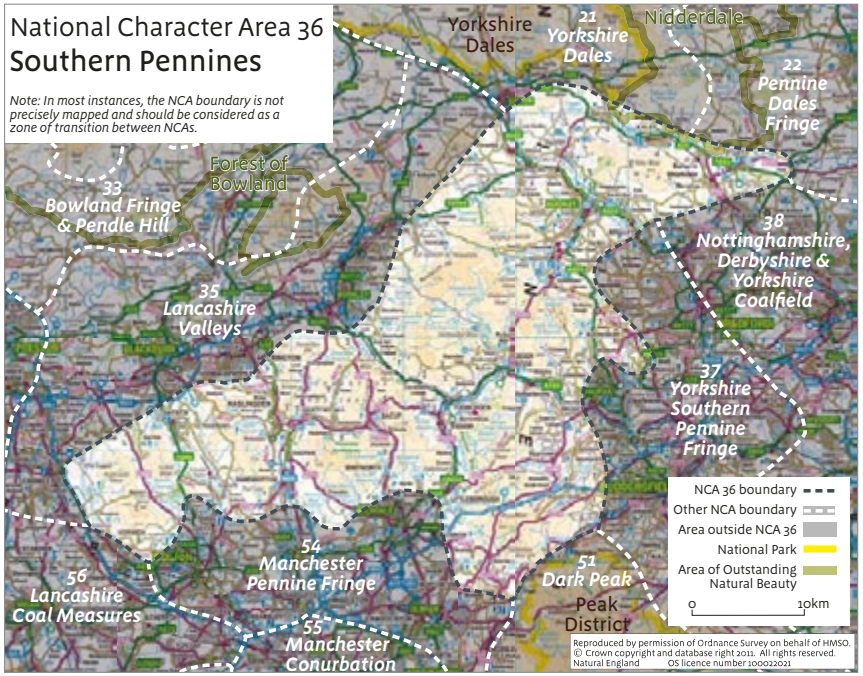
[1] The Natural Choice: Securing the Value of Nature, Defra (2011; URL: www.official-documents.gov.uk/document/cm80/8082/8082.pdf)
[2] Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services, Defra (2011; URL: www.defra.gov.uk/publications/files/pb13583-biodiversity-strategy-2020-111111.pdf)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

Summary

The Southern Pennines are part of the Pennine ridge of hills, lying between the Peak District National Park and the Yorkshire Dales National Park. This is a landscape of large-scale sweeping moorlands, pastures enclosed by drystone walls, and gritstone settlements contained within narrow valleys. The area contains internationally important mosaics of moorland habitats that support rare birds such as merlin, short-eared owl and twite. The peat soils, including blanket bog, store significant volumes of carbon. With its high rainfall and impervious rocks it is an important area for water supply, with many reservoirs supplying water to nearby conurbations. The Southern Pennines are also important for recreation due to the extensive open access areas and footpaths, and the sense of escapism they offer, along with the ease of access from large towns. This dramatic landscape has inspired many, such as the Brontës and Ted Hughes. Future challenges for the area include managing the land to reduce downstream flooding, restore blanket bog and improve water quality, and managing increased recreational demand.

Statements of Environmental Opportunity

- **SEO 1**: Safeguard, manage and enhance the large areas of open, expansive moorland, and the internationally important habitats and species they support, as well as protecting soils and water resources
- **SEO 2**: Manage and enhance the pastoral character of the moorland fringes, lower hills and valleys, with their mosaics of pastures and meadows, and their strong field patterns defined by drystone walls, to improve ecological networks and strengthen landscape character.
- **SEO 3:** Protect the comprehensive range of historic landscape features for their cultural value and the contribution they make to local distinctiveness and sense of identity.
- **SEO 4**: Increase the enjoyment and understanding of the landscape and to experience a sense of escapism and inspiration, while also conserving the qualities of the landscape and its valuable historic and wildlife features.



Click map to enlarge; click again to reduce.

Description

Physical and functional links to other National Character Areas

As much of the National Character Area (NCA) is at high elevation there are long, extensive views in all directions, which create visual links with the conurbations around Manchester and the plains of Lancashire to the west with the extensive conurbations of Yorkshire to the east.

There are also strong physical links with urban areas to the east and west in particular the rivers draining down from higher land, which may result in flooding within the neighbouring NCAs. These rivers also provide strong ecological links from the uplands to the adjacent lowlands.

As a central part of the Pennines and with a high coverage of semi-natural vegetation, the area forms part of important ecological networks with the Peak District to the south and the Yorkshire Dales to the north, as well as having obvious geological connections.

The Southern Pennines provide many services and benefits to the adjacent large populations, not only through the supply of drinking water, flood mitigation and carbon storage, but also through the extensive opportunities for open-air recreation in a dramatic landscape. Its historic development is closely linked to the physical resources available, and the development of the conurbations to the east and west.

Distinct areas

- Central spine of moorland fringed by upland pastures and deeply dissected by narrow valleys.
- Lower, more undulating hills of the West Pennine Moors and Rossendale Hills.
- Wide shallow valleys of the rivers Aire and Wharfe.

The sweeping moorlands and upland pastures contrast with the enclosed valleys with their wooded sides and settlements.

Key characteristics

- Large-scale, open, sweeping landscape with high flat-topped hills providing extensive views, cut into by narrow valleys with wooded sides.
- Mosaics of moorland vegetation on the plateaux, including blanket bog and heathland, supporting internationally important habitats and assemblages of upland birds, invertebrates and breeding waders.
- Enclosed upland pastures and hay meadows enclosed by drystone walls on the hillsides, and narrow valleys with dense gritstone settlements in the valleys, with steep slopes often densely wooded, providing strong contrast with open moorlands.
- Many reservoirs on the moors, supplying drinking water to adjacent towns, wintering and breeding habitats for birds and high quality recreation experiences.
- Medieval villages and smallholdings on the higher shelves of land above the valleys, with small fields and a dense network of lanes and paths.
- Local stone buildings, with stone flags on roofs, bring a high degree of homogeneity to towns, villages, hamlets and farmsteads.
- Rich time depth, from prehistoric features such as carved rocks, to medieval boundary stones, old mineral extraction sites and more recently, mills, factories and non-conformist chapels.
- Historic packhorse routes traversing the moorlands, with more recent road, rail and canal routes located along valleys.
- Prominent features, including Stoodley Pike, Darwen Jubilee Tower, Rivington Pike, wind farms and communications masts, visible from afar.

The moorlands drop down to pastures on terraces and side slopes, with narrow wooded valleys.

Looking towards Rombalds Moor, drystone walls enclosing pastures form strong patterns on the moorland fringes.

The open uplands, seen here with the striking Stoodley Pike monument, contrast with the lower meadows and pastures.

Southern Pennines today

The large-scale, sweeping landscape of exposed upland moorland and pastures contrast strongly with deeply incised valleys with wooded sides. There is widespread and obvious evidence of man's activities throughout history, which gives the area a historic richness but reduces its sense of remote wilderness.

The moorland plateau is dissected by many small, fast-flowing streams, which join to form four main river systems – the Wharfe, Aire, Colne and Calder, which drain eastwards, and two further rivers, the Roch and Irwell, which drain to the west. Most of the valleys are narrow and steep-sided, with woodland on the steepest slopes. The Aire and Wharfe are broader valleys, with pastures and meadows on the more level and fertile valley floors.

Agriculture is largely limited to livestock grazing on upland pastures, with some small-scale dairy farming in the valley bottoms. The field pattern is small fields defined by walls of local gritstone, and in places post and wire fencing. Improved pastures are found on the relatively better-quality land on lower moorland fringes and in the wider valleys and, in places, extensive Parliamentary enclosures have resulted in strong regular patterns of walled fields. Many of the farms hold rights to graze livestock on the moorlands, which they actively exercise.

Over time, farms have carved out pastures from the moorlands, as here with these stone built farmsteads above Cliviger Gorge.

Structures such as pylons are prominent features, visible from long distances.

On higher land, there are extensive areas of semi-natural habitats with the different types of moorland vegetation fluctuating in response to grazing regimes, exposure, hydrology and management. In places, the effects of enclosure, grazing, uncontrolled burning and atmospheric pollution have resulted in vegetation dominated by purple moor grass, mat grass and cotton grass. The core of the area however supports a rich variety of upland habitats, including internationally important blanket bog and upland heathland, which form an intimate mosaic with species-rich flushes and acid grassland. These habitats provide food and shelter for a number of bird species, including merlin, short-eared owl and golden plover.

These upland habitats contrast with the grasslands of the moorland fringes, which are generally under less extensive agricultural management, giving rise to a patchwork of fields, with varied texture and colour. The wetter rushy pastures provide feeding and nesting areas for birds such as lapwing, snipe, redshank and curlew. The remaining species-rich meadows on the valley sides and bottoms offer colourful displays of flowers in spring and early summer, while also providing a valuable food source for the nationally important populations of twite.

Woodland is sparse and generally limited to the steep sides of valleys, where woodlands of beech and sycamore occur along with small areas of conifers. Internationally important upland oak woodlands, primarily associated with wooded cloughs, extend up to the moorland, but some are in poor condition. There are a few 20th-century conifer plantations on higher land, in some instances associated with the reservoirs. The isolated farmsteads on the moorland fringes are often sheltered by copses of trees.

The moorland plateau provides extensive views out over the valleys, and across the plains and conurbations of Manchester and Lancashire and across the conurbations of the wool towns of Yorkshire to the east. This reduces the sense of isolation that is often experienced in other upland moorland locations, but there remains a sense of grandeur and spaciousness on the moorland tops, with big skies and exposure to the elements. Built forms including Stoodley Pike, wind farms, communications masts and pylon lines are prominent features that are visible from long distances. Quarries are largely restricted to moorland fringes, with the exception of the heavily quarried valley at Whitworth.

The Southern Pennines have a rich history, with evidence from prehistory on the moorland tops, medieval boundary stones, and early and late industrialisation. The many weavers' houses with wide windows, for example in the older villages such as Heptonstall and Luddenden located on the shelves of land above the valleys, provide evidence of the early practice of processing wool at home. The fast-flowing streams were used to power corn, wool and cotton mills, and the lime-free water arising from the sandstone was ideal for processing textiles.

The many structures in close proximity to water provide ideal sites for bats, notably Daubenton's, while waterbodies such as mill ponds provide suitable conditions for the vulnerable native crayfish.

The settlements are predominantly built from the local sandstone, with stone flag roofs, in a vernacular style, so that there is strong visual coherence, with many of the settlements making a significant contribution to the overall aesthetic quality of the landscape. Other historic features, notably the many non-conformist chapels, reveal the independent thinking of the people of the area and remain as striking landmarks.

The area is a valuable water catchment area and contains a large number of reservoirs for the supply of water to adjacent conurbations as well as making a substantial contribution both to landscape character and to the attractiveness of the area for visitors. Other attractions include Brontë countryside around Haworth, Hardcastle Crags and the Keighley and Worth Valley Railway.

The landscape through time

The Southern Pennines are formed from the Millstone Grit Group and the Coal Measures, both of Carboniferous age. The hills of the Pennines here dip down relatively gently to the east but are steeper to the west, giving rise to some elevated scarps on the west side.

In the middle of the area, thick, coarse-grained sandstone (gritstone) beds lie horizontally and are separated by softer mudstone and siltstone beds, creating a terraced landscape of flat-topped hills and interlocking escarpments. Between Todmorden and Bacup, the Westphalian-age Coal Measures, a sequence of thin coals, shales and sandstones overlie the Millstone Grit.

The area is cut by numerous faults, giving rise to a complicated pattern of rocks. Cliviger Gorge, a deeply trenched glacial erosion feature, follows the line of a fault. The alternate bedding of hard grit and softer shales gives rise to a number of waterfalls, such as Lumb Falls near Hebden Bridge.

In the south of the area, between Rochdale and Huddersfield, the Pennines are at their narrowest, with crag-capped edges running parallel to the main valleys. Ice melt has deepened these narrow and steep-sided valleys.

To the north-east of the area Rombalds Moor, a distinctive lower ridge of Millstone Grit, is separated by the wide valley of the River Aire, where glacial till occurs along with alluvium. During the last ice age, glacial moraine ridges blocked drainage of the valley, forming a series of glacial lakes, the deposits of which are preserved beneath the alluvium.

Extensive woodland clearance of higher land during the later Neolithic period and the Bronze Age has formed the open peat landscapes of today. Significant evidence can be seen in the nationally significant Neolithic carved rocks of Rombalds Moor and the Mesolithic deposits preserved beneath the peat on Castleshaw Moor.

Terraced housing, mills and roads can be seen contained within the well-wooded Calder Valley.

There is evidence of iron-age settlements, and of a Roman road between Manchester and Ribchester, while during the medieval period a network of packhorse trails was established across the Pennines. Royal hunting forests were established in the Norman period on the slopes above Rossendale,

Hoddlesden and Trawden, which formed the framework for later farmsteads, hamlets and cattle farms (vaccaries).

The combination of fast-flowing streams and soft water quality made the area very suitable for textile production and, based on sheep reared locally, the textile-producing areas grew in prosperity from the 14th century. Farming was often combined with home-based weaving, coal mining and quarrying, while the wooded valley sides were coppiced. More land was enclosed and new, aisled farmhouses and farm buildings were built, while small and irregular fields around settlements developed in the 17th and 18th centuries as weavers' subsistence plots.

The widespread use of local sandstone for building creates a distinctive and unified appearance.

From the 15th century, enclosure on the moorland fringes began, accelerating in the 16th century. In the late 18th century, large-scale division of much of the remaining land was undertaken, some initially for arable cropping, though most was devoted to sheep rearing.

The hard, impervious sandstones created conditions for the construction of large reservoirs, firstly to supply the canals and then to provide drinking water for the expanding conurbations to the east and west. The hard sandstones were also widely used for building farms, barns, walls, factories, terraced houses and chapels. Evidence of coal mining and stone quarrying can be seen on the valley sides, as at Bacup, Haslingden and Cliviger.

The home-based textile industry, with its stone cottages built with large windows to light the looms, was overtaken in the 18th century by rapid industrialisation which concentrated people into the valleys where water-powered fulling and spinning mills were built. This was facilitated by the improvement of the transport infrastructure, with construction of the canals (which opened up trading routes to the Atlantic), followed by railways and road improvements.

By the 19th century, the landscape was dominated by large mill buildings with chimneys and extensive rows of terraces clinging onto the hillsides. Non-conformity was well established, and chapels became a common feature. There was some depopulation of the higher land, some as a result of actions of the early water companies, as reservoirs were built across this area to supply the new mill towns. The decline of the textile industry, following the slump of 1920, left many mills derelict.

Over recent decades, there has been a continuing pressure from development in the area, especially in the east and south, with a large number of barn conversions. Farmsteads continue to be sold off separately from the land, with

consequent changes in curtilages, including the division of adjacent fields into pony paddocks. Many mills have been converted into other uses, including retail and housing. There is demand for space for wind farms, to capture the strong winds on the moorlands. There has been an increase in the area of woodland, and more woodlands have been brought under management, in particular to restock and expand upland oak woodlands.

Farm size remains small and livestock numbers remain high, although they have dropped significantly since 2000. In places, drystone walls are collapsing through lack of maintenance and some intensification of grassland management has occurred.

Historic grazing regimes, coupled with air pollution and artificial drainage, have all had a significant effect on the blanket bog, mire and wet-heath communities of the South Pennines. In many locations, a recent increase in the frequency of moorland burning is associated with a reduction in overall biodiversity. Where this effect has combined with wildfire events, moorland habitats can become overly dominated by single species of flora, such as purple moor grass.

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 NCA is important for producing livestock. Rearing sheep remains the principal industry associated with most agricultural holdings. Livestock numbers remain relatively high, although they have dropped significantly since 2000.

- **Water availability:** This NCA provides a valuable water catchment area for northern England. This is due to the high levels of rainfall in the area and the presence of a large number of reservoirs, including Rivington, Worsthorne, Widdop, Watersheddles, Gorpley and Blackstone Edge, the locations of which are due to a combination of the topography and impervious rock types. The Southern Pennines are the source of many major river systems. These rivers provide a source of freshwater to many neighbouring NCAs.

The high rainfall and impervious rocks create good conditions for reservoirs, which form dramatic and popular features within the landscape.

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

- **Cimate regulation:** The organic peaty soils of the Southern Pennines generally have a high carbon content and are associated with the large expanses of blanket bog and wet-heath habitats. This offers significant climate regulation where the habitats are in good condition. Historical damage to blanket bog habitats, including through air pollution, drainage and burning, has reduced the level of value attached to this service, but large-scale habitat restoration within this NCA offers a significant opportunity to enhance climate change regulation. The small percentage of existing woodland cover also offers limited climate regulation.

- **Regulating soil erosion:** Peatland soils cover the majority of the Southern Pennines. Where peat-rich soils are covered by protective semi-natural vegetation in good condition, the vegetation can protect the soils in such locations, the rate of soil erosion can be relatively low. However, the peaty soils within large areas of this NCA are at risk of gullying / hagging and rapid erosion in locations where the protective vegetation is damaged, highly modified or stressed. This can greatly reduce the value of the service.

- **Regulating water quality:** The ecological status of approximately half the river lengths in this NCA is moderate. This record shows the chemical status to be generally good, although some rivers such as the Aire have failed to achieve good chemical condition. Degraded peatland habitats can lead to a reduction in the value of the potable water resource, with greater water colouration often leading to in creased water treatment costs. The presence of large areas of degraded peatland habitats within this NCA means that there are significant opportunities to increase the value of this service by restoring these degraded peatlands.

The many reservoirs are popular with visitors, as well as providing habitats for wildlife and drinking water for adjacent populations.

- **Regulating water flow:** There is a risk of fluvial flooding along the narrow river valleys in this NCA where settlements have typically developed. There is scope to improve flood mitigation by intercepting and retaining water for longer within key locations in river catchments. In the Southern Pennines, this may be achieved through implementing a combination of good moorland habitat management and selective woodland planting . These measures may reduce the degree of flood risk within this NCA, and mitigate the severity of flood events which occur downstream in adjacent NCAs.

Cultural services (inspiration, education and wellbeing)

- **Sense of place/inspiration:** The dramatic landform of hills and narrow valleys has given rise to a distinctive upland pastoral landscape, with gritstone settlements and a backdrop of woodlands on steep slopes. This landscape combines with a strong cultural background based on the textiles industry to create a strong sense of place. Feelings of escapism and inspiration are often expressed in relation to the open moorlands, with their expansive views and strong sense of isolation and wildness. This landscape has inspired many artists and writers, from the Brontës to Ted Hughes and Simon Armitage.

- **Sense of history:** This is evident in the rich time depth of historic evidence, from prehistoric features on the moorlands, to early agriculture and the industry based within farmsteads and villages on the moorland fringes, later large-scale industrialisation with canals, roads, mills and railways all contained within the narrow valleys. The many historic features, robustly built in local stone, remain, to reveal the many periods of man's activity.

- **Recreation:** There is a remarkably dense network of public rights of way, combined with extensive open access areas, national trails and packhorse routes that cross the hills. There are also many popular spots for visitors, especially some of the reservoirs, Hardcastle Crags and the Brontë country around Haworth.

- **Biodiversity:** The Southern Pennines have one of the highest proportions of nature designations in England, and charismatic species such as twite, curlew and golden plover provide a key attraction to visitors.

The layers of history are always evident in the South Pennines. Here 20th-century pylons cross Todmorden Moor above a farmstead established many centuries ago on the spring line and a 19th-century non-conformist chapel, now converted to residential use.

Statements of Environmental Opportunity

SEO 1: Safeguard, manage and enhance the large areas of open, expansive moorland and the internationally important habitats and species they support, as well as protecting soils and water resources.

For example, by:

- Restoring and improving ecological links between moorland habitats (blanket bog, upland heathland, species-rich flushes and mires), for example through introducing responsive grazing regimes, to improve the condition of the vegetation and achieve a strong and resilient ecological network.
- Restoring degraded areas of blanket bog to active sphagnum-dominated bog to promote peat formation.
- Enhancing the full range of moorland habitats to ensure that they support the internationally important assemblage of bird species, allowing the population size to be maintained and, where possible, increased.
- Retaining water or managing run-off by re-wetting moorland (for example through blocking grips, but in ways that do not adversely impact on archaeological evidence or access) to bring blanket bog back into favourable ecological and hydrological condition.
- Restoring degraded heathland communities dominated by mat grass to dwarf shrub communities, introducing sustainable grazing regimes to avoid poaching of soils and aid water infiltration, and ensuring that burning and cutting programmes will promote structural and biological diversity as well as avoiding loss of peaty soils through erosion or oxidation.
- Preventing and controlling wildfires through a collaborative fire control plan.
- Discouraging works or development that reduce the sense of remoteness and 'wildness' of the moorlands.

SEO 2: Manage and enhance the pastoral character of the moorland fringes, lower hills and valleys, with their mosaics of pastures and meadows and their strong field patterns defined by drystone walls, to improve ecological networks and strengthen landscape character.

For example, by:

- Maintaining pastoral land uses and encouraging more extensive and appropriate grazing management.
- Enhancing moorland fringe habitats, to increase species rich grasslands and scrub with varied hydrology, to enhance plant diversity and in particular to provide feeding and nesting to aid the recovery of the twite population.
- Encouraging the expansion and creation of a more ecologically connected patchwork of grasslands – unimproved pastures, rushy pastures, species-rich pastures and meadows – in particular on the moorland fringes and higher shelves of land.
- Introducing flexibility into land management, including less intensive grazing regimes, to encourage a more diverse range of habitats and vegetation types and structure to develop, thus enabling habitats to respond to climate change effects and allowing species to move into more suitable locations.
- Retaining and restoring historic patterns of drystone walls on the moorland fringes, on upland pastures, around farmsteads and settlements, and along tracks.

SEO 3: Protect the comprehensive range of historic landscape features for their cultural value and the contribution they make to local distinctiveness and sense of identity.

For example, by:

- Retaining and protecting the evidence of past uses of the moorland, in particular the significant prehistoric carved stones on Rombalds Moor and elsewhere, and the early packhorse trails, medieval boundary stones, and navvy villages associated with building the reservoirs.
- Retaining evidence of the historic water management systems and interpreting the history of the water supply for industry, transport and drinking water.
- Ensuring that any restoration or conversion of structures such as mills and bridges takes into account the presence of bats, especially Daubenton's bat, which take advantage of breeding and roosting sites close to water.
- Bringing waterbodies such as mill ponds into sound management to protect local populations of crayfish.
- Maintaining the visible evidence of the historic environment of the moorland fringes and valleys, in particular retaining historic field patterns defined by drystone walls, farmsteads, laithe houses, barns, weavers' cottages, mill buildings, terraced houses, chapels and artefacts associated with canals, mills and factories.
- Retaining the complex settlement pattern that reveals change over time, keeping the contrast between densely populated valleys and the backdrop of woodlands, pastures and moorland.
- Preserving evidence of the particular pattern of miner-farming in the Rossendale Hills including small-holdings and squatter settlements.
- Conserving archaeological features through management including sustainable grazing regimes and scrub clearance.
- Improving access to and interpretation of historic sites and features, to reveal their role in the development of the landscape over time, for the enjoyment and understanding of the public.
- Ensuring that the repair, restoration or conversion of vernacular buildings is carried out with due regard to their historic interest using local sandstones (limestones in the west) with sandstone flags for roofs and using appropriate styles and techniques.

SEO 4: Improve opportunities for the enjoyment and understanding of the landscape and to experience a sense of escapism and inspiration, while also conserving the qualities of the landscape and its valuable historic and wildlife features.

For example, by:

- Maintaining the high level of public access with extensive areas of open access land and the dense network of rights of way, with clear but discreet signposting where necessary.
- Managing visitor pressures and ensuring that paths are adequately surfaced and maintained to prevent undue erosion.
- Improving access to selected areas, in particular to the many reservoirs, to meet the needs of diverse audiences.
- Encouraging more people to visit the distinctive open countryside for quiet enjoyment, using sustainable transport where possible, to enable them to improve health as well as enjoy and understand their surroundings.
- Restoring the historic canal networks and improving access.
- Finding solutions to managing the Pennine Way and Pennine Bridleway to ensure a high-quality experience for all users, while protecting sensitive habitats and vulnerable ground-nesting birds, and controlling illegal activities such as fly-tipping.
- Managing and controlling wildfires, fly-tipping and illegal off-roading through a coordinated approach.
- Providing interpretation of the many geodiversity features of the area, and the role that geology plays in the historic development and land uses in the area.
- Providing interpretation of historic buildings and artefacts to bring out their role in the development of the landscape over time, facilitating access where appropriate.

Additional opportunities

1. Protect the strong relationship between landscape and the underlying geology, the land uses it supports and its significance to the cultural identity of the area.

For example, by:

- Maintaining key views of landform and geological features, and using semi-natural landcover to enhance and support biodiversity but not obscure landform features, such as open moorland with rock outcrops
- Identifying characteristic features of the Carboniferous geology both within and outside designated sites, and keeping important geological exposures visible, such as quarry faces, cuttings, outcrops and stream sections, and, where appropriate, accessible.
- Using local stone for field boundaries and farmsteads so that their relationship to underlying geology is revealed.

2. Manage existing woodlands and extend broadleaved woodland cover in appropriate locations to help deliver climate change mitigation, improve water quality and supply, improve biodiversity, provide biomass, and strengthen landscape character.

For example, by:

- Restoring, expanding and linking existing fragmented areas of broadleaved woodland and wood pasture, especially on valley sides.
- Ensuring that existing woodlands are actively managed to improve carbon sequestration, enhance biodiversity and potentially provide sources of woodfuel, as well as providing new access opportunities where appropriate.
- Encouraging creation of upland woodland and wood pasture on valley sides, in cloughs and gills, to stabilise banks, reduce erosion, capture carbon and increase wildlife value.
- Ensuring that new woodlands are created in suitable locations and include native species that are suitable for the physical location, thus contributing to the biodiversity resource, making the habitats more resilient to climate change, avoiding damage to historic features and strengthening landscape character.

Supporting document 1: Key facts and data

Total area: 119, 715 ha

1. Landscape and nature conservation designations

The Southern Pennines lie between the Peak District and Yorkshire Dales National Parks, and also Nidderdale AONB, but only 0.6 per cent of the NCA falls within these national landscape designations.

Source: Natural England (March 2011)

1.1 Designated nature conservation sites

The NCA includes the following nature conservation designations:

Tier	Designation	Name	Area (ha)	Percentage of NCA
European	Special Protection Area (SPA)	South Pennine Moors Phase 2	20,843	17
	Special Area of Conservation (SAC)	South Pennine Moors Rochdale Canal	20,843 1	17
National	National Nature Reserve (NNR)	None		<1
National	Site of Special Scientific Interest (SSSI)	A total of 15 sites wholly or partly within the NCA	21,027	18

Source: Natural England (March 2011)

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

Extensive stretches of the upland moorlands are designated both Special Protection Areas (SPA) and Special Areas of Conservation (SAC) – 20,843 ha. which represents over 17 per cent of the total area. In addition a small stretch of the Rochdale Canal (1.5 ha) is also designated SAC.

- 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'
- There are 257 Local sites in the Southern Pennines covering 14,161 ha.

1.2 Condition of designated sites

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

SSSI condition category	Area (ha)	Percentage of SSSI in category condition
Favourable	383	2
Unfavourable recovering	17,266	82
Unfavourable no change	2,978	14
Unfavourable declining	377	2

Source: Natural England (March 2011)

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

2. Landform, geology and soils

2.1 Elevation

The NCA is an upland area, with maximum elevation reaching 514 m, but with deep valleys cut into the plateau, so that the range of elevation is 471 m.

Source: Countryside Character Area Description, Southern Pennines Natural Area Profile

2.2 Landform and process

The landform is a plateau deeply dissected by river valleys, often with distinct 'steps' where rivers have cut down below the level of earlier broader valleys, and showing signs of over-deepening by glacial meltwater. Most of these valleys are narrow but the Upper Aire Valley is wider, with some glacial till and moraine.

The rocks dip to the east, resulting in a series of escarpments, steep to the west and sloping away to the east, forming some prominent rocky edges.

Source: Countryside Character Area Description, Southern Pennines Natural Area Profile

2.3 Bedrock geology

The solid geology is dominated by Carboniferous rocks. The Millstone Grit group of Namurian age comprises gritstones, sandstones and coarse grained sandstones formed by ancient river deltas. Between Todmorden and Bacup, Westphalian-age Coal Measures, a sequence of thin coals, shales and sandstones, overlies the Millstone Grit.

The geology of the area is complex as these sedimentary rocks are of widely varying thickness and are cut by many faults.

Coal and ironstone have all been worked from the rocks in the past, as well as stone for building and shales for brick making. Currently the only commercial extraction is of stone for road construction and building.

A breakdown of the solid geology as a proportion of the total land area is:

- 52 per cent sandstones (including gritstones)
- 46 per cent mudstones and siltstones

Source: Countryside Character Area Description, Southern Pennines Natural Area Profile

2.4 Superficial deposits

Drift geology is relatively limited, with some alluvial deposits in the bottom of the narrow valleys and some glacial till and moraines in the larger valleys. The Upper Aire Valley contains the sediments of some glacial lakes, now buried beneath alluvium.

Source: Countryside Character Area Description, Southern Pennines Natural Area Profile

2.5 Designated geological Sites

Natural river sections and man-made exposures in particular, disused quarries, railway and canal cuttings, provide important and accessible sections allowing the interpretation, understanding and continued research into the geodiversity of the NCA.

Tier	Designation	Number
National	Geological Site of Special Scientific Interest (SSSI)	6
National	Mixed Interest SSSIs	1
Local	Local Geological Sites	52

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

Agricultural Land Classification	Area (ha)	Percentage of NCA
Grade 1	0	0
Grade 2	0	0
Grade 3	6,338	5
Grade 4	52,327	44
Grade 5	54,692	46
Non agricultural	1,346	1
Urban	5,011	4

Source: Natural England (2010)

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

3. Key waterbodies and catchments

3.1 Major rivers/canals

The Southern Pennines NCA forms the watershed between rivers running east to the North Sea and west to the Irish Sea and thus has many small, fast-flowing streams feeding in to the upper reaches of several main rivers. In addition there are three significant canals which cross the Pennines.

Name	Length in NCA (km)
River Aire	19
River Calder	21
River Washburn	0.5
River Wharfe	22
River Darwen	0.5
River Irwell	21
River Roch	1
River Worth	11
Rochdale Canal	25
Huddersfield Narrow Canal	9
Leeds and Liverpool Canal	19

Source: Natural England (2010)

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

3.2 Water quality

The total area of Nitrate Vulnerable Zone is 48,772 ha (41 per cent).

Source: Natural England (2010)

3.3 Water Framework Directive

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

4. Trees and woodlands

4.1 Total woodland cover

The NCA contains over 7,514 ha of woodland (6 per cent of the NCA), of which 5,398 ha is broadleaved woodland.

Over 15 per cent of the woodland resource, 1,144 ha, is ancient woodland, including 380 ha of plantations on ancient woodland sites.

Although many of the valley sides are clothed in woodland, giving parts of the NCA a wooded character, overall the NCA has only 46 per cent woodland cover.

The White Rose Community Forest includes the districts of Bradford, Calderdale and Kirklees and thus covers over 55,000 ha of the NCA area (46 per cent of the total NCA area). The Red Rose Community Forest area (central and western Greater Manchester) lies largely to the west, with just 4,131 ha (3 per cent) falling within the westernmost reaches of the NCA.

Source: Natural England (2010), National Inventory of Woodland and Trees, Forestry Commission (2003)

4.2 Distribution and size of woodland and trees in the landscape

Most of the woodland cover within the NCA is found on the steep valley sides, with some copses sheltering the dispersed farmsteads on higher ground.

There are only a few blocks of conifers in this area.

The woodlands found within steep ravines or cloughs, are the small remnants of ancient woodland, which would have once covered much larger areas. These clough woodlands include areas of internationally important upland oak woodland, which are characterised by a mix of tree species including birch, alder, rowan and oak.

Source: Natural England (2010), National Inventory of Woodland and Trees, Forestry Commission (2003)

4.3 Woodland types

A breakdown of the area and type of woodland (over 2 ha) found across the Character Area is detailed below.

Source: Natural England (2010), National Inventory of Woodland and Trees, Forestry Commission (2003)

Woodland type	Area (ha)	Percentage of NCA
Broadleaved	5,398	5
Coniferous	1,294	1
Mixed	427	<1
Other	395	<1
Total	**7,514**	**6**

Source: Forestry Commission (20011)

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

Woodland type	Area (ha)	Percentage of NCA
Ancient semi-natural woodland	764	1
Ancient replanted Woodland (PAWS)	380	<1

Source: Forestry Commission (20011)

5. Boundary features and patterns

5.1 Boundary features

Field boundaries are predominantly drystone walls constructed with local sandstones from the Millstone Grit and the Coal Measure Series or in some localities, limestone. Walled tracks lead from the valley bottoms to the fell tops, giving access to the open moorland for summer grazing.

5.2 Field patterns

There are very few walls on the moorlands, where ownership boundaries are often marked by lines of boundary stones. The upland pastures that fringe the moorlands are bounded by drystone walls and are generally small to medium in size, with localised areas of larger fields in regular geometric patterns dating from the 19th-century enclosures. While boundary walls are sound, internal field boundaries are often in poor condition due to lack of maintenance.

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

6. Agriculture

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

6.1 Farm type

Holdings are predominantly based on upland livestock (940 holdings, 2009) with just 123 involved in dairying. There has been a significant move away from dairying to livestock rearing over the past 10 years.

6.2 Farm size

The number of farm holdings has declined over the past 10 years, in particular those holdings under 20 ha. However farms below 20 ha still represent 57 per cent of all holdings but only 13 per cent of the farmed area (these figures do not include the access that many farms have to common grazing on the moors).

6.3 Farm ownership

Farms are almost equally divided between tenanted or owned farms:

- 2009: Total farm area = 69,068 ha; owned land = 36,491 ha
- 2000: Total farm area = 71,113 ha; owned land = 41,099 ha

6.4 Land use

The land is predominantly permanent grass or long-term leys, for dairy or sheep and cattle rearing, with virtually no arable cropping and a small amount of stock feed.

6.5 Livestock numbers

Numbers of livestock remain relatively high, although they have dropped significantly since 2000. In 2009 there were over 48,000 cattle (down from over 60,000 in 2000), and 285,000 sheep (down from 338,000), with some 5,300 pigs (down from 9,700). The area produces a large number of store cattle and sheep that are then moved to the lowlands for finishing, as well as producing significant numbers of breeding sheep for the lowlands.

6.6 Farm labour

The majority of holdings are run by principal farmers (2301 in 2009), with few salaried managers. The number of full-time workers dropped from 193 in 2000 to 141 in 2009, while the number of part-time workers remained high and at 279 in 2009 was twice as many as full-time. The numbers of casual workers has dropped from 230 to 170.

Source: Agricultural Census, Defra (2010)

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

7. Key habitats and species

7.1 Habitat distribution/coverage

The Southern Pennines NCA supports a range of upland habitats. These include internationally important upland heathland and blanket bog habitats on the fell tops in a habitat mosaic with stretches of purple moor-grass and lowland acidic grasslands. Other more fragmented habitats, in particular pastures and small woodlands, occur on the moorland fringes and in cloughs.

The presence of this habitat mosaic is of major importance in providing suitable conditions for an internationally important assemblage of birds including dunlin, twite, snipe, curlew, wheatear, whinchat, redshank, common sandpiper, ring ouzel and lapwing.

There are large expanses of internationally important blanket bog and upland heathland, often botanically poor and dominated by cottongrass, with Sphagnum mosses being quite rare, primarily as a result of overgrazing, overburning and atmospheric pollution. Where the blanket peats are slightly drier, heather, crowberry and bilberry become more frequent. Upland dry heath, dominated by heather, occupies the lower slopes of the moors on mineral soils or where the peat is thin. In the cloughs, which extend into the heather moorlands, a greater mix of dwarf shrubs can be found together with more lichens and mosses. The heathlands and blanket bogs, in mosaic with smaller habitat features such as upland flushes and fens, and areas of bracken / scrub, support key species including merlin, twite and ring ouzel.

Woodlands occur on the valley sides and in some cloughs and support important assemblages of birds including redstart, pied flycatcher, wood warbler, tree pipit, lesser spotted woodpecker, spotted flycatcher and marsh tit. There are some internationally important upland oak woodlands, dominated by a mixture of tree species including sessile oak, birch and rowan.

The partially restored section of the Rochdale Canal contains important habitats for submerged aquatic plants and emergent vegetation, including extensive colonies of the internationally scarce floating water plantain species (*Luronium natans*). Locally the canal contains the most significant stands of water violet. The site also supports a diverse assemblage of pondweeds, which reflects the quality of the water.

The valley sides and bottoms are used primarily for agricultural production as inbye pastures and meadow land. These support a range of grassland types including wet rushy pastures, and the few surviving unimproved lowland and upland meadows. These habitats provide suitable feeding and nesting habitat for a range of breeding waders including lapwing, curlew, snipe and redshank. The meadows and pastures also provide valuable feeding areas for the rare twite, although colonies are declining.

The many stone structures close to waterbodies, for example mills, factories, bridges, and culverts, provide good sites for populations of bats, especially Daubenton's bat, while several small waterbodies like mill ponds support the vulnerable native crayfish.

Source: Southern Pennines 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 includes the following areas of mapped priority habitats (as mapped by National Inventories (unless stated)) Footnotes denote local/expert interpretation. This will be used to inform future national inventory updates.

Priority habitat	Area (ha)	Percentage of NCA
Blanket bog	28,702	24
Broadleaved woodland (National Inventory of Woodland and Trees)	3,142	3
Upland heathland	1,419	1
Lowland dry acid grassland	721	1
Lowland meadows	773	1
Purple Moor-grass & rush pastures	613	1
Floodplain grazing marsh	99	<1
Lowland calcareous grassland	15	<1
Upland calcareous grassland[1]	88	<1
Upland hay meadows[2]	15	<1
Fens	348	<1
Lowland heath[3]	18	<1
Lowland raised bog	18	<1

Source: Natural England (2011)

Natural England's expert opinion is that is this likely to be: [1] Lowland Calcareous Grassland Priority Habitat; [2] Lowland Meadow Priority Habitat; [3] degraded Blanket Bog/Upland Heathland Priority Habitat

There are also small areas of inland rock / scree and upland swamp and flushes (no data available).

- 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/Species'
- Maps showing locations of S41 are available at: http://data.nbn.org.uk/

8. Settlement and development patterns

8.1 Settlement pattern

The moorlands are unpopulated, whilst there are scattered farmsteads around the moorland fringes.

Older settlements, such as Heptonstall and Luddenden, based on a dual economy of agriculture and the early home-based wool industry, are located on the shelves of land above the valleys but below the higher moorland.

Larger settlements, with terraces for workers, spread along the valleys when transport routes – canals, railways and roads – opened the valleys up and enabled the large-scale industrialisation of the textile industry.

Sources: Country Quality Counts Draft Historic Profile , S Pennines Countryside Character Area description

8.2 Main settlements

The main conurbations all lie outside this NCA, with only Halifax partly included within it. There are extensive areas of unpopulated moorland, with scattered farmsteads around the fringes, and small towns and villages in the valleys. The largest town is Keighley, and others include Ilkley, Hebden Bridge, Todmorden, Littleborough, Ramsbottom and Darwen.

Sources: Country Quality Counts Draft Historic Profile , S Pennines Countryside Character Area description

8.3 Local vernacular and building materials

The use of local hard sandstones which, are very suitable for building, in particular Millstone Grit, in all constructions, from drystone walls and farmsteads to terraced houses and factories, gives a high degree of visual coherence to the appearance of settlements and reveals a close connection with the underlying geology . Historic building traditions include the survival of 15th-century timber-framed houses due to encasing in stone. The laithe house tradition is characteristic for this area from the 17th through to the 19th century. Weavers' houses, with their wide windows especially on the first floor, to let light in for the home-based textile industry, are found in the older settlements. During the 19th century there was an expansion of dairy buildings and construction of some 19th-century model farms and also of striking non-conformist chapels. There is also survival of some early cruck-framed barns to the south of the area. About 60 per cent of historic farm buildings remain unconverted. However, about 92 per cent are intact structurally, showing a positive trend.

Sources: Country Quality Counts Draft Historic Profile , South Pennines Countryside Character Area description

9. Key historic sites and features

9.1 Origin of historic features

- There are widespread Mesolithic deposits for example at Castleshaw Moor and March Hill near Marsden and Neolithic/bronze age upstanding remains in uplands. The frequent occurrence of carved rocks is characteristic, with those on Rombalds and Ilkley Moors of national significance.
- There is some evidence of iron age/Romano-British settlement, including Blackstone Edge Roman road and the probable site of Olicana Fort at Ilkley.
- Boundary stones on the moorlands mark out the boundaries of townships for allocating peat and grazing rights.
- Packhorse routes, such as Blackstone Edge, and bridges indicate trade across the Pennines.
- Drystone wall enclosures are evidence of early enclosure periods and more strikingly, 19th century Parliamentary enclosures.
- Model farms for example at Dobroyd (near Todmorden).
- Distinctive buildings include non-conformist chapels, weavers' cottages in older settlements, followed by mills, factories and chimneys for example at Hebden Bridge, Todmorden.
- More modern historic features include anti-tank blocks on moorland.

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

9.2 Designated historic assets

This NCA has the following historic designations:

- 14 Registered Parks and Gardens covering 377 ha.
- 0 Registered Battlefields.
- 261 Scheduled Monuments.

- 3,823 Listed Buildings

More information is available at the following address:

- http://www.english-heritage.org.uk/caring/heritage-at-risk/

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

Historic designed landscapes are characteristic of the western moorland edges where they provide an important link between the densely populated valleys and the more remote upland. These include Rivington and Lever Park, Bold Venture and Whitehill Parks, and Towneley and Smithills Parks on the edge of the NCA.

The Heritage at Risk register indicates that there are currently 217 designated monuments at risk in the NCA.

10. Recreation and access

10.1 Public access

- A large proportion of the NCA – 38,231 ha (38 per cent of the total area) is Open Access land, indicating its significance as a resource for the enjoyment of the populations of the nearby conurbations.

- There are 4,190 km. of public rights of way within the NCA, giving a density of 3.5 km per km^2, one of the highest densities in the country.

- Two key national trails run north – south through the NCA: the Pennine Way (53 km) and the Pennine Bridleway (120 km).

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)	1,630	1
Common Land	14,361	12
Country parks	1,112	1
CROW Access Land (Section 4 and 16)	38,222	32
CROW Section 15	19,753	16
Village greens	4	<1
Doorstep greens	4	<1
FC Walkers Welcome Grants	1,040	<1
Local Nature Reserves	327	<1
Millennium greens	13	<1
Accessible National Nature Reserves	0	0
Agri-Environment Scheme Access	15	<1
Woods for People	2,042	2

Sources: Natural England compiled data 2011 / Woodland Trust / National Trust / Forestry Commission

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

11. Experiential qualities

11.1 Tranquillity

Based on the CPRE map of tranquillity (2006), the areas of greatest tranquillity are unsurprisingly the moorlands and moorland fringes. The lowest scores for tranquillity are along the valley bottoms, where roads, railways, industry and housing are all squeezed in.

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

Tranquillity	Score
Highest value within NCA	105
Lowest value within NCA	-90
Mean value within NCA	-4

Sources: CPRE (2006)

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

11.2 Intrusion

Intrusion category	1960s (%)	1990s (%)	2007 (%)	Percentage change (1960s-2007)
Disturbed	43	54	70	+64
Undisturbed	54	43	24	-57
Urban	3	3	6	+100

Sources: CPRE (2007)

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

Leeshaw Reservoir, one of the many reservoirs constructed to supply the expanding towns and cities to the east, sits within a pastoral landscape with moorlands on the higher land.

12. Data sources

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

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

Supporting document 2: Landscape change

Recent changes and trends

Over recent decades the Southern Pennines have undergone a number of changes affecting the landscape.

Trees and woodlands

- Results from Countryside Quality Counts for the period 1999 to 2003 indicate that along with an increase in the uptake of woodland grant schemes for the management of established woodlands, there has also been a significant increase in the area of woodlands, with agreements in place to restock and expand upland oak woodlands.

Boundary features

- Over the last few decades drystone walls have tended to be neglected: only 3 per cent had agri-environment agreements in 2003. This was reinforced by the increase in number of part-time farmers, reflecting a reduction of man-power investing in the management and maintenance of landscape features such as field boundaries. The introduction of Environmental Stewardship (ES) in 2005 led to a significant increase in positive environmental management of boundary features. 794km of stonewall are now managed by land managers under ES.

Agriculture

- There has been a decrease in rough grass and an increase in permanent grass up to 2003.
- Grazing pressure has declined, but perhaps not as markedly as in other upland NCAs. Agricultural census data shows that while numbers of livestock are relatively high at present, they have dropped significantly since 2000. In 2009 there were over 48,000 cattle (down from over 60,000 in 2000), and 285,000 sheep (down from 338,000), with some 5,300 pigs (down from 9,700).
- In the 1990s agri-environment scheme uptake was above the national average and included management of upland hay meadows and upland rough grazing, and enhancement of heather moorland. Much work has been done over recent years to bring the SSSI into favourable condition.
- Census data indicates that the number of farm holdings has declined over the past 10 years, particularly farms smaller than 20 ha, although 20 per cent of farms remain under 20 ha in extent (these figures do not include the access that many farms have to common grazing on the moors).
- Local knowledge indicates that more farmers now run their holdings on a part-time basis, holding down other jobs in the nearby conurbations.

The majority of the trends are based upon data and analysis from Countryside Quality Counts assessment 1999-2003 and reported in Tracking Change in the Character of the English Landscape (2007), Natural England. The NCA Facts and data supporting document sets out a wide range of current environmental data and information about the NCA, including links to SSSI condition data.

- Holdings are predominantly based on upland livestock (940 holdings) with just 123 involved in dairying. There has been a trend away from dairying to livestock rearing over the past 10 years.

- In 2009 there were 2,301 principal farmers and few salaried managers (24) and the number of full-time workers had dropped from 193 in 2000 to 141. The number of part-time workers however remained high, and at 279 in 2009 was twice as many as full-time. The numbers of casual workers dropped from 230 to 170.

Settlement and development

- There has been considerable development outside the existing urban fringe, especially at the eastern and southern ends of the NCA. This has detracted from local landscape character where vernacular styles, proportions and materials have not been used.

- There has been an increase in the numbers of people living in the area and commuting to for example Manchester, Rochdale, Halifax, Huddersfield and Leeds, leading to a spread of light and noise impacts. There is also a perceived increase in numbers of visitors, especially to hot spots like Haworth, leading to changes in shops and other facilities.

- Barns and other farm buildings are being converted and curtilages extended, with more paddocks and stables, and the holdings are run on a part-time basis, with a consequent reduction of investment in maintaining the fabric of the landscape.

- There is also a perceived tendency for farmers, often those reaching retirement age, to sell land which is then amalgamated into larger holdings, with a subsequent move towards 'ranching' of livestock. This is supported by the agricultural data which shows a trend towards fewer small farm holdings along with a reduction in overall farmed area.

- Many mills and other buildings have been converted into other uses, including retail and housing, thus avoiding their dereliction or loss. Over recent years there has also been construction of pylons, communications masts and wind farms, often in prominent locations.

- Recently there has been an increase in the number of single wind turbines to supply one farmstead or hamlet, along with an increased interest in alternative energy sources in particular small-scale hydro-electricity, based on the fast flowing streams that once powered mills. Currently there is demand for space for windfarms to capture the strong winds on the moorlands.

Semi-natural habitat

- Overall, the management regimes of moorlands and pastures have changed through a number of increased pressures such as shooting, grazing, recreational access and development. The reduction of man-power is also resulting in less hefted or managed livestock.

- The type of moorland management is a critical factor in the state of moorland habitats; in places poor management, including drainage and burning on short rotations, has had an adverse impact on the biodiversity of blanket bog and wet heath communities. In areas where excessive or unregulated burning has taken place this has led to the dominance of moorland habitats by single species, in particular by purple moor grass.

- Eroded areas of peat are proving difficult to restore due to changing climatic and hydrological conditions as well as their high acidity, a consequence of earlier air pollution.
- Many moorlands are registered commons, which can result in poor land management where consensus cannot be achieved.
- Changes in agricultural practices, in particular since the 1950s, have also led to a reduction in species-rich upland pastures and hay meadows.
- Positive changes to agricultural management (largely funded through restorative agri-environment schemes) have led to 82 per cent of SSSI area now classed as unfavourable recovering.

Historic features

- There were a large number of barn conversions suggesting transformation of historic character of building stock. About 60 per cent of historic farm buildings remained unconverted and about 92 per cent were intact structurally in 2003.
- The Heritage at risk register indicates that there are currently 217 designated monuments at risk in the NCA.

Rivers

- The biological river water quality in 1995 was predominantly poor, but improved to 2003. Over the same period chemical water quality also improved. Many aquatic animals, such as otter and salmon, have been able to return to watercourses due to water quality improvements, although several hydrological barriers remain which do restrict movement.
- By 2009,the Environment Agency Compliance Monitoring suggested that the ecological status of approximately half the river lengths in the NCA has been assessed as 'moderate'; the other half of river lengths have not yet been assessed.
- The chemical condition of approximately six river lengths in the NCA has been assessed as 'good', while approximately three rivers, including the River Aire, have been classed as 'failing to achieve good' chemical condition. Approximately half of the river lengths in the NCA have not been assessed for chemical quality.
- Groundwater quality across this NCA is classed as 'poor'.

Drivers of change

Climate change

Climate change is likely to result in:

- Periods of heavy rain that may result in soil erosion and pollution of watercourses downstream, and possible slope failure and land slippage.
- Periods of heavy rain that may result in flash flooding, pollution of watercourses and erosion of river banks that may affect urban areas and transport infrastructure downstream, particularly in the Irwell, Calder, Aire and Wharfe valleys.
- Possible expansion of arable or energy crops into areas currently under permanent grassland, but also possibility of more meadows replacing pastures at higher altitudes.
- Prolonged periods of drought which are likely to have a very adverse affect on peatland habitats, making them more prone to soil erosion and damage from wildfire events and reducing their wildlife value.

Other key drivers

- There is likely to be an increase in housing numbers particularly in Bradford District where green infrastructure opportunities for incorporating accessible green space, sustainable drainage systems and new habitats, forming corridors linking urban areas with open countryside, will be required.

- The whole of the Southern Pennines uplands have been identified as green infrastructure of strategic importance, while many of the valleys have also been identified as key corridors – for example the Aire, Calder, Colne, Colden Clough, Hardcastle and Luddenden Dean.

- The Airedale Masterplan identifies the Aire Valley around Keighley as an area for economic investment, which could provide opportunities for increasing green infrastructure to maintain the quality of the environment, while Lancashire now has a green infrastructure strategy.

- Continued pressure for development of housing and industry on the fringes of the NCA, especially in Calderdale and Kirklees, and conversion of traditional buildings in open countryside, is anticipated.

- Agri-environment schemes are to be reviewed in 2013. The need for flexibility in land management, to address movement of species and changing habitats, will need to be addressed. There may be opportunities for improvements in the condition of habitats and historic buildings. There is likely to be a continuing high level of interest in agri-environment schemes as they provide important support for small farms on marginal land, but the trend towards 'hobby farming' and diversification is expected to continue.

- There is likely to be pressure for large-scale arable and dairying in the more agriculturally productive parts of the area for example in the Aire and Wharfe valleys.

- The negotiation of appropriate moorland management regimes, to achieve good condition of the vegetation and water quality, including the restoration of bare peat and degraded blanket bog, between the various interests, including game production, livestock and water supply, will remain a key issue.

- Natural England's Upland Vision calls for all eroding peat soils and blanket bog to be stabilised, re-wetted and vegetated, woodlands to be better managed, and woodland cover extended, including wood pasture and scrub.

- Flood risk management will result in changes, as in the relevant Catchment Flood Management Plans some 50 per cent of the area is defined as moderate to high flood risk where the Environment Agency plans to take further action to reduce flood risk. The flood generating potential of the Aire, Calder and Irwell catchments is particularly sensitive to land management issues.

- The current poor performance of the region in terms of recycling and recovery means there is likely to be an increasing need for waste management facilities and landfill capacity.

- There is likely to be continued demand for resources of sand and gravel along the Aire and Wharf valleys and crushed rock from the uplands.

- There is likely to be a continued demand for recreation and access to the open countryside from the urban populations in adjacent areas.

Supporting document 3: Analysis supporting Statements of Environmental Opportunity

The following analysis section focuses on a selection of the key provisioning, regulating and cultural ecosystem goods and services for this NCA. These are underpinned by supporting services such as photosynthesis, nutrient cycling, soil formation and evapo-transpiration. Supporting services perform an essential role in ensuring the availability of all ecosystem services.

Biodiversity and geodiversity are crucial in supporting the full range of ecosystem services provided by this landscape. Wildlife and geologically-rich landscapes are also of cultural value and are included in this section of the analysis. This analysis shows the projected impact of Statements of Environmental Opportunity on the value of nominated ecosystem services within this landscape.

This view up Cragg Vale clearly shows the typical pattern of land cover in the South Pennines, with the stone-built settlement of Mytholmroyd on the valley floor, the woodlands on the steep side slopes and the pastures and moorland on the plateau above.

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
SEO1: Safeguard, manage and enhance the large areas of open, expansive moorland and the internationally important habitats and species they support, as well as protecting soils and water resources.	↗ **	↔ **	↑ **	○	○	↑ **	↑ **	↗ **	↑ ***	↑ ***	↗ *	↗ *	n/a	↑ *	↑ ***	↔ *	↗ *	↑ ***	↔ *
SEO2: Manage and enhance the pastoral character of the moorland fringes, lower hills and valleys, with their mosaics of pastures and meadows and their strong field patterns defined by drystone walls, to improve ecological networks and strengthen landscape character.	↗ *	↔ *	↔ *	↔ *	○	↗ *	↗ **	↗ *	↔ *	↗ *	↗ **	↗ *	n/a	↑ *	↗ *	↔	↗ *	↑ ***	↔ *
SEO3: Protect the comprehensive range of historic landscape features for their cultural value and the contribution they make to local distinctiveness and sense of identity.	↔ *	↔ **	↔ **	↔ **	↔ **	↔ **	↔ **	↔ **	↔ **	↔ **	↔ **	↔ **	n/a	↑ *	↑ ***	↗ *	↗ *	↔ **	↔ **
SEO4: Improve opportunities for the enjoyment and understanding of the landscape and to experience a sense of escapism and inspiration, while also conserving the qualities of the landscape and its valuable historic and wildlife features.	↔ *	↔ *	↔ *	↔ *	↔ *	↘ *	↔ *	↔ *	↔ *	↙ *	↔ *	↔ *	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 sweeping landform with an open character formed of high altitude gritstone moors, contrasting strongly with deeply dissected wooded valleys, particularly in the central area.	■ Part of the Pennine spine, with maximum elevation over 500 m, but range of elevation of 471 m. ■ Clear evidence of underlying geology and its contribution to subsequent land use and development, in particular building stone, with geodiversity revealed through both natural features and quarries.
Valuable mosaics of habitats on the open moorland, including blanket bog, species-rich acidic flushes and mires, wet and dry heaths, acid grasslands, contrasting with pastures managed to varying intensities on the moorland fringes, with wooded cloughs and broadleaved woodland on steeper valley sides.	■ Extensive stretches of moorlands are designated both Special Protection Area (SPA) and Special Area of Conservation (SAC), encompassing over 17 per cent of total area. Moorland habitats include blanket bog, wet and dry heath, flushes and acidic grassland, supporting a range of species including merlin, curlew, peregrine, golden plover, hen harrier, short eared owl and lapwing, and the vulnerable twite colonies. ■ 15 Sites of Special Scientific Interest (SSSI) covering 21,000 ha, include cloughs, quarries, woodlands and pastures, as well as the moorland habitats. ■ Upland pastures divided by drystone walls, creating strong visual character as well as evidence of past enclosure. ■ Mosaics of grasslands provide texture and colour as well as biodiversity resource. ■ Woodlands provide strong visual backdrops, and assist with absorbing the scattered farmsteads / hamlets / other development into the valley landscapes.
Reservoirs to supply adjacent conurbations are frequent through the moorland area and contribute to strong and distinctive character of these moorlands.	■ The narrow valleys in impervious gritstone providing good sites for catching and holding water, with 22 reservoirs in central area alone, giving it a distinctive character. ■ The reservoirs are often popular focal points for recreation – walking, fishing, riding, biking and quiet enjoyment.

Landscape attribute	Justification for selection
Rich time depth, with historic evidence from all periods, including prehistoric features on moorlands, packhorse trails across moors, weavers' cottages, chapels and mills are evident throughout. Major industrial buildings are often significant landmarks in valleys.	■ Internationally important concentrations of carved prehistoric rocks on Ilkley and Rombalds moors. ■ 261 scheduled monuments and 3,823 listed buildings, which cover the historic activity through time, from prehistoric rocks to early industrial buildings to large scale industrial and related buildings such as chapels of 19th century.
Settlement pattern reveals historic development, with prehistoric carved rocks, evidence of early boundaries and tracks on the moors, older villages and farmsteads based on agriculture and early wool industry on higher shelves of land, and more recent settlement confined largely to valley bottoms; dense settlements of gritstone buildings often extend up the valley sides, with complex mix of housing, factories, mills, chapels, roads, railways and canals.	■ 261 scheduled monuments, including many carved rocks on Rombalds Moor of international significance. ■ Medieval boundary stones marking out township rights on moorlands. ■ Home weaving industry revealed through typical houses with wide windows to light the looms. ■ Stone-built settlements like Heptonstall visually prominent on higher shelves. ■ Large mills with chimneys act as focal points in valleys. ■ High number (3,823) of listed buildings, including non-conformist chapels. ■ Robust architecture of canals, reservoirs, mills very evident.
Striking visual continuity, through extensive use of local building materials with sandstone flags on roofs, creating a high degree of visual unity to towns, villages and farmsteads; also fields are bounded by drystone walls which form strong patterns in places.	■ Patterns of walls particularly strong on higher shelves of land where upland pastures fringe the moorland. ■ Building materials sourced locally. ■ Visual coherence arising from widespread use of local sandstones for building and roofing.
Extensive views from elevated locations.	■ Extensive views out, and also views in, often punctuated by key features such as Stoodley Pike, communications masts, windfarms.

Landscape attribute	Justification for selection
Extensive network of public rights of way enabling access to and enjoyment of the many natural and cultural features of the landscape.	■ Two key national trails run through – Pennine Way, Pennine Bridleway – as well as a number of local routes for example Brontë Way. ■ Very high density of footpaths – 3.5 km per km^2. ■ Relatively high levels of tranquillity especially on moorlands and moorland fringes. ■ Wide distribution of historic features from all periods. ■ Reservoirs attract day visitors for walking, fishing, biking, riding and quiet enjoyment. ■ Some focal points of visitor interest notably Haworth and Top Withens (Brontë connections), Stoodley Pike, Hebden Bridge and Hardcastle Crags.
Woodlands clothe steeper slopes of valley sides.	■ Woodland covers only 4 per cent of area and is generally contained within valleys but provides a strong backdrop to activity within the valleys. ■ Over 70 per cent is broadleaved, and about 15 per cent is ancient woodland.
Clear and evident connections between underlying geology and subsequent historical development and land uses.	■ Strong landform, with outcrops and quarries revealing underlying stone. ■ Clear and visible historical evidence of development through all periods.

Landscape opportunities

- Protect open moorland and extensive views.
- Protect contrasts between enclosed, wooded valleys and open moorland and upland pastures.
- Protect clear links between land use and underlying geology.
- Protect archaeological evidence, including carved rocks and historic features including vernacular architecture, drystone walls.
- Protect the unity of building materials and styles.
- Protect the mosaics of moorland habitats.
- Protect the strong network of public rights of ways, linking key landscape features.
- Protect and manage existing woodland.
- Manage existing species-rich pastures and meadows.
- Manage moorland habitats, to enhance biodiversity and create and extend mosaics of habitats to support key species of international significance.
- Manage the restoration of drystone walling.
- Manage access to protect sensitive sites, avoid impacting on sense of remoteness and provide quiet enjoyment and recreation opportunities for a wide range of users.
- Interpret the landscape and the surviving historic evidence from all periods.
- Manage the extensive archaeological evidence and historic sites.
- Plan improvements in moorland management to restore peat, create habitat mosaics and enhance biodiversity.
- Plan for a significant increase in woodland on steep valley sides, up cloughs and on suitable sites in areas of upland pastures and moorland fringes.
- Plan an increase in variation in management of upland pastures, to achieve diversity of fields (including textures, colours, biodiversity and other aspects that contribute to landscape character) along with more suitable feeding and nesting sites for twite and breeding waders, and introduce management regimes to restore and support species-rich pastures / meadows.
- Plan the interpretation of the upland landscape, the water supply processes, land management practices and cultural heritage for improved understanding and enjoyment. Building restorations, conversions and new build to be sympathetic with local styles and materials.

Ecosystem service analysis

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

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

Service	Assets/ attributes: main contributors to service	Main beneficiary	State	Analysis	Opportunities	Principal services offered by opportunities
Food provision	Sustainable livestock production systems	Regional	This is an important area for rearing livestock, but soils are poor and there is little opportunity for arable crops due to, climate, topography, altitude and slopes; 90 per cent of the land is Agricultural Grade 4 or 5.	Livestock production systems prevail over the majority of this NCA and have strong association with the area's cultural services. In many locations well managed livestock production systems have the potential to increase the overall food provision of this NCA whilst benefiting many of the other key ecosystem services that the South Pennines support. Inappropriate stocking regimes, with insufficient stock management (and stockhusbandry) may have a significant detrimental effect on many key environmental services including biodiversity, soil erosion, water quality and climate regulation.	Work with the local farming community to consider how to increase the overall carrying capacity of livestock within the South Pennines and where it could be achieved while avoiding adverse impacts on other services.	**Food provision** **Biodiversity** **Climate regulation** **Regulating soil erosion**

Service	Assets/ attributes: main contributors to service	Main beneficiary	State	Analysis	Opportunities	Principal services offered by opportunities
Timber provision	Existing woodland	Local	There is only 6.3 per cent woodland cover, and much of this broadleaved and on steep valley sides, so there is limited timber production other than for local use.	Most of the woodland is on steep valley sides or in cloughs. With much of the land used for livestock rearing and sporting interests, there are limited places for woodland creation. There is only a limited forestry industry in the area.	There iscope for woodland creation on some slopes, but this needs to avoid peat areas and avoid impacting on habitats suitable for twite or other sites of biodiversity value. Also need to ensure that new woodlands are created where they sit well with landscape, biodiversity and historic environment interests.	**Timber provision** **Regulating water flow** **Climate regulation**
Biomass energy	Existing woodland	Local	The existing woodland cover (7,514 ha / 6.3 per cent of the NCA) offers limited potential for the provision of biomass through bringing unmanaged woodland under management. There is generally a low potential yield for short rotation coppice, and medium potential yields for miscanthus throughout the NCA. For information on the potential landscape impacts of biomass plantings within the NCA, refer to the tables on the Natural England website[4].	There would be limited suitable locations for new biomass plantings. However, more could be done to improve outputs from existing woodlands.	Ensure that existing woodlands are managed to produce surplus timber which could be used to provide local sources of environmentally sustainable fuel for example for wood fired boilers.	**Biomass energy**

[4] http://www.naturalengland.org.uk/ourwork/farming/funding/ecs/sitings/areas/036.aspx

Service	Assets/ attributes: main contributors to service	Main beneficiary	State	Analysis	Opportunities	Principal services offered by opportunities
Water availability	Upland streams Blanket bog High levels of precipitation Impervious geology (allowing for reservoir construction)	National	This NCA is a valuable drinking water catchment area and contains a large number of reservoirs, such as Rivington, Blackstone Edge, Widdop, Watersheddles, Gorpley and Withens Clough that provide drinking water to adjacent conurbations. The headwaters of many rivers including the Irwell, Calder and Colne arise in this NCA, and the rivers Aire and Wharfe pass through in the north-east. Many fast-flowing streams drain the moorland plateau, cutting steeply inclined ravines into the surrounding hills. There is water available for abstraction throughout the majority of the NCA area; however, there is no water available from the rivers Worth[5] or Wharfe[6] in the north-east of the NCA, or from the rivers Roach or Croal in the south-west of the NCA[7]. There are no significant groundwater sources in this NCA.	High rainfall combined with impervious rocks suitable for reservoir construction make the area hugely important for providing clean drinking water for adjacent conurbations as well as for industrial processes. Water is also needed to supply the canals; the Leeds and Liverpool Canal passes through the Aire Valley, and the Rochdale Canal through the Calder Valley. Land management practices are key to improving infiltration and storing surface water.	Seek opportunities to block moorland grips, to increase holding capacity of the moorland soils Ensure that moorland habitats, especially blanket bog, are well vegetated and under good environmental management, increasing the capacity of habitats to retain water.	**Water availability** **Regulating water quality** **Biodiversity**

[5] Environment Agency, Aire and Calder Catchment Abstraction Management Strategy, May 2007.
[6] Environment Agency, Wharfe and Lower Ouse Catchment Abstraction Management Strategy, March 2005.
[7] Environment Agency, Northern Manchester Catchment Abstraction Management Strategy, May 2007.

Service	Assets/ attributes: main contributors to service	Main beneficiary	State	Analysis	Opportunities	Principal services offered by opportunities
Climate regulation	Upland peaty soils and organic soils Existing woodland	National	Significant climate regulation is provided by the upland peaty soils in this NCA, which generally have a carbon content of 20-50 per cent, with particularly high levels of carbon storage associated with the large expanse of blanket bog (25,000 ha) and the highly organic soils which prevail across vast areas of moorland[8]. However, in some areas the freely draining slightly acid loamy soils which cover 22 per cent of the NCA[9] can be low in organic matter in part due to prolonged periods of arable cultivation. The existing woodlands perform a role in the sequestration and storage of carbon, however this is limited due to the low woodland cover of 4.5 per cent.	Much importance is attached to conserving the peat-based soils of the South Pennines due to the significant volumes of green-house gases stored within them. Bare and eroded areas of peat need to be re-vegetated and management to protect and expand areas of active blanket bog should be put in place. In addition, any activities that might damage peaty soils should be avoided for example, creating tracks, planting trees, soil compaction and unsustainable burning regimes. On free draining slightly acid soils, measures could be taken to improve carbon sequestration by increasing organic matter inputs and by reducing the frequency/extent of cultivation although cropping is limited in its extent. **continued on next page...**	Ensure that all areas of blanket bog are under good environmental management which improves the habitat's ability to actively sequestrate CO2 from the atmosphere, while retaining significant volumes of green house gases in storage. Prioritise the restoration of bare and eroded peatland habitats. Encourage sustainable grazing regimes on permanent pasture with a low-input of artificial fertiliser. Create new woodland where this sits well alongside landscape, biodiversity or historic environment interests. Seek opportunities to extend areas of floodplain, introducing permanent grassland and wet pastures.	**Climate regulation** **Regulating water quality** **Regulating water flow** **Biodiversity** **Regulating soil quality**

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

[9] Soils Data © Cranfield University (NSRI) and for the Controller of HMSO 2011.

Service	Assets/ attributes: main contributors to service	Main beneficiary	State	Analysis	Opportunities	Principal services offered by opportunities
Climate regulation (cont')				**...continued from previous page.** It is important to ensure that the existing woodlands are in good management so that their role in sequestering and storing carbon is enhanced. The area of woodland cover could be expanded where appropriate. Areas of wetland could be expanded, but opportunities are likely to be limited because valleys tend to be narrow and built up.		

Service	Assets/ attributes: main contributors to service	Main beneficiary	State	Analysis	Opportunities	Principal services offered by opportunities
Regulating soil erosion	Very acid upland soils with a peaty surface and low permeability including blanket bog cover very extensive areas (44 per cent of the NCA). Freely draining slightly acid sandy soils	Regional	The peaty plateau soils are at risk of gullying/ hagging (and loss of particulate organic matter) where surface vegetation is damaged or lost and from surface run-off and can be affected by wind erosion where the soil is bare. The blanket bog soils are also vulnerable to occasional mass flow events. Drainage of these soils (for example through gripping) may also result in increased oxidation of carbon and soil wastage. Also at risk of erosion are the freely draining slightly acid sandy soils especially on moderately or steeply sloping ground where cultivated or bare soil is exposed. This will be exacerbated where organic matter levels are low after continuous arable cultivation or where soils are compacted.	Critical issues in this NCA include ensuring that the peaty soils retain water in situ, have good vegetative cover and are not overgrazed, unsustainably burned/ subject to trampling / poaching or damage by mechanised activities. Risks arise with sandy soils on steep slopes, which are vulnerable to rapid run-off during storm events, but these are limited in extent. There is also need to address risks of poaching and compaction on soils with impeded drainage.	Take steps to restore bare and eroded peat. Manage the moorlands to ensure good vegetative cover and reduce run-off rates by restoring the hydrology and ecology of peatland habitats. Seek opportunities to establish permanent grassland and woodland along cloughs, steep valley sides and near watercourses. Manage pastures in ways that build up organic matter and avoid compaction, for example by reducing grazing pressures.	**Regulating soil erosion** **Regulating water quality** **Regulating water flow** **Regulating soil quality** **Biodiversity** **Climate regulation**

Service	Assets/ attributes: main contributors to service	Main beneficiary	State	Analysis	Opportunities	Principal services offered by opportunities
Regulating soil quality	Slowly permeable wet very acid upland soils (26 per cent of NCA) and blanket bog (saturated soils) (18 per cent) Freely draining slightly acid loamy soils (22 per cent) Slowly permeable wet acid loamy and clayey soils (14 per cent) Very acid loamy upland soils with wet peaty surface (13 per cent)	Local	The slowly permeable wet very acid upland soils with a peaty surface and the blanket bog peat soils contain significant volumes of organic matter. This is retained where extensive grazing and sustainable burning regimes are in place. However, these soils. are at risk of losing their organic matter through a combination of unsustainable management practices, climate change and soil erosion. The freely draining slightly acid loamy soils have potential to increase soil organic matter content if managed correctly. The slowly permeable seasonally wet acid loamy and clayey soils have poor water infiltration. These soils are easily damaged when wet.	For the wet and peaty soils, measures should be centred on those which can restore the natural hydrology of peatland habitats (this may increase water retention in some locations and mitigate the severity of flood events) and ensure good vegetative cover. Adjusting management of the freely draining soils to encourage the build up of organic matter will also improve overall soil structure and aid water infiltration. It is important to minimise compaction and / or capping risk on wet soils, which can arise from over-grazing, trafficking or other mechanised activities. These will tend to exacerbate run-off problems as well as damage soil structure. These soils may have limited potential for increasing organic matter levels by management interventions.	Manage moorland habitats to safeguard the carbon-rich soil and encourage peat-forming plants. Ensure that the management of the pastures and meadows on the moorland fringes will encourage the build up of organic matter through for instance extensive grazing regimes, which will also reduce the level of poaching by livestock. Avoid carrying out mechanised activities such as trafficking that will cause compaction of soils, especially in wet conditions.	**Regulating soil quality** **Regulating water quality** **Climate regulation** **Regulating water flow** **Regulating soil erosion**

Service	Assets/ attributes: main contributors to service	Main beneficiary	State	Analysis	Opportunities	Principal services offered by opportunities
Regulating water quality	Many fast-flowing streams and rivers Extensive areas of semi-natural habitats including moorland, rough grazing and woodland Area of high precipitation	Regional	Vegetated wet peat helps regulate water quality preventing oxidation of bare peat that causes the peat to become less stable and liable to erosion effecting water quality in rivers and causing discolouration of water. The ecological status of approximately half the river lengths in the NCA has been assessed as 'moderate'; the other half of river lengths has not yet been assessed.[10] The chemical condition of approximately six river lengths in the NCA has been assessed as 'good', while approximately three rivers, including the River Aire, has been classed as 'failing to achieve good' chemical condition. Approximately half of the river lengths in the NCA have not been assessed for chemical quality.[11] Groundwater quality across this NCA is classed as 'poor'.[12]	Steep watercourses result in high levels of run-off, especially after heavy rainfall, with consequent impacts of erosion and increased sediment load on areas downstream. Degradation of peat is causing water colouration issues, which water supply companies have to treat before the water enters the supply.	Re-vegetate all bare peat and improve the management of degraded peatland habitats, managing existing moorland vegetation to enhance its biological condition, reducing the degree of water colouration within associated watercourses. Establish permanent grassland (non-invasive) scrub and woodland along cloughs, steep valley sides and near watercourses.	**Regulating water quality** **Regulating soil erosion** **Regulating water flow**

[10] Environment Agency, Compliance Monitoring, January 2009.
[11] ibid.
[12] ibid.

Service	Assets/ attributes: main contributors to service	Main beneficiary	State	Analysis	Opportunities	Principal services offered by opportunities
Regulating water flow	Many of England's major river systems have their source in the uplands within this NCA, flowing both eastwards and westwards	Regional	There is a risk of fluvial flooding along the narrow river valleys in this NCA where settlements have typically developed. The towns in the Rossendale Valley in the west of the NCA have developed in narrow, steep-sided valleys of the River Irwell and its tributaries and have a long history of flooding from the river. Up to 1,000 properties are at risk of flooding in Rawtenstall, and Ramsbottom has a history of flooding (a defence built in 2000 currently protects 115 low-lying properties. Small settlements like Strongstry, Chatterton, Stubbins and Irwell Vale generally have little protection from floods. There are many culverts on the river, some of which are collapsing or have low flood capacity. Build-up of gravel and debris in the river might increase flood risk and gravel removal has been undertaken historically. Approximately 650 properties are at risk of flooding and by 2100 climate change is expected to increase this figure to 1,000 properties.[13] **continued on next page...**	Improving the management and control of flood waters in this NCA will benefit the many urban areas and settlements downstream in other NCAs. Much can be done to address moorland and upland pasture management, but scope for increasing floodplain capacity or creating wetlands in the narrow built up valleys are limited. Improved management and control of flood waters in this NCA will benefit the many urban areas and settlements downstream, in other NCAs. Much can be done to address moorland and upland pasture management, but scope for increasing floodplains or creating wetlands adjacent to watercourses within the valleys is very limited, as they are generally so narrow and built up.	Slow down run-off from the moorlands by blocking grips and increasing the storage capacity of the soils by raising water table levels. Seek opportunities to expand areas of wetland habitats including blanket bog on the moors and reedbeds and wet pastures along valley bottoms. Seek opportunities which allow rivers to follow natural courses and reengage with their floodplains Seek opportunities that allow rivers to follow natural courses and reengage with their floodplains.	**Regulating water flow** **Regulating soil erosion** **Regulating water quality** **Water availability**

[13] Environment Agency, Irwell Catchment Flood Management Plan, Summary Report, December 2009.

Service	Assets/ attributes: main contributors to service	Main beneficiary	State	Analysis	Opportunities	Principal services offered by opportunities
Regulating water flow (cont')			**...continued from previous page.** Settlements and properties along other river valleys in the NCA are similarly at risk of flooding, such as the town of Keighley which is at risk of flooding from the River Aire.[14]			
Pollination	Extensive semi-natural habitats cover over 27,000 ha (20 per cent) of this NCA	Local	Blanket bog, heathland, meadows and species-rich grasslands provide nectar sources for pollinating insects.	There is a need to ensure such habitats are in good condition and look for ways to expand them.	Seek opportunities to expand areas of species-rich grassland on the moorland fringes and within valleys; also road verge management and small sites within villages.	**Pollination** **Food provision** **Biodiversity**

[14] Environment Agency, Flood Map, 2010.

Service	Assets/ attributes: main contributors to service	Main beneficiary	State	Analysis	Opportunities	Principal services offered by opportunities
Sense of place/ inspiration	Open and expansive moorland landscape Strong patterns of upland pastures Contrasts with enclosed narrow valleys with wooded sides Mills, farmsteads, villages and drystone walls all built of local gritstone Time depth of evident historic interest	National/ Regional	The unique sense of place of this NCA is defined by its strong landform with large scale, open and expansive upland landscape contrasting with moorland fringes of pastures, narrow valleys with wooded sides, mill towns and villages. The majority of the holdings are small and worked on a part-time basis, which is reflected in small fields defined by stone walls. The distinctive moorlands support over 25,000 ha of blanket bog and other upland habitats including upland heathland, purple moor grass and rush pastures. There are also lowland meadows. Much is managed by livestock grazing (with extensive areas of common land) and in some places recreational shooting. There is a wealth of historic features from prehistory through medieval times and later industrial times, with many artefacts and a strong settlement pattern, all of which have drawn on the availability of water and raw materials. **Continued on next page...**	The Southern Pennines have a very strong and distinct landscape character, one that is close in quality to the National Parks to the north and south, with more evident historical features from the industrial period. The area is very popular with the many residents of adjacent conurbations for recreation and relaxation.	There is scope to protect the contrasts between open expansive moorlands, walled pastures of the moorland fringes, and enclosed wooded valleys. Opportunities exist to retain and restore patterns of drystone walls and the vernacular architecture of farmsteads and field barns. There are opportunities to ensure that development respects local settlement patterns and building materials, and to avoid the loss of historic evidence through insensitive development. There is scope to support upland farming that underpins the land use of the area.	**Sense of place/ inspiration** **Recreation** **Sense of history**

Service	Assets/ attributes: main contributors to service	Main beneficiary	State	Analysis	Opportunities	Principal services offered by opportunities
Sense of place/ inspiration (cont')			**...continued from previous page.** There are also over 3,000 ha of broadleaved woodland, mostly upland oak and ash; although cover is relatively low, the woodlands form important backcloths and focal points. Feelings of inspiration and escapism are likely to be associated with the long distance, panoramic views from exposed upland moors and pasture across the valleys, plains of Lancashire and the woollen towns of Yorkshire[16]. The open moorlands with the dramatic crags, the pastures and the deeply cut valleys are also inspiring, with the presence of birds such as curlew, snipe, golden plover, redshank, lapwing and twite (the 'Pennine finch') contributing to the experience as well as to the wildlife richness of the area. In places however the sense of isolation and wilderness is affected by more recent construction of larger structures. These moorlands were the dramatic setting and inspiration for the work of the Brontë family, with Top Withens supposedly featuring in Charlotte Brontë's 'Wuthering Heights', while the NCA also has literary links to Ted Hughes and Simon Armitage.			

Service	Assets/ attributes: main contributors to service	Main beneficiary	State	Analysis	Opportunities	Principal services offered by opportunities
Sense of history	Prehistoric features on the moorlands Medieval settlements, farmsteads Early weavers' cottages, small-scale industrial artefacts and strong patterns of drystone walls Industrial heritage revealed through mills, canals and factories Striking architecture of Victorian reservoirs **Continued on next page...**	Regional	A sense of history is evident in the area's strong industrial past of textiles, engineering and manufacturing, resulting in a densely settled landscape concentrated within the valleys, especially at nodal points of valley junctions, spreading up valley slopes in some locations. Many buildings are constructed in characteristic local gritstone with slate roofs. There is evidence of local quarrying and reservoir construction, which contrast with pre-industrial development such as older settlements and farmsteads on the moorland fringe. There is an abundance of prehistoric settlement sites on the open moors and moorland fringe with enclosed and unenclosed farmsteads, ring cairns, bowl barrows, small, irregular medieval fields surrounded by stone walls, strip lynchets and linking ancient routeways[15]. **Continued on next page...**	This area is well known for its many layers of visible history, resulting in a range of structures and features. The main emphasis will be on protecting features, but also on interpreting them to a wider public audience.	There are opportunities to protect, manage and interpret the many layers of historic evidence. There are also opportunities to ensure that the restoration of vernacular buildings is carried out using local styles and appropriate materials, and that land management practices and developments such as tracks do not damage archaeological evidence or historic features. There are many opportunities to use the network of paths to gain access to, reveal and interpret the area's rich history.	**Sense of history** **Sense of place/ inspiration** **Recreation**

[15] Further supported by the above and by the research 'Capturing the cultural services and experiential qualities of landscape'(2009), Research Box, Land Use Consultants and Rick Minter for Natural England NECR024

Service	Assets/ attributes: main contributors to service	Main beneficiary	State	Analysis	Opportunities	Principal services offered by opportunities
Sense of history (cont')	**...continued from previous page.** Unity to all structures through widespread use of local building materials		**...continued from previous page.** Aspects of history that are likely to be particularly evident to the general public are the strong gritstone architecture of the textile mills and weavers' cottages linked by walkways and stone steps, which remain as significant landmarks and focal points alongside historic canals, including the Rochdale and Leeds-Liverpool canals. On the moors, historic packhorse trails crossing moorland tops are still evident and form part of well-used trails, while on the moorland fringes, strong patterns are created by the drystone walls that enclose the fields. The Victorian dams of the numerous reservoirs on the impermeable uplands contribute to a strong visible sense of history as does the widely visible Stoodley Pike monument.			

Service	Assets/ attributes: main contributors to service	Main beneficiary	State	Analysis	Opportunities	Principal services offered by opportunities
Tranquillity	Expansive moorlands with a sense of remoteness Open spaces and stretches of open water Secluded and quiet cloughs and valleys	Regional	The area has experienced a significant decline in tranquillity since the 1960s. Undisturbed areas have decreased from 55 per cent in the 1960s to 24 per cent in 2007[16]. Small remaining areas of tranquillity are in the central north and to the west. Characteristics of the landscape that are particularly important in conveying a sense of tranquillity are the wooded valley sides or "cloughs", the rivers and canals of the NCA, and the areas of exposed open moorland with expansive views; although these views have been eroded by intrusive structures.	Despite the reduction in tranquil areas, the upland strip is extremely important in providing open spaces and an experience of wild moorlands for the many people living in the adjacent conurbations. Although recent development has occurred in the valleys, there remain many quiet and secluded cloughs.	There are opportunities to retain the sense of remoteness and wildness in the moorlands and moorland fringes by protecting them from inappropriate development.	**Tranquillity** **Sense of place/ inspiration**

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Service	Assets/ attributes: main contributors to service	Main beneficiary	State	Analysis	Opportunities	Principal services offered by opportunities
Recreation	Network of footpaths (3.5km. per km^2) Open access land (38 per cent of the area) The Pennine Way and the Pennine Bridleway Local trails and country parks	Regional	The area offers an extensive network of rights of way totalling 4,190km reflecting the historic nature of development of this landscape and giving good access to valleys and moorland fringes. Some of these now form local trails such as the Brontë Way and Calderdale Way. There is also a significant amount of open access land covering 38,230 ha. In addition, 20km of the Pennine Bridleway National Trail and 53 km of the Pennine Way National Trail run through the NCA. The area also offers recreational opportunities in the form of country parks at lower elevations, developed near reservoirs for example at Lever Park, Jumbles and Ogden.	There are many access opportunities here meeting the needs and interests of the large urban populations in adjacent areas, and with easy access by road, rail and bus. There is still scope to improve the provision of a range of recreational opportunities and to provide interpretation of the many elements of the landscape.	Explore opportunities to improve access by ensuring that paths are maintained and well signposted and that some surfaced paths are provided for use by all levels of ability and interest at key locations, for example at selected reservoirs. Seek opportunities to provide interpretation of the landscape and its many features, especially historic features such as boundary stones, tracks, farms, canals, mills and reservoirs.	**Recreation**

Service	Assets/ attributes: main contributors to service	Main beneficiary	State	Analysis	Opportunities	Principal services offered by opportunities
Biodiversity	International and National Designations	National / Regional	International and National Nature designations currently cover 18 per cent of the NCA. At present the vast majority of the designated resource is in poor ecological condition.	Improving the biological condition of the designated resource is likely to involve land management activities that will improve other services. This will be achieved principally through an increase in coverage of semi-natural habitat, restoration of natural hydrological systems and sustainable grazing regimes. These in turn have the potential to help increase regulation services such as regulating of water quality and soil erosion, while also contributing to sense of place.	Improve the area of designated in habitat in favourable biological condition.	**Biodiversity** **Sense of place/ inspiration** **Regulating soil erosion** **Regulating water quality**
Geodiversity	Striking landforms that clearly reveal geological processes Exposures in old quarries Local stone used for building	Regional	There are currently 6 nationally designated geological sites within the NCA. These consist mainly of natural river sections and man-made exposures (in particular disused quarries).	Designated sites provide important and accessible sections allowing the interpretation, understanding and continued research into the geodiversity of the NCA. Exposure of these features also makes a positive contribution toward sense of place and sense of history.	Seek opportunities to provide access to and interpretation of the rich geodiversity of the NCA.	**Geodiversity** **Sense of place/ inspiration** **Sense of history**

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