



Introduction

As part of Natural England's responsibilities as set out in the Natural Environment White Paper¹, Biodiversity 2020² and the European Landscape Convention³, we are revising profiles for England's 159 National Character Areas (NCAs). These are areas that share similar landscape characteristics, and which follow natural lines in the landscape rather than administrative boundaries, making them a good decision-making framework for the natural environment.

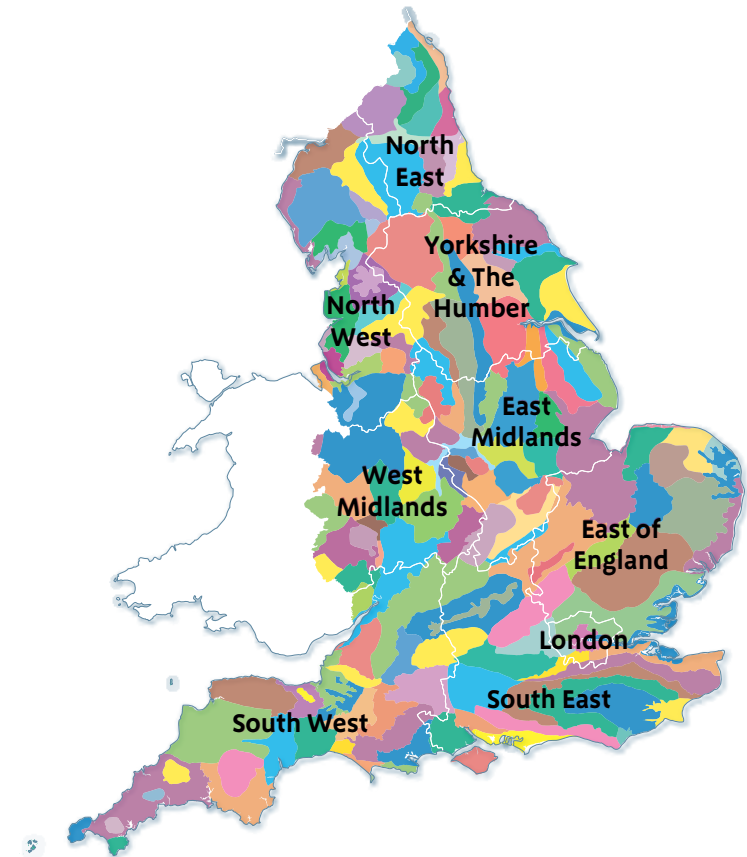
NCA profiles are guidance documents which can help communities to inform their decision-making about the places that they live in and care for. The information they contain will support the planning of conservation initiatives at a landscape scale, inform the delivery of Nature Improvement Areas and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

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

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

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

National Character Areas map



¹ The Natural Choice: Securing the Value of Nature, Defra (2011; URL: www.official-documents.gov.uk/document/cm80/8082/8082.pdf)

² Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services, Defra (2011; URL: www.defra.gov.uk/publications/files/pb13583-biodiversity-strategy-2020-111111.pdf)

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

Summary

The Border Moors and Forests National Character Area (NCA) consists of an extensive, sparsely populated upland plateau, with long-distance views and a strong sense of remoteness and tranquillity. The rivers North Tyne and Rede form wide valleys through the uplands, while the rivers Lyne and Irthing flow south-west to the Solway Firth. The underlying geology consists of Carboniferous deposits which have weathered differentially to form craggy outcrops, with subsequent glacial and fluvial deposition. The high altitude and climatic conditions led to the build-up of peat deposits and the formation of a large expanse of upland mire habitats, much of which is internationally designated as Border Mires, Kielder–Butterburn Special Area of Conservation. The extent of these habitats has been reduced by widespread conifer afforestation, particularly at Kielder Forest which occupies the slopes around Kielder Water, a large, winding reservoir at the head of the North Tyne Valley which also forms a prominent feature in the landscape. The uplands are drained by small rivers in enclosed valleys, with the larger valleys sheltering upland hay meadows, scattered farmsteads and copses of broadleaved woodland. Much of the south-eastern area lies within Northumberland National Park. Military training areas also occupy large tracts of land.

The underlying geodiversity of this NCA retains evidence of climatic changes and landscape evolution. There is also widespread archaeological and historical evidence indicating the strategic importance of this border area, most notably Roman marching camps and later defensible farmhouses. The peatlands and their associated habitats, together with the extensive woodland cover, play a very important role in storing carbon and regulating water supply downstream. Afforestation had the most significant impact on the upland landscape during the 20th century.

Overgrazing and drainage have previously posed threats to upland habitats, but grazing pressure has now been reduced and moorland management has improved, partly through agri-environment schemes. It will be important to ensure that appropriate management of these upland ecosystems continues. Another key challenge will be to improve access and recreational opportunities in order to enable people to enjoy the inspirational upland landscape while preventing damage to valuable habitats.

Click map to enlarge; click again to reduce.

Statements of Environmental Opportunity

- **SEO 1:** Protect the range of internationally important blanket bog habitats in the Border Mires, increasing the ability of the landscape to store carbon and enhancing the biological value of the many streams and rivers, and their role in regulating water supply, flow and quality.
- **SEO 2:** Work with the farming community to retain the character of the upland farmed landscape and increase the value of local produce, while employing sustainable land management practices to increase biodiversity value associated with a range of grassland habitats.
- **SEO 3:** Enhance broadleaved and coniferous woodlands for their biodiversity and landscape value, their role in regulating climate change and soil erosion, and for the provision of timber and biomass, and ensure that planting occurs in appropriate locations.
- **SEO 4:** Protect, and provide opportunities to access and enjoy, the inspirational qualities of the uplands including the wide views, dramatic landscape features such as Kielder Water, and the sense of remoteness and tranquillity.



The lower stretches of the North Tyne Valley are characterised by regular fields of improved grassland, with scattered farmsteads.

Description

Physical and functional links to other National Character Areas

The Border Moors and Forests National Character Area (NCA) consists of an upland plateau lying to the south of a natural high ridge of hills that form the border with Scotland. The land rises towards the Cheviot Hills to the north-east, and to the north-west is the Wauchope/Newcastleton Character Area in the Scottish Borders. At a lower elevation to the east are the Northumberland Sandstone Hills, and to the south the Whin Sill scarps form the boundary with the Tyne Gap and Hadrian's Wall NCA. The land descends towards the Solway Basin to the south-west. Away from forested areas, long-distance views are afforded along wide, straight valleys to the south, and across the plateau to the low-lying Solway Firth to the south-west and the Cheviot Hills to the north-east.

The rivers North Tyne and Rede rise on the border ridge to the north and cut through the plateau, forming two large valleys running north-east to south-west through the NCA. These are tributaries of the River Tyne, which in turn flows east to the North Sea. The major rivers draining the southern half are the River Lyne and the River Irthing, a tributary of the Eden; both flow west to the Solway Firth. Management of the moorland and forestry on the upland plateau is likely to influence river flow downstream in both catchments. Kielder Water reservoir, at the head of the North Tyne Valley, plays an important role in providing potable water to settled areas in both the Tyne and Wear valleys as part of a regional water transfer network.

Owing to the remote upland nature of the area, there are very few major transport links with other NCAs. The A68, which follows the Rede Valley, is the only principal route passing through the area, linking the Tyne Valley to the south with the Scottish Borders to the north.



Upland hay meadows on the moorland fringe are grazed by hardy breeds of sheep and cattle.

Key characteristics

- A large-scale upland landscape of sweeping moorlands and coniferous forests, with extensive views, sparsely populated, with dark night skies and a strong feeling of remoteness and tranquillity.
- Extensive areas of exposed moorland with a variety of mire habitats and unimproved grassland, much of which is internationally designated.
- Large tracts of planted coniferous forest, including Kielder Forest, the largest planted coniferous woodland in northern Europe, with a patchwork of felled areas and different age classes of non-native conifers.
- Network of small streams and rivers flowing through narrow gorges and crags, draining the uplands and forming enclosed valleys.
- Upland farmed landscape of scattered farmsteads with semi-improved and improved pasture in the larger valleys, mainly enclosed by wire fences and drystone walls, with small copses of broadleaved woodland.
- Kielder Water, a large expanse of open water at the head of the North Tyne Valley, forming a dramatic landscape feature and providing recreational opportunities as well as supplying potable water.
- Military training areas covering large tracts of land including Spadeadam Forest and the more open Otterburn Ranges, with associated noise and activities influencing perceptions of tranquillity and remoteness.
- Archaeological and historical features of interest in the landscape, such as the remains of Roman marching camps and fortified farmhouses as evidence of past border instability.

Border Moors and Forests today

The Border Moors and Forests NCA consists of a large-scale landscape of high, rolling or undulating plateau with expanses of sweeping moorlands and extensive conifer forests, sparsely populated and dissected by two broad river valleys. It lies to the south of a natural high ridgeline which forms the border with Scotland, between the Cheviot Hills to the north-east and the Solway Basin to the south-west. There are very few settlements and the area has a strong sense of remoteness and tranquillity, with long-distance views and dark night skies. The underlying geology consists principally of sandstones and limestones overlain by glacial deposits. The upland is dissected by the valley of the North Tyne, the principal river draining the area, with the extensive reservoir of Kielder Water at the head of the valley forming an impressive feature in the landscape. The principal tributary of the North Tyne, the River Rede, forms a parallel valley to the north-east, at the head of which is the smaller Catcleugh Reservoir. The principal rivers draining south-west into the Solway Firth are the White Lyne, Black Lyne and Irthing.

Extensive conifer plantations are a notable feature of the landscape. There is a marked contrast between these and the large expanses of exposed moorland with extensive views, which are characterised by a mixture of blanket bog and mire, wet heath and unimproved grassland. The relatively high altitude of the upland plateau, combined with high rainfall and low temperatures, has resulted in the formation of peaty soils which have limited agricultural land use. Consequently, most agriculture is centred on the rearing of hardy breeds of sheep and cattle. Some areas are managed for grouse shooting, and military training areas have been established across large tracts of land at Spadeadam and Otterburn. However, management is not intensive across the uplands as a whole and there is very little infrastructure.

Kielder Forest is the largest area of planted woodland in northern Europe, and forms a dramatic landscape of forested hillsides around Kielder Water. The forest consists of a variety of age classes and species including spruce, pine and larch, and is broken up by valleys and craggy outcrops, recently felled areas and forest tracks. Open mires also form a mosaic within forested areas. Kielder Forest supports a number of iconic wildlife species, and is one of the last strongholds in England for the red squirrel. Other important species include breeding osprey, otter, salmon and the Kielder feral goat, a descendant of domestic goats which now roams the area wild. It is a popular destination owing to its high landscape value and opportunities for walking, horse riding, cycling and mountain biking, and water-based activities, while osprey watching together with observation of other birds and wildlife are also popular activities.



The uplands are drained by a network of streams and rivers in enclosed valleys, with narrow gorge sections.

The NCA has one of the largest expanses of upland moorland and mire habitat in England. Much of this is internationally designated as the Border Mires, Kielder–Butterburn Special Area of Conservation (SAC). Mires occur throughout the upland area; to the north-east, blanket mire dominated by *Sphagnum* species occurs alongside heather-dominated heath, whereas to the south-west there is a mixture of raised and intermediate mires dominated by bog mosses. The variety of mire habitats is largely a result of the deep hollows which occur across the surface of the underlying glacial material, and they often preserve evidence of past climatic and environmental changes. There are also localised features such as fens and flushes at the heads of valleys. The moorland fringe supports nationally important upland hay meadows and acid grassland, much of which remains unimproved.

The uplands are drained by a network of small streams and rivers, with narrow gorges and sandstone crags, which form enclosed valleys. Further downstream, the North Tyne and Rede valleys are characterised by a mixture of upland hay meadows and semi-improved or improved grassland in large, regular fields, enclosed mainly by drystone walls, thin hedgerows and wire fences. The lower valleys of Redesdale and North Tynedale have the largest fields, dating from late 18th and 19th century re-organisation and enclosure, and elsewhere more irregular boundaries evidence the piecemeal and ancient enclosure of farmland from the medieval period. Tree cover is sparse and largely restricted to copses around settlements. Stone-built farmsteads and hamlets are scattered through the valleys, becoming more frequent further to the south, and principally built in the vernacular style using local sandstone with slate roofs. A number of small towns and villages are located in Redesdale along the A68, which forms the only major transport route through the NCA. Unenclosed grazing commons can be found in the quiet, remote valleys of the White Lyne and Black Lyne rivers to the south-west. This part of the NCA has a higher proportion of deciduous woodland, with lines of alder growing along watercourses. The gravel shoals, sand banks and wet woodland communities along the River Irthing are internationally recognised as part of the River Eden SAC.

The Pennine Way National Trail runs through the NCA from south to north, and with a large proportion of public forest and uncultivated country much of the land is accessible to the public. The remoteness, tranquillity and high landscape value of the area has been recognised by the designation of Northumberland National Park, which accounts for 39 per cent of the NCA.



Recently felled areas are a feature of the forested landscape.

The landscape through time

Although there are some outcrops of Silurian age on the border ridge forming part of the Riccarton Formation, the majority of the underlying geology in the Border Moors and Forests consists of sedimentary rocks of Carboniferous age. These include the Ballagan Formation, the Fell Sandstone Formation, the Alston Formation and the Tyne Limestone Formation – a sequence of limestones, shales and sandstones, locally with thin beds of coals and ironstones. The more resistant sandstones and the less resistant limestones have weathered to form a 'cuesta' landscape with distinctive craggy outcrops. Subsequently, during the last glaciation, deep ice sheets deposited a thick layer of till and other glacial sediments over the entire area, as well as scouring basins and depressions in the landscape, while deposition of fluvial sands and gravel has occurred in the lower valleys. The glacial activity has been a more significant determinant of soil type than the underlying rocks. During the Holocene (our present interglacial), extensive peat deposits have formed over the uplands, varying in depth owing to the presence of hollows in the surface of glacial deposits, resulting in a mosaic of upland mire habitats.

Human influence on the landscape began in prehistoric times with the clearance of native broadleaved woodland from the Neolithic period. There is abundant archaeological evidence of prehistoric land use (including field systems), ritual sites (such as standing stones and burial cairns) and settlement (in the form of hill forts, palisaded enclosures and enclosed farmsteads), especially from the Bronze Age to Romano-British periods. The evidence of Roman occupation is internationally significant; the modern A68 follows the course of Dere Street, the main north–south Roman road, for much of its length through the Redesdale Valley and there is further archaeological evidence of the road, along with a branch road heading east towards the coast. The series of Roman marching camps along the course of Dere Street are a clear indication of Roman military presence and the strategic importance of the area close to the northern limit of the Roman Empire. The camps are likely to have been



Kielder Water, built in the 1970s at the head of the Tyne Valley, forms a distinctive feature in the landscape.

supplied by Romano-British farmsteads, many of which also survive. The remains of 'shieling' settlements suggest that the uplands were occupied and farmed seasonally during the medieval period, although this system may have had prehistoric origins. Many of these hamlets and villages were later adopted as permanent settlements.

During the period of intermittent border warfare from the 14th to the 16th centuries, tenants held land in exchange for military service. Defensible stone farmhouses known as 'bastles' mostly date from the late 16th and 17th centuries, when the Reivers (border raiders) marked the instability which continued as a feature of this area. Over the 17th and 18th centuries, a gradual reduction in warfare and instability, combined with an amelioration in the climate, resulted in settled pastoral farming becoming more widespread, and drove roads, cross-ridge dykes and enclosures appeared more widely across the landscape. Spoil heaps and disused railway lines indicate that there was a small-scale coal mining industry, and milk was also exported from this area by rail. Another key development of significance to the rural economy was the expansion of rural sports with shooting lodges (for example, at Kielder for the Dukes of Northumberland).

Widespread afforestation during the 20th century, beginning in the 1920s, had a highly significant impact on the landscape. The extent of mire habitat was reduced, with conifer encroachment and forestry drainage posing a threat to remaining mires. Afforestation may also have impacted on the potential for new archaeological discoveries. The creation of Kielder Water in the late 1970s was also highly significant. As well as allowing for large-scale water storage, it also brought about a major change in the landscape character and began to attract many more visitors to the area. The establishment from the early 20th century of military training areas at Spadeadam and Otterburn has introduced intrusive features such as military camps, roads, security fences, safety notices and overhead power lines, and military operations have had some influence on perceptions of tranquillity. Other significant changes during the last century have included the introduction of asphalt roads and power grid connections, and the consequent increases in motor vehicle traffic and light pollution respectively. Architectural changes have also taken place – modern, colour-washed houses which have been built for forestry workers, for instance at Stonehaugh and Byrness, and modern agricultural buildings which contrast with the more traditional sandstone farmhouses with slate roofs.



Coniferous woodland consists of a variety of species and age classes, and is often mixed with broadleaved trees.

While generally development pressures have remained very low, agricultural changes including widespread drainage took place in the late 20th century. In places, overgrazing, drainage and burning have had an adverse impact on upland mire habitats. However, there has been a reduction in grazing pressure and burning, and improved management of heather moorland in recent years. Major blanket bog restoration projects took place from 1998 to 2003 and 2006 to 2009, increasing the extent of functioning mire habitat. Broadleaved trees have recently been planted more extensively within the upland conifer plantations, particularly alongside watercourses and on the Otterburn Ranges.

Ecosystem services

The Border Moors and Forests 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 Border Moors and Forests NCA is contained in the 'Analysis' section of this document.

Provisioning services (food, fibre and water supply)

- **Food provision:** Owing to the harsh climatic conditions and poor soil quality in this upland NCA, the rearing of hardy breeds of sheep and cattle predominates. It will be important to maintain grazing levels at an appropriate level on upland farmland. Marketing of local produce from traditional breeds, and their relationship with the upland landscape, should be promoted.
- **Timber provision:** Woodland cover for the whole NCA is very high at 43 per cent, with conifer plantations occupying 29 per cent of the Border Moors and Forests, making timber production a key provisioning service of the NCA. It will be important to manage forests in such a way that they can provide other ecosystem services besides timber production, including benefits to biodiversity and access for recreational activities. Although recent restoration projects have seen conifers being removed from mire sites, conifer encroachment should continue to be actively managed with lower valley slopes representing suitable locations for replacement planting. Foresters may need to take account of the impacts of climate change by increasing the variety of species planted. Good forestry practice should also be followed to avoid acidification and sedimentation of watercourses.

- **Biomass energy:** The NCA offers a significant opportunity for the provision of biomass and wood fuel as by-products of timber production in conifer plantations. Wood fuel is used to power a community district heating system within the NCA, and there is the potential for further such initiatives.
- **Water availability:** The provision of water to more populated areas downstream in Tyneside and Wearside and Solway Firth is a key service of this upland NCA. Healthy upland mire habitats can retain large volumes of water and there is a dense network of upland streams feeding the main rivers. Kielder Water is part of a regional water transfer network allowing water to be transferred between catchments when required, and Catcleugh Reservoir forms a key water resource for the city of Newcastle.

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

- **Climate regulation:** The NCA plays a very important role in climate regulation through carbon storage. Peaty soils which predominate across the uplands have a very high carbon content, and the large areas of woodland are a significant means of carbon sequestration. It will be important to continue to restore bare peat and manage moorland appropriately to ensure that blanket bogs are active. Woodland cover should be increased where appropriate, such as on lower valley slopes.
- **Regulating water quality:** Peat erosion poses a substantial risk to water quality through discolouration and acidification, and so moorland management measures to ensure good vegetative cover and good forestry practice are important in maintaining water quality. Maintaining grassland or woodland strips alongside watercourses helps to reduce sediment runoff and therefore improve water quality. Active livestock husbandry is also important in reducing poaching of riverbanks.

- **Regulating water flow:** Settled areas downstream of the NCA, in the Tyne Valley and Solway Firth, are vulnerable to flooding. Management of water flow in the upper reaches of the major rivers and their tributaries is key to reducing flood risk. Moorland management practices which promote the growth of bryophytes will result in increasing surface roughness, affording extra water storage and reducing run-off rates within associated sub-catchments. Using appropriate drainage techniques in managed forests is also key to reducing run-off rates.
- **Regulating soil quality:** Appropriate management enables peat soils to store and sequester carbon, but they are vulnerable to oxidation and the loss of organic matter when they dry out. Appropriate moorland management will be required to restore the hydrology and vegetation cover of peat soils and ensure active bog formation on deep peat. Encouraging extensive livestock rearing and following good forestry practice will minimise damage to upland soils.
- **Regulating soil erosion:** The wet peaty soils which predominate are vulnerable to erosion due to drying out. This can be reduced by moorland management measures such as grip blocking and ensuring that peat surfaces are well vegetated. Woodland cover can help to maintain soil stability in some locations, although conifer encroachment into areas of deep peat increases the risk of the peat drying out, so measures should be put in place to reduce this. Grazing should be kept at an appropriate level to prevent erosion of soils on upland hay meadows, and good forestry practice should be followed to maintain the stability of woodland soils.

Cultural services (inspiration, education and wellbeing)

- **Sense of place/inspiration:** This is a large-scale, sparsely populated upland landscape, whose sense of place is defined by the sweeping moorland and the feelings of wildness and remoteness that it inspires. Kielder Water, and the wooded slopes of Kielder Forest which surround it, are more recent additions to the landscape but add to its dramatic nature and are important in defining its sense of place. It is also characterised by sheltered valleys with scattered stone farmsteads and hamlets, and upland pastures on the valley sides.
- **Sense of history:** The NCA has a strong sense of history. The underlying geology preserves evidence of past landscapes and biodiversity as well as climatic changes that have characterised this NCA over many millions of years. The strategic importance of the border area has had a marked influence on the landscape. The remains of Roman marching camps are found along the route of the Roman road of Dere Street. Later periods of border warfare and instability influenced the settlement pattern, with many defensible farmhouses and steadings dating from this period. There is abundant evidence of prehistoric occupation. The gradual transition from seasonal occupation to a more settled form of agriculture is evident from the remains of shieling settlements and later enclosed pastures.
- **Tranquillity:** The Border Moors and Forests, together with the neighbouring Cheviots NCA, is the most tranquil area in England. It is sparsely populated with very few major settlements and transport links, and is highly valued for its dark night skies. The broad upland plateau, forested hillsides, reservoirs and enclosed valleys have a strong sense of remoteness and tranquillity, which can have a calming and restorative effect on people's health and wellbeing. However, perceptions of tranquillity and remoteness are affected by military operations.

- **Recreation:** The Border Moors and Forests offer significant opportunities for recreation, with much of the land being uncultivated. Over half of the area is open access land. The Pennine Way National Trail passes through the NCA, and Kielder Water and the surrounding Kielder Forest, as well as other extensive areas of the public forest estate, offer further opportunities for a range of recreational activities.
- **Biodiversity:** The NCA has a large extent and variety of upland mire habitats including blanket bog, raised bog and fen, much of which is internationally designated as Border Mires, Kielder–Butterburn SAC. Upland hay meadows, and the wet woodland, gravel shoals and sand banks along the River Irthing are also internationally recognised, and there are nationally important areas of ancient semi-natural woodland. Appropriate management will help to protect and enhance upland habitats, and there are opportunities to extend the area of broadleaved woodland. Riparian habitats and coniferous woodland support a number of protected and priority species, some of which are declining and require conservation measures to boost their populations. This should include appropriate management of coniferous forests.
- **Geodiversity:** The diverse underlying geology of this NCA is of national and international importance. Of particular significance are the Lower Carboniferous deposits that preserve evidence for landscape evolution over 300 million years ago, and there is evidence preserved of past biodiversity and volcanic activity. Carboniferous fell sandstones have formed the principal building material, giving rise to the local vernacular style still seen in many traditional buildings. The peat bogs and mires preserve valuable evidence of more recent ecological and climatic changes since the end of the last ice age, which may give valuable insights into future climate change.



Maintaining woodland strips alongside watercourses , such as here in the North Tyne Valley, helps to reduce sediment run-off.

Statements of Environmental Opportunity

SEO 1: Protect the range of internationally important blanket bog habitats in the Border Mires, increasing the ability of the landscape to store carbon and enhancing the biological value of the many streams and rivers, and their role in regulating water supply, flow and quality.

For example, by:

- Using management measures such as grip blocking to improve cover of bryophytes and other vegetation, encouraging active blanket bog formation and maintaining the water and carbon storage capacity of the uplands.
- Avoiding erosion and damage to peat soils through activities such as inappropriate burning, drainage, construction of tracks and forestry operations.
- Restoring blanket bog habitat where possible, and controlling the spread of self-seeding conifers from plantation forests bordering heathland and mire habitat.
- Establishing marginal riparian habitats of scrub, wet woodland and permanent grassland strips.
- Enabling natural river flows in order to support active natural processes and protect features such as gravel shoals and sand banks.
- Managing watercourses to maintain and enhance suitable freshwater habitat for a range of species including freshwater pearl mussel, otter and salmon, and opportunities for angling.

SEO 2: Work with the farming community to retain the character of the upland farmed landscape and increase the value of local produce, while employing sustainable land management practices to increase biodiversity value associated with a range of grassland habitats.

For example, by:

- Protecting, managing and seeking opportunities to extend upland hay meadows, continuing to cut for hay and using little or no artificial fertiliser.
- Encouraging extensive livestock grazing on upland pastures to maintain grasslands with a range of hydrological conditions and a high diversity of species.
- Increasing levels of cattle grazing where required to reduce the spread of Molinia grasses.
- Restricting access to river banks by livestock, and managing the use of sheep dips, in order to reduce soil erosion and maintain water quality.
- Maintaining and restoring drystone walls and traditional farm buildings, ensuring that through re-use their heritage interest is retained.
- Encouraging the marketing of local produce, linking it to the high-quality landscape from which it comes.
- Ensuring that land management practices recognise the importance of the archaeological heritage within this NCA, including evidence of prehistoric land use and settlements.

SEO 3: Enhance broadleaved and coniferous woodlands for their biodiversity and landscape value, their role in regulating climate change and soil erosion, and for the provision of timber and biomass, and ensure that planting occurs in appropriate locations.

For example, by:

- Increasing the range of species in conifer plantations, thereby improving resilience to disease and potentially to the impacts of climate change, as well as enhancing the landscape value of plantations and benefiting biodiversity.
- Promoting the use of wood fuel as a by-product of commercial timber production.
- Protecting remaining areas of semi-natural woodland and seeking opportunities to expand them where appropriate, using native broadleaved species, and where woodlands are fragmented, linking them where possible to make them more resilient and to enable species movement.
- Restoring native tree species to broadleaved woodlands, using natural regeneration where possible.
- Managing woodland appropriately for the benefit of priority species, such as planting small seed tree species for red squirrel and maintaining small areas of woodland on the moorland fringe for black grouse.
- Controlling the spread of self-seeded conifers, and finding compensation planting sites in more appropriate locations, such as valley slopes.
- Conserving alder-dominated wet woodland, especially in the Lyne and Irthing valleys.
- Re-establishing traditional management practices such as coppicing in deciduous woodland where appropriate, to provide a sustainable harvest of biomass and timber.
- Ensuring that land management practices have regard to the importance of the archaeological heritage of this NCA.

SEO 4: Protect, and provide opportunities to access and enjoy, the inspirational qualities of the uplands including the wide views, dramatic landscape features such as Kielder Water, and the sense of remoteness and tranquillity.

For example, by:

- Preventing inappropriate development, and controlling lighting levels, in order to protect the tranquillity, dark skies and sense of remoteness of the upland landscape.
- Managing access opportunities on moorland and in forested areas, to allow people to enjoy the expansive and remote landscape of the forests, moors and mires, while minimising damage to sensitive habitats and disturbance to wildlife.
- Maintaining the safe and informed use of the public estate, including Kielder Forest and the Otterburn Training Area.
- Encouraging responsible recreational uses that are based on the particular qualities of the landscape, such as walking, riding, cycling, horse riding, wildlife watching, angling and star gazing, especially in forest areas.
- Maintaining and enhancing access opportunities for different user groups, including those with reduced mobility, and providing interpretation of the landscape, its history, geology and current land uses, for the understanding and enjoyment of visitors.
- Maintaining the Pennine Way National Trail to a high standard to allow its continued enjoyment by walkers while minimising erosion on surrounding moorland.



Kielder Forest is one of the last strongholds in England for the red squirrel.

Additional opportunity

1. Protect the geological, archaeological and historic evidence of changing land use in the area and the significance of its location as a border region.

For example, by:

- Conserving the archaeological remains of Roman roads and marching camps as evidence of the strategic importance of the area during Roman times.
- Protecting the remains of shieling settlements, demonstrating the past seasonal use of the uplands for farming.
- Conserving traditional fortified stone farmsteads dating from periods of border warfare, and minimising the loss of historic features through modern conversions.
- Using local materials and building techniques and styles when restoring vernacular or historic buildings.
- Identifying stretches of landscape where there are several interrelated features, recording their relationship to the wider landscape, and providing interpretation in imaginative ways to enhance people's understanding and enjoyment of the history of the landscape.

Supporting document 1: Key facts and data

Area of Border Moors and Forests National Character Area (NCA): 127,156 ha

1. Landscape and nature conservation designations

The Northumberland National Park covers 49,876 ha which is 39 per cent of the Border Moors and Forests NCA.

More information about the protected landscape can be found at:

- www.northumberlandnationalpark.org.uk/

Source: Natural England (2011)

1.1 Designated nature conservation sites

The NCA includes the following statutory nature conservation designations:

Tier	Designation	Name	Area (ha)	% of NCA
International	Ramsar	Irthinghead Mires	779	<1
European	Special Protection Area (SPA)	n/a	0	0
	Special Area of Conservation (SAC)	Border Mires, Kielder-Butterburn SAC; Harbottle Moors SAC; Roman Wall Loughs SAC; River Eden (part) SAC; North Pennine Dales Meadows SAC.	11,957	9

Tier	Designation	Name	Area (ha)	% of NCA
National	National Nature Reserve (NNR)	Kielderhead NNR; Whitelee Moor NNR; Kielder Mires NNR; Gowk Bank NNR; Greenlee Lough NNR	5,383	4
	Site of Special Scientific Interest (SSSI)	A total of 30 sites wholly or partly within the NCA	17,054	13

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

All the SAC and Ramsar boundaries lie within the SSSI area. Very small areas of NNR are not included within SSSI boundaries.

There are 36 local sites in Border Moors and Forests covering 1,160 ha which is 1 per cent of the NCA.

Source: Natural England (2011)

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

1.1.1 Condition of designated sites

SSSI condition category	Area (ha)	Percentage of NCA SSSI resource
Unfavourable declining	4	<1
Favourable	6,715	39
Unfavourable no change	22	<1
Unfavourable recovering	10,250	60

Source: Natural England (March 2011)

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

2. Landform, geology and soils

2.1 Elevation

The elevation ranges from about 50 m on the lower Liddle Water up to 602 m at Peel Fell on the Scottish border. The mean elevation is 275 m.

Source: Natural England (2010)

2.2 Landform and process

The Border Moors and Forests essentially comprises a dissected upland plateau with broad undulating hills reaching up to 600 m divided by wide shallow valleys. To the north-west it drops down to the Solway Basin and to the south it is defined by the Whin Sill scarps running along the Tyne Gap. To the east are the Cheviots and the sandstone hills of Northumberland.

Source: Border Moors & Forests Countryside Character Area Description

2.3 Bedrock geology

The area is everywhere underlain by sedimentary rocks of Carboniferous age. These comprise, in ascending order, the Cementstones Group, the Fell Sandstone Group, the Scremerston Coal Group and the Lower, Middle and Upper Limestone Groups. The Cementstones Group consists essentially of a sequence of shales with numerous thin beds of impure limestone, while the Fell Sandstone Group comprises a series of thick coarse-grained sandstones. The remaining groups of Carboniferous rocks have been laid down in a repeating sequence of limestones, shales and sandstones, locally with thin beds of coals and ironstones. Most significant of these, in terms of landscape development, are the resistant sandstones and, more rarely, the limestones. These form a distinctive cuesta landscape with steep craggy scarps and long sloping dip slopes reflecting the alternating hard and soft strata, particularly around the southern and eastern edges of the area.

Source: Border Moors & Forests Countryside Character Area Description

2.4 Superficial deposits

During the last glaciation, deep ice sheets flowed south from Scotland and deposited a thick mantle of boulder clay or till over almost the whole area. The nature of the soils of the area owes more to these deposits than the underlying rocks. Extensive areas of shallow to deep peat have developed since the retreat of the glaciers over much of the uplands. The valley bottoms have gravels and sands associated with fluvial deposition since the end of the last glaciation.

Source: **Border Moors & Forests Countryside Character Area Description**

2.5 Designated geological sites

Tier	Designation	Number
National	Geological Site of Special Scientific Interest (SSSI)	7
National	Mixed Interest SSSIs	1
Local	Local Geological Sites	3

Source: **Natural England (2011)**

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

2.6 Soils and Agricultural Land Classification

There are seven main soilscape types in this NCA but the vast majority of the soils reflect the wet upland nature of the area with 50 per cent of the soils by area comprising slowly permeable wet very acid upland soils with a peaty surface and 21 per cent comprising blanket bog peat soils. Other upland, valley side and valley bottom soils include; slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils (9 per cent); raised bog peat soils (6 per

cent); very acid loamy upland soils with a wet peaty surface (5 per cent); slowly permeable seasonally wet acid loamy and clayey soils (5 per cent); and loamy soils with naturally high groundwater (2 per cent).

Source: **National Soils Resources Institute Soilscape Maps**

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

Grade	Area (ha)	% of NCA
Grade 1	0	0
Grade 2	0	0
Grade 3	741	<1
Grade 4	13,244	10
Grade 5	62,186	49
Non-agricultural	50,894	40
Urban	0	0

Source: **Natural England (2010)**

Grade 4 land is found on the lower slopes in the south-west and along the east side and in the valleys, while the limited area of Grade 3 land is confined to the North Tyne valley.

- Maps showing locations of Statutory sites can be found at: <http://magic.Defra.gov.uk/website/magic/> – select 'Landscape' (shows ALC classification and 27 types of soils).

3. Key water bodies and catchments

3.1 Major rivers/canals

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

■ River Rede	39 km
■ River Irthing	22 km
■ River North Tyne	19 km
■ White Lyne	19 km
■ Warks Burn	17 km
■ Black Lyne	17 km
■ Chirdon Burn	16 km
■ Blacka Burn	14 km
■ King Water	10 km
■ Kielder Burn	7 km
■ Liddel Water	2 km
■ River Lyne	<1 km
■ Kershope Burn	<1 km

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.

Reflecting the location of the NCA along the central spine of England, the area drains both to the North and Irish Seas through adjacent NCAs. The greater part of the catchment drains to the North Sea via the North Tyne and its tributaries (see below) which joins the River Tyne to reach the sea at Newcastle. The North Tyne also drains Kielder Reservoir. The south-western part of the NCA drains to the Irish Sea via the River Irthing and its tributaries which join the River Eden to drain into the Solway Firth and the River Lyne and Liddell Water which both join the River Esk which also drains into the head of the Solway Firth just to the north of the Eden outflow.

The watercourses River North Tyne, River Rede, Warks Burn, Chirdon Burn, Blacka Burn and Kielder Burn drain into to the North Sea. The waterbodies River Lyne, White Lyne, Black Lyne, River Irthing, King Water, Liddel Water and Kershope Burn drain into the Irish Sea via the Solway Firth.

3.2 Water quality

There is no Nitrate Vulnerable Zone within the NCA.

Source: Natural England (2010)

3.3 Water Framework Directive

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

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

4. Trees and woodlands

4.1 Total woodland cover

The NCA contains 54,552 ha of woodland. Woodland cover over the whole NCA is very high at 43 per cent and reflects the extensive conifer plantations of the area which cover 36,561 ha (29 per cent of the NCA). There are 1,884 ha of pure broadleaved woodland (1 per cent of the NCA) and 155 ha of mixed broadleaves and conifers (<1 per cent of the NCA). The area of ancient woodland (including plantations on ancient woodland sites) is 576 ha (<1 per cent of the NCA).

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

4.2 Distribution and size of woodland and trees in the landscape

Conifer plantations comprise the principal woodland cover of the area and mainly consist of Norway and Sitka spruce with pine and larch in various stages of management with maturing stands, areas of clear fell and replanting. Areas of broadleaved planting, open strips along watercourses and open areas of mire and craggy outcrops within the forests, add to the variety of structure and enclosure locally. The extensive areas of tree cover are also divided by forest tracks and linear firebreaks. The largest area of afforestation is located at the head of the North Tyne valley, in Kielder Forest. This forest incorporates Kielder reservoir. Other major areas of extensive coniferous forest are Kershope Forest, Redesdale Forest, Spadeadam and Wark Forest. Elsewhere in the uplands, trees are few, largely limited to sheltering clumps around isolated farmsteads. Ancient woodland is largely restricted to river valleys – the Rede and North Tyne and its tributaries in the central and northern sections of the NCA and the River Lyne and Irthing in the south-west where there are valley woodlands of national significance.

Source: Natural England (2012)

4.3 Woodland types

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

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

Woodland type	Area (ha)	% of NCA
Broadleaved	1,884	1
Coniferous	36,561	29
Mixed	155	<1
Other	15,952	13

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

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

Type	Area (ha)	% of NCA
Ancient semi-natural woodland	415	<1
Planted Ancient Woodland (PAWS)	161	<1

Source: Natural England (2004)

5. Boundary features and patterns

5.1 Boundary features

The valleys of Redesdale and the North Tyne and the south-western fringes of the area mostly comprise drystone wall boundaries around allotments and in-bye with some hedgerows. The extensive upland areas have walls but the allotments are often divided by wire fences.

Source: Border Moors & Forests Countryside Character Area description; Countryside Quality Counts (2003)

5.2 Field patterns

The lower valleys of Redesdale, the North Tyne and the south-western fringes demonstrate 18th and 19th century agricultural improvements with large regular fields with smaller in-bye enclosures in sheltered valleys. The areas of upland that are not afforested either comprise unfenced tracts of common or very large rectangular fields.

Source: Border Moors & Forests Countryside Character Area description; Countryside Quality Counts (2003)

6. Agriculture

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

The total area of farmed land is 52,561 ha (only 41 per cent of the NCA area) comprising 280 farm holdings (2009 figures), a reduction of 16 holdings on 2000. All figures below relate to 2009 unless otherwise stated.

6.1 Farm type

This is a predominantly upland livestock farming area with 231 holdings (83 per cent) in the Less Favoured Area. Sheep and beef cattle predominate with only 6 holdings having a dairy herd (down from 11 in 2000).

Source: Agricultural Census, Defra (2010)

6.2 Farm size

Farms over 100 ha in size are predominant accounting for 44 per cent of the total number of holdings and 89 per cent of the land area, which reflects the extensive area of upland farms. Otherwise farm size is fairly evenly spread over size classes: less than 5 ha account for 10 per cent of holdings; 5 to 20 ha, 14 per cent of holdings; 20 to 50 ha, 14 per cent of holdings; and 50 to 100 ha, 18 per cent of holdings. Trends show an increase in the number of farm holdings above 100 ha between 2000 and 2009 (6 more). The numbers of holdings in all class sizes below 100 ha decreased by 22. These figures do not include the access that many farms have to common grazing on moors.

Source: Agricultural Census, Defra (2010)

6.3 Farm ownership

Fifty-five per cent of the agricultural land (28,694 ha) is tenanted with 46 per cent (24,267 ha) farmed by the owner.

Source: Agricultural Census, Defra (2010)

6.4 Land use

Ninety-eight per cent of the farmed area is grazing land (51,537 ha).

Source: Agricultural Census, Defra (2010)

6.5 Livestock numbers

In 2009 sheep were the most numerous livestock with 198,000 animals. There were 249,400 animals in 2000, a reduction of 21 per cent. There were 16,300 cattle and 20,000 in 2000, a reduction of 18 per cent. The number of pigs in the area was 600 in 2009 compared to 150 in 2000, an increase of 296 per cent.

Source: Agricultural Census, Defra (2010)

6.6 Farm labour

The majority of farms in 2009 were managed by their owner, 453 holdings or 74 per cent, with only 8 holdings, 1 per cent, having farm managers.

Source: Agricultural Census, Defra (2010)

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

7. Key habitats and species

7.1 Habitat distribution/coverage

The Border Moors and Forests comprise an exceptional range and extent of mires including upland blanket bog, raised bog and intermediate bogs. Prior to the creation of Kielder Forest, the extent was much greater. Upland heathland is present throughout the area but tends to be more prevalent in the drier north-east. Ancient semi-natural woodland is largely restricted to valley sides with nationally important examples on the south-western slopes of the massif. Species-rich grasslands such as upland hay meadows are relatively scarce but include some internationally important examples.

Blanket bog and fen: The mires within the Border Moors and Forests NCA are of international importance and form part of what was once, prior to afforestation, the largest continuous tract of blanket bog across northern England. They are important for their extent and exceptional quality, the transitions between blanket bog, raised bog and various kinds of fen, including valley fen and flushes, and the range of topographic situations in which these mires can occur. They support an exceptional range of bog-mosses *Sphagnum spp.* and sedges *Carex spp.* Although much of the land has been afforested, significant areas of the original bog remain throughout the forested expanse.

The mires show considerable variation across the area. The eastern and higher altitude Kielderhead and Emblehope Moors areas, for example, typically comprise extensive and continuous blanket mire dominated by heather *Calluna vulgaris* and hare's-tail cotton grass *Eriophorum vaginatum* with scattered bog mosses. Where the water table is higher bog-mosses become the dominant vegetation among deergrass *Trichophorum germanicum* and cross-leaved heath *Erica tetralix*. Cloudberry *Rubus chamaemorus* is characteristic of these high bogs.

In west Northumberland and east Cumbria the lower altitude Spadeadam and Butterburn Flow mires are a complex of more scattered mires that comprise both raised mires formed in basins and intermediate mires on wetter higher ground, which are transitional to blanket bog. These have a very high cover of bog-mosses with scattered sedges and dwarf shrubs including cranberry *Vaccinium oxycoccus* and bog rosemary *Andromeda polifolia*. Typically the surface of the bogs has a patterning of hollows and ridges with different species exploiting these microhabitats.

There are also a range of other characteristic mire types including base-rich and base-poor valley fens, springs and flushes. The valley fens which support species that require more water movement than the rain-fed blanket mires including marsh cinquefoil *Potentilla palustris*, bogbean *Menyanthes trifoliata* and common sedge *Carex nigra*. Vegetation that requires mineral-rich flushing, often from calcareous rocks, are also an important feature associated with these mire complexes and include a range of typical lime-loving bryophytes and other plants including sedges such as dioecious sedge *Carex dioica*, lesser clubmoss *Selaginella selaginoides* and butterwort *Pinguicula vulgaris*. Such communities are also found elsewhere on sloping ground in the NCA.

Woodland: Nationally important examples of ancient semi-natural woodland are present in the NCA. The most extensive of these are associated with the narrow river valleys and gorges such as those on the rivers Lyne, Black Lyne, Rae Burn and Irthing in the south-west of the area. These are typically diverse woodlands reflecting the varied underlying geologies that the rivers cut through and often include cliffs and rocky outcrops. Oak-birch woodland typically occurs on the drier acidic soils of the upper slopes of the woods where greater wood-rush *Luzula sylvatica* can dominate the woodland floor with deeper soils supporting hazel *Corylus avellana* and a richer ground flora of wood sorrel *Oxalis acetosella* and ferns. Deeper and richer soils are dominated

by ash *Fraxinus excelsior*, oak *Quercus petraea*, downy birch *Betula pubescens*, some remnant wych elm *Ulmus glabra* and hazel and a species-rich ground flora including ramsons *Allium ursinum* and dog's mercury *Mercurialis perennis*. Wetter areas are dominated by alder woodland often with a number of other trees including bird cherry *Prunus padus* and a ground flora that can include marsh hawk's-beard *Crepis paludosa* and bugle *Ajuga reptans*.

Some of the woodlands in the NCA are nationally important for lichens that are associated with the cool, damp and unpolluted air of western Britain.

Nationally important wet woodlands are present in the area and include some unusually extensive examples on valley slopes as at Mollen Woods in the south-west and Billsmoor Park and Grasslees Wood in the north-east. These are dominated by alder, often with birch and hazel and a field layer including meadowsweet *Filipendula ulmaria*, sedges, rushes and grasses and which can include ramsons, sanicle *Sanicula europaea* and primrose *Primula vulgaris* where the soils are more mineral rich or they are flushed with lime-rich water. Important areas of alder-dominated wet woodland are also associated with gravel and shingle in and around the River Irthing.

Grasslands: Nationally important upland hay meadows are present in the NCA. These are variable in species composition depending on the nature of individual fields but are always diverse and typically support grasses such as sweet vernal grass *Anthoxanthum odoratum* and crested dog's-tail *Cynosurus cristatus* with herbs including wood cranes-bill *Geranium sylvaticum*, pignut *Conopodium majus* and lady's mantles *Alchemilla spp.* These grasslands typically include flushed ground which can support communities described below.

National important examples of species-rich pastures are also present and these can also occur in meadows managed for hay. These are very variable

and can be dominated by a range of rushes, sedges and grasses where flushed including purple moor-grass *Molinia caerulea* and jointed rush *Juncus articulatus*. Devil's-bit scabious *Succisa pratensis*, globeflower *Trollius europaeus*, northern hawk's-beard *Crepis paludosa* and northern marsh orchid *Dactylorhiza purpurella* are typically present, often on steep banks or the crests of slopes. Drier ground can support heath-grass *Danthonia decumbens*, burnet saxifrage *Pimpinella saxifrage* and zigzag clover *Trifolium medium*.

Rivers: The Rivers Irthing and King Water are part of the internationally important River Eden SAC. The Irthing is a natural and dynamic river which has allowed the development of gravel shoals which are important for wet woodland dominated by alder and an invertebrate fauna of species associated with river shingles and sandbanks.

Source: Border Uplands Natural Area Profile

7.2 Biodiversity Action Plan (BAP) priority habitats

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

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

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

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

Habitat	Area (ha)	% of NCA
Blanket bog	22,015	17
Upland heathland	7,409	6
Fen	1,094	1
Broadleaved mixed and yew woodland (broad habitat)	895	1
Lowland heathland	33	<1
Upland hay meadow	28	<1
Purple moor grass and rush pasture	23	<1
Lowland dry acid grassland	5	<1
Lowland meadows	4	<1

Source: Natural England (2011)

7.3 Key species and assemblages of species

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

8. Settlement and development patterns

8.1 Settlement pattern

This is a very sparsely populated NCA comprising remote farmhouses and small hamlets and villages principally located in the North Tyne, Redesdale and Lyne Valleys. The market town of Bellingham is the largest town in the area and is a popular stopping off point on the Pennine Way.

Source: Border Moors & Forests Countryside Character Area description; Countryside Quality Counts (2003)

8.2 Main settlements

The main settlements in the NCA are Bellingham and Otterburn.

Source: Border Moors & Forests Countryside Character Area description; Countryside Quality Counts (2003)

8.3 Local vernacular and building materials

Buildings are mainly constructed of the local Fell Sandstone with slate roofs. An unusual and distinctive building form is the bastle or fortified farmhouse, mainly constructed as protection against raiding Scots, with examples to the north-west of Bellingham and in Redesdale. The colour washed terraces of housing constructed for forestry workers by the Forestry Commission at Stonehaugh and Byrness are rather urban in character. The barracks of timber huts at Otterburn and Redesdale military camps are conspicuous elements in the landscape. Large framed and clad agricultural buildings and modern bungalows have replaced traditional buildings in some locations. The roofs are of red pantiles, slate or stone slates. Brick terraces are prominent in later industrial settlements.

Source: Border Moors & Forests Countryside Character Area description; Countryside Quality Counts (2003)

9. Key historic sites and features

9.1 Origin of historic features

Neolithic and Bronze Age clearance of the post-glacial woodland started the process leading to the formation of open moorland landscape. Burial cairns and field systems attest to the presence of these early settlers. Romano-British farmsteads, buried or traceable as earthworks, are widespread and may have provided produce, cattle and grain, for the Roman army. The well-preserved Roman road to the border runs through Redesdale, accompanied by perhaps the most important collection of marching camps in the Roman Empire. Medieval or earlier origins are likely for the scattered valley hamlets and farmsteads. Seasonal grazing in the uplands from the prehistoric period has left patterns of small shieling settlements, some adopted for permanent settlement in later centuries. The sparse historic settlements are typified by fell sandstone construction with slate roofs, the result of extensive rebuilding from the late 18th century. Small scale coal mining remains are widespread.

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

9.2 Designated historic assets

This NCA has the following historic designations:

- 1 Registered Park and Garden covering 117 ha
- 1 Registered Battlefield covering 227 ha
- 208 Scheduled Monuments
- 209 Listed Buildings

Source: Natural England (2010)

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

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

10. Recreation and access

10.1 Public access

- Sixty-four per cent of the NCA, 81,504 ha, is classified as being publically accessible, which is extremely high in a national context and reflects the large proportion of the NCA which is upland open access land and Forestry Commission woodland accessible to the public.
- There are 828 km of public rights of way at a density of 0.6 km per km².
- Forty-eight kilometres of the Pennine Way national trail passes through the NCA.

Sources: Natural England (2010)

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

Access designation	Area (ha)	% of NCA
National Trust (Accessible all year)	0	0
Common Land	761	<1
Country Parks	0	0
CROW Access Land (Section 4 and 16)	85,772	67
CROW Section 15	<1	<1
Village Greens	21	<1
Doorstep Greens	0	0
Forestry Commission Walkers Welcome Grants	2	<1
Local Nature Reserves (LNRs)	0	0
Millennium Greens	0	0
Accessible National Nature Reserves (NNRs)	5,383	4
Agri-environment Scheme Access	9	<1
Woods for People	56,068	44

Sources: Natural England (2011)

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

11. Experiential qualities

11.1 Tranquillity

Based on the CPRE map of tranquillity (2006) the Border Moors and Forests are an extremely tranquil area reflecting the vast expanses of forest and moorland that are present. The parts of the NCA with marginally less tranquillity are found along Redesdale, the North Tyne valley and around the southern and western fringes where most of the population of the area live and where there are associated roads, villages and farms.

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

Category of tranquillity	Score
Highest value within NCA	150
Lowest value within NCA	-12
Mean value within NCA	62

Sources: CPRE (2006)

- More information is available at the following address:
<http://www.cpre.org.uk/what-we-do/countryside/tranquil-places/in-depth/item/1688-how-we-mapped-tranquillity>

11.2 Intrusion

The 2007 Intrusion Map (CPRE) shows the extent to which rural landscapes are 'intruded on' from urban development, noise (primarily traffic noise), and other sources of visual and auditory intrusion. This shows a similar pattern to the Tranquillity Map with the NCA being essentially undisturbed throughout its area reflecting its low population and the limited intrusion of the minor roads and villages. A breakdown of intrusion values for this NCA is detailed in the table below.

Category of intrusion	1960s (%)	1990s (%)	2007 (%)	% change (1960s-2007)
Disturbed	<1	n/a	<1	<1
Undisturbed	99	99	100	1
Urban	n/a	n/a	n/a	n/a

Sources: CPRE (2007)

Notable trends from the 1960s to 2007 are virtually no change in intrusion over the period.

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

12. Data sources

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

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

Supporting document 2: Landscape change

Recent changes

Trees and woodlands

- There has been significant restructuring of coniferous plantations, with an increase in planting of broadleaved trees and open areas created along watercourses.
- There are agreements in place for expansion of upland oak and ash woodland, and exclusion of stock from wooded areas.
- Native broadleaved woodland is being encouraged through natural regeneration, the promotion of scrub growth and specific planting schemes.

Boundary features

- Countryside Quality Counts (CQC) data (1999–2003) indicates that there was a limited uptake of appropriate Countryside Stewardship agreements, representing only 3 per cent of the total boundary length. The majority of agreements related to fencing.
- Stone walls represent the greatest length of field boundaries in this NCA.

Agriculture

- There was significant uptake of Countryside Stewardship agreements for heather moorland enhancement and upland rough grazing between 1999 and 2003.
- There has been a reduction in the number of holdings and an increase in the size of holdings in recent years.

- There has been a 21 per cent reduction in sheep numbers and an 18 per cent reduction in cattle numbers between 2000 and 2009. There may be instances of Molinia grasses increasing due to undergrazing of pastures.
- Hay meadows are becoming increasingly scarce as farmers move to silage making in preference to hay making.

Settlement and development

- The area is subject to very low development pressures. There continues to be limited development in the NCA.
- There has been an increasing trend for converting farmsteads into holiday accommodation in recent years.
- There has been a recent increase in the development of cattle sheds associated with farmsteads in the NCA, allowing livestock to be kept in over the winter months.
- There has been an increase in the number of small-scale renewable energy installations such as small wind turbines and solar panels.
- A significant number of windfarms have been developed in neighbouring character areas and are now clearly visible from locations within the NCA.

Semi-natural habitat

- 39 per cent of SSSI land within the NCA was classified as in favourable condition at this time, and 60 per cent in recovering condition.
- Major blanket bog restoration projects took place from 1998 to 2003 and 2006 to 2009, increasing the extent of mire habitats, and enhancement of mire habitats has continued through clearance and control of conifer regeneration and grip blocking.
- Increase in *Molinia* grasses due to undergrazing is becoming a threat to heath and mire habitats.

Historic features

- CQC data indicates that 94 per cent of historic farm buildings were intact structurally, and remained unconverted to modern styles, as of 2003.
- There remains a lack of archaeological features recorded in forested areas.

Coast and rivers

- CQC data shows that biological and chemical river water quality remained very good as of 2003.
- There was limited evidence of uptake of Countryside Stewardship Schemes for the management of riparian habitats.

Minerals

- There are currently no proposed strategic minerals and waste sites within the NCA.
- Peat was formerly extracted from Bellcrag Flow but planning permission has now lapsed.
- The Forestry Commission operate small quarry sites within the forest estate for the maintenance of the forest road network.

Drivers of change

Climate change:

- Climate change is likely to cause a higher frequency of storm events resulting in an increased number of high flow 'spates' in upland rivers, increasing the risk of flooding in the valleys and downstream, as well as increased erosion of stream and river channels, and subsequent sedimentation both within the NCA and further downstream.
- Climate change is likely to have an impact on upland mire ecosystems. More frequent droughts could lead to drying out of peat, and a lengthened growing season may change the species composition of upland mire habitats.
- There may also be impacts on agriculture, for example by affecting the productivity and growing season of grazing pastures.
- Climate change may result in changes in commercially viable species used in conifer plantations.

Other key drivers

- Recognition of the importance of upland peat habitats for carbon storage is likely to result in an increasing drive for the protection and enhancement of blanket bog and mire within the NCA. The possible threat to these habitats due to an increase in the extent of *Molinia* grasses may increase the need for protection measures.
- There is also a drive for increasing connectivity of semi-natural habitats. In Kielder Forest and other plantations managed by Forest Enterprise, steps are being taken to further open up the forest along watercourses as well as increasing the amount of broadleaf planting.
- There is likely to be increasing pressure for wind farm development as a result of government targets for renewable energy generation. There may also be a demand for new hydropower schemes and increased production of wood fuel.
- The trend for converting farmhouses into holiday accommodation is likely to continue, to cater for visitors seeking recreational opportunities in the NCA.
- There may be a demand for increasing military training infrastructure at Spadeadam and on the Otterburn Ranges as a result of an increase in the amount of military training taking place in the UK.
- It is likely that visitor numbers will continue to increase, particularly in the National Park and Kielder Water and Forest Park, with potential benefits for the local economy, but putting further pressure on habitats and infrastructure, with increased risks of footpath and bridleway erosion, demand for car parks and signage, damage to vegetation and wildfires. There may be opportunities for green tourism and voluntary visitor payback in order to ensure that increased tourism has a net positive impact on the local environment and economy.

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.



Kielder Water enhances the sense of tranquillity in the NCA, as well as offering opportunities for recreation.

Statement of Environmental Opportunity	Ecosystem Service																		
	Food provision	Timber provision	Water availability	Genetic diversity	Biomass provision	Climate regulation	Regulating water quality	Regulating water flow	Regulating soil quality	Regulating soil erosion	Pollination	Pest regulation	Regulating coastal erosion	Sense of place/inspiration	Sense of history	Tranquility	Recreation	Biodiversity	Geodiversity
SEO 1: Protect the range of internationally important blanket bog habitats in the Border Mires, increasing the ability of the landscape to store carbon and enhancing the biological value of the many streams and rivers, and their role in regulating water supply, flow and quality.	↗ **	↘ **	↑ ***	↔ *	↘ **	↑ ***	↑ ***	↑ ***	↑ ***	↑ ***	↑ ***	↔ **	n/a	↑ **	↔ **	↗ **	↗ **	↑ ***	↔ *
SEO 2: Work with the farming community to retain the character of the upland farmed landscape and increase the value of local produce, while employing sustainable land management practices to increase biodiversity value associated with a range of grassland habitats.	↗ **	↔ **	↗ **	↑ ***	↔ **	↗ **	↑ ***	↑ ***	↑ ***	↑ ***	↑ ***	↔ **	n/a	↑ ***	↑ **	↔ **	↔ **	↑ ***	↔ ***

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

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

Statement of Environmental Opportunity	Ecosystem Service																		
	Food provision	Timber provision	Water availability	Genetic diversity	Biomass provision	Climate regulation	Regulating water quality	Regulating water flow	Regulating soil quality	Regulating soil erosion	Pollination	Pest regulation	Regulating coastal erosion	Sense of place/inspiration	Sense of history	Tranquility	Recreation	Biodiversity	Geodiversity
SEO 3: Enhance broadleaved and coniferous woodlands for their biodiversity and landscape value, their role in regulating climate change and soil erosion, and for the provision of timber and biomass, and ensure that planting occurs in appropriate locations.	↔ **	↑ ***	↑ ***	↔ ***	↑ ***	↑ ***	↑ ***	↑ ***	↑ ***	↑ ***	↔ **	↑ ***	n/a	↗ **	↔ **	↗ **	↗ **	↑ ***	↔ ***
SEO 4: Protect, and provide opportunities to access and enjoy, the inspirational qualities of the uplands including the wide views, dramatic landscape features such as Kielder Water, and the sense of remoteness and tranquillity.	↔ **	↗ **	↗ **	↔ **	↗ **	↗ **	↗ **	↗ **	↗ **	↗ **	↗ **	↔ ***	n/a	↑ ***	↑ **	↑ ***	↑ ***	↗ **	↗ **

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

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

Landscape attribute	Justification for selection
<p>Extensive upland plateau of broad, sweeping hills dissected by wide valleys, sparsely populated and with a strong sense of wildness, remoteness and tranquillity, and dark night skies.</p>	<ul style="list-style-type: none"> ■ Large expanses of upland moorland and forest give a wild and remote feel to the landscape. ■ Extensive views along wide, straight valleys to the south, towards the Cheviot Hills in the north-east, and across the Solway basin to the south-west. ■ Sparsely populated landscape with no large settlements, isolated farmsteads and hamlets in valleys, and very few major transport and communication links. ■ Few settlements thus very little light pollution. ■ Large extent of unfarmed land, with 67 per cent of the total area being open access land.
<p>Large extent and variety of peat dominated upland mire and blanket bog habitats.</p>	<ul style="list-style-type: none"> ■ Mire habitats including blanket bog (17 per cent), raised mire and intermediate mire set within open heather moorland (6 per cent) and forested areas. ■ Large areas of upland mire designated as Border Mires, Kielder–Butterburn Special Area of Conservation (SAC) and Irthinghead Mires Ramsar site, as well as a number of national nature reserves. ■ Locally distinctive mire habitats including fens and flushes at the head of valleys. ■ Lack of tree cover on open moorland contrasts strongly with neighbouring conifer plantations.
<p>Extensive conifer plantations including Kielder Forest forming a dramatic, constantly changing landscape around the slopes of Kielder Water and providing a habitat for iconic wildlife species.</p>	<ul style="list-style-type: none"> ■ Coniferous forest covers a large part (29 per cent) of the upland area. Woodland cover over the whole NCA is very high at 43 per cent. ■ Kielder Forest, the largest planted forest in northern Europe, creates a dramatic landscape with conifers clothing the winding slopes around Kielder Water, Britain's largest man-made lake. ■ Forests provide a habitat for iconic species such as red squirrel and osprey. ■ A popular destination for walkers, horse riders, cyclists and mountain bikers, water-based activities, and wildlife watching. ■ Forested areas are broken up by valleys, mires and smaller areas of broadleaf planting.

Landscape attribute	Justification for selection
<p>Network of streams and small rivers draining the uplands flowing into enclosed valleys.</p>	<ul style="list-style-type: none"> ■ Narrow gorges and sandstone crags characterise rivers in their upper reaches, and important geological deposits are exposed in places. ■ Valleys shelter enclosed pasture in regular fields and woodland copses around farmsteads and small hamlets. ■ Rivers support important salmon fisheries and other protected and priority species such as otter. ■ Lines of deciduous trees along rivers and areas of alder-dominated wet woodland, particularly along the River Irthing to the south-west.
<p>Upland farmed landscape of enclosed pastures and scattered farmsteads on the slopes of wide valleys, raising traditional livestock breeds.</p>	<ul style="list-style-type: none"> ■ Upland farmland comprising a mixture of hay meadows, improved and semi-improved pastures. ■ Traditional, hardy breeds of cattle and sheep which are well adapted to the harsh climatic conditions. ■ Regular fields enclosed mainly by drystone walls. ■ Scattered farmsteads, most of which are built in the traditional vernacular style from local stone, with slate roofs. ■ Small copses of deciduous woodland mainly grouped around farmsteads.
<p>Archaeological and historic evidence of Roman occupation and later settlement patterns.</p>	<ul style="list-style-type: none"> ■ Evidence of the Dere Street Roman road with fortifications and possibly the most important collection of marching camps in Europe along its route. ■ Remains of shieling settlements from prehistoric times, providing evidence of seasonal occupation of the landscape. ■ Fortified 'bastles' built during periods of border warfare, integrated into present day stone-built farmsteads.

Landscape opportunities

- Protect the tranquillity of the large expanses of upland moorland and forest and their sense of wildness and remoteness.
- Protect the range of internationally important upland mire habitats and the peaty soils required to support them.
- Protect and manage upland hay meadows by cutting for hay, rather than silage, maintaining grazing at an appropriate level using traditional livestock breeds, and avoiding the use of artificial fertilisers.
- Enhance the biodiversity and landscape value of conifer plantations by increasing the number of species and age range of trees, including small seed species to benefit red squirrels and including areas of broadleaf planting and open land, especially alongside watercourses.
- Protect the quiet rural character of the valleys and their characteristic stone built farmsteads and small hamlets, and ensure that local building stone and slate roofs are used in new builds and the restoration of farmhouses.
- Conserve existing ancient semi-natural woodland and seek opportunities to expand the area of native broadleaved woodland.
- Encourage woodland planting on lower valley slopes where it complements and enhances landscape character.
- Conserve and extend riparian habitats, in particular alder-dominated wet woodland.
- Enable natural river flows and support active natural processes that contribute to geomorphological features such as gravel shoals and sand banks.
- Maintain and enhance facilities at Kielder Forest and elsewhere for outdoor recreational activities including walking, riding, cycling, water-based activities and wildlife watching, in order to help people enjoy and understand the landscape and to improve their physical and mental health and wellbeing.
- Maintain the surface of the Pennine Way National Trail to allow people to enjoy using this route while minimising the impact of erosion on surrounding land.
- Protect, and provide interpretation of, geodiversity, the archaeological remains of Roman roads and marching camps, and the evidence of shieling settlements in order to improve visitor knowledge, understanding and enjoyment of these features.
- Protect the bastles, and provide interpretation about the landscape that resulted from border conflicts.
- Protect dark night skies by controlling lighting levels around settlements and promoting efficient external lighting.

Ecosystem service analysis

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

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

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Food provision	Livestock rearing	<p>Rearing of hardy breeds of sheep and cattle predominates. Only 41 per cent of the NCA is farmed land.</p> <p>The majority of that area is grade 5 agricultural land with some grade 4 land and a very small amount of grade 3 land.</p>	Regional	<p>Soil quality is poor due to the high altitude and prevailing climate of high rainfall and low temperatures, limiting agriculture to livestock rearing. Hardy breeds of livestock have traditionally been reared, which are able to withstand the climatic conditions and poor quality grazing, and are characteristic of the upland farmland in this NCA.</p> <p>Mire habitats are sensitive to grazing pressure and overgrazing of sheep in the uplands has been an issue in the past, but there has been a reduction in grazing pressure in recent years. In some areas, reduction in cattle numbers on rough</p> <p>Continued on next page...</p>	<p>Encourage the uptake of agri-environment schemes and work with the farming community to maintain grazing at appropriate levels across a range of habitats, for example increasing cattle numbers on rough grassland within key periods in the farming calendar to reduce the spread of <i>Molinia</i> where required.</p> <p>Promote the marketing of local produce from traditional livestock breeds, and the link between these breeds and the unique upland landscape of the NCA.</p>	<p>Food provision</p> <p>Biodiversity</p> <p>Sense of place / inspiration</p>

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Food provision cont.				<p>... continued from previous page</p> <p>grassland has led to an increase in the spread of <i>Molinia</i>, which threatens the species diversity of wet heath habitats. Undergrazing may also reduce the suitability of rough grassland for breeding waders. Maintaining grazing at an appropriate level will help to ensure that livestock rearing can continue sustainably.</p> <p>Marketing locally sourced food, and the link between hardy breeds and the local environment, can play an important role in supporting tourism in the area, and in the process help encourage a locally sustainable green economy.</p>		

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Timber provision	Conifer plantations	<p>Woodland cover is very high, at 43 per cent, while conifer plantations cover around 29 per cent of the NCA and consist principally of Norway and Sitka spruce, with pine and larch, in varying stages of maturity. Kielder Forest is the largest plantation in the NCA, with significant plantations also at Kershope Forest, Redesdale Forest, Spadeadam and Wark Forest.</p> <p>Broadleaved woodland represents only 1 per cent of the NCA and mixed woodland less than 1 per cent.</p>	National	<p>Timber production represents a very significant land use within this NCA, with large swathes of open moorland having been converted to forestry in the 20th century. Recently there has been an increase in the amount of broadleaf planting within conifer plantations, coupled with opening up woodlands to provide a mosaic of habitats and increase biodiversity, particularly along watercourses. Plantations can also be managed to provide access for recreational activities.</p> <p>Planting of a greater variety of species in conifer plantations would increase resilience to disease, and may also help to adapt to the potential future impacts of climate change.</p> <p>Encroachment from conifers has represented a threat to many of the NCA's mire habitats due to succession and the drying out of peat, with subsequent impacts on soil and water quality. Recent restoration programmes have seen plantations pulled back from key mires sites; however, it will be necessary to continue to manage conifer encroachment. Steep lower valley slopes may provide appropriate sites for replacement planting as they are often unsuitable for agriculture.</p> <p>Harvesting timber has the potential to contribute to sedimentation and acidification of watercourses, and should be carefully managed to try to avoid adverse impacts on water quality.</p> <p>Feral goats have the potential to impact on young tree crops if their population is allowed to increase.</p>	<p>Continue to harvest timber sustainably while allowing the forests to perform other functions such as carbon sequestration.</p> <p>Increase the variety of species which can be harvested sustainably within conifer plantations.</p> <p>Manage the spread of self seeded conifers and encourage replacement planting in more suitable locations where it will complement and enhance landscape character, for example lower valley slopes.</p> <p>Follow good forestry practice in order to avoid sedimentation and acidification of watercourses.</p> <p>Manage feral goat numbers to prevent impact on young tree crops.</p>	<p>Timber provision</p> <p>Biomass energy</p> <p>Biodiversity</p> <p>Climate regulation</p>

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Water availability	<p>High rainfall</p> <p>Rivers</p> <p>Reservoirs</p> <p>Mires and other semi-natural habitats</p>	<p>The NCA falls within the areas of the Eden and Esk Catchment Abstraction Management Plan (CAMS)⁴ and the Tyne CAMS⁵. It does not overlay any major aquifers and surface water resources within the NCA have 'water available' status with the exception of the River Irthing (a tributary of the River Eden) which is classed as 'over abstracted'.</p> <p>Principal uses of water abstracted from the Tyne catchment are public water supply for downstream settlements (for example Newcastle and Gateshead) and regulation of water to ensure continued supplies in the region's rivers through water transfers.</p> <p>Kielder Water forms a key part of a regional water transfer network. Water can be transferred via the Tyne-Tees tunnel to the River Wear and, if required, River Tees catchments. Catcleugh Reservoir is also a principal source of water for the city of Newcastle.</p> <p>Water is abstracted from the Eden and Esk CAMS area for a variety of purposes, including industrial use, public water supply, farming, private water supply, hydropower and bottling.</p>	National	<p>Water supply to downstream areas is a key provisioning service, both to areas within the catchment of rivers within the NCA, and also when required to other catchments further south.</p> <p>Large volumes of water are retained in the upland mires and there is a dense network of upland streams feeding the main rivers. The extensive woodland cover and areas of permanent grasslands help to maintain high infiltration levels. It will be important to ensure that upland blanket bogs are active and well vegetated, so that water infiltration and water storage capacity are improved.</p> <p>The River Irthing and King Water both form part of the River Eden Special Area of Conservation, and so it will be important to ensure that abstraction from these rivers is controlled in order to prevent impacts on habitats downstream.</p>	<p>Ensure that appropriate moorland management measures are put in place to maintain vegetative cover and the growth of bryophytes, in order to increase water storage on peat-dominated habitats.</p> <p>Support water resource and supply management, water conservation and water-use efficiency measures to prevent over-abstraction impacting on the River Irthing and River Kingwater.</p>	<p>Water availability</p> <p>Biodiversity</p> <p>Climate regulation</p> <p>Regulating water quality</p> <p>Regulating water flow</p> <p>Regulating soil quality</p> <p>Regulating soil erosion</p>

⁴ The Eden and Esk Catchment Abstraction Management Strategy, Environment Agency (2013; accessed from: www.environment-agency.gov.uk/research/planning/40197.aspx)

⁵ Tyne Catchment Abstraction Management Strategy, Environment Agency (2013; accessed from: www.environment-agency.gov.uk/research/planning/40197.aspx)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Genetic diversity	Traditional breeds and varieties	<p>The NCA supports several herds of rare breed cattle such as Black Galloway and White Shorthorn.</p> <p>Traditional sheep breeds in the NCA include the Cheviot and Blackface.</p> <p>The Kielder feral goat, a descendent of domestic goats, now roams the area wild.</p>	Local	<p>Due to the climatic conditions in this NCA, hardy breeds of livestock predominate and so rare breeds have been maintained here which are no longer found in areas with more productive pastures. Promoting produce from these breeds can help to encourage a green economy that supports local tourism.</p>	<p>Promote the marketing of local produce from traditional breeds including meat, milk and wool.</p> <p>Promote the husbandry of traditional livestock breeds, for example through agri-environment schemes.</p>	<p>Genetic diversity</p> <p>Food production</p>
Biomass energy	Woodland	<p>Woodland cover is very high (43 per cent).</p> <p>There are 9 boilers and 5 woodfuel suppliers in the area (Forestry Commission 2012)</p> <p>There is mixed potential for biomass planting.</p>	Regional	<p>Existing woodland cover offers very high potential for the provision of biomass and woodfuel as by-products of commercial timber production. This has been put to use in a community district heating system powered by woodfuel at Kielder village.</p> <p>Coppicing may also be appropriate in some areas of broadleaved woodland.</p> <p>For information on the potential landscape impacts of biomass plantings within the NCA, refer to the tables on the Natural England website⁶.</p> <p>Short Rotation Coppice (SRC) yield is high in the lower land to the south and east but low in the uplands that cover much of the NCA. Potential miscanthus yield is low across most of the NCA and is not likely to be a useful biomass source.</p>	<p>Seek opportunities to increase the production of biomass and woodfuel as by-products of timber production.</p> <p>Promote opportunities for further community woodfuel initiatives.</p> <p>Manage broadleaved woodlands by coppicing where appropriate.</p>	<p>Biomass energy</p> <p>Timber provision</p> <p>Water availability</p>

⁶ www.naturalengland.org.uk/ourwork/farming/funding/ecs/sitings/areas/default.aspx

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Climate regulation	Peaty soils Woodland	<p>Soil carbon levels are high (20-50 per cent) across much of this NCA, associated with the large tracts of blanket bog and upland heath and the generally peaty soils found across its upland moorland area.</p> <p>Soils under woodland within the NCA (43 per cent of its area) are also relatively high in carbon and the woodland itself is important in sequestering and storing carbon.</p>	International	<p>Upland peatlands play a very important role in climate regulation due to their ability to store large amounts of carbon when managed appropriately. Woodlands are also an important carbon sink. Considering the large extent of both peaty soils and woodland cover, climate regulation through carbon sequestration is one of the most significant services offered by the NCA.</p> <p>Climate change is likely to result in an increased incidence of storm events, as well as more frequent summer droughts.</p> <p>Upland mire and wet heath habitats have previously been damaged by drainage and overgrazing. Damage to peat soils can lead to the release of previously stored carbon through oxidation. However, much work has been done in recent years to restore the integrity of these habitats.</p> <p>Continued on next page...</p>	<p>Use appropriate moorland management, for example grip blocking and controlled grazing regimes to encourage active bog formation with a high level of vegetative cover, to protect the peat and increase carbon sequestration.</p> <p>Seek to avoid any damage to peat through burning practices, and limit the effect of artificial drainage upon the hydrology.</p> <p>Encourage extensive grazing regimes and low or nil artificial fertiliser input to maintain carbon capture on upland pastures.</p> <p>Maintain and create links between semi-natural habitats across the farmed environment.</p>	<p>Climate regulation</p> <p>Biodiversity</p> <p>Geodiversity</p> <p>Water availability</p> <p>Regulating water quality</p> <p>Regulating water flow</p> <p>Regulating soil quality</p> <p>Regulating soil erosion</p>

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Climate regulation cont				<p>... continued from previous page</p> <p>Continued restoration of bare and eroded peat should be prioritised and can be achieved through management measures such as grip blocking, increasing Sphagnum cover and controlled grazing regimes, as well as preventing inappropriate management such as burning too frequently. Appropriate management will help to ensure that blanket bogs are active, therefore increasing carbon sequestration. Maintaining a high level of vegetation cover on moorland habitats will also help to ensure that they are resilient to changing climatic conditions and storm events.</p> <p>Grazing regimes should be carefully managed on upland pastures in the valleys, and extensive livestock rearing with minimal fertiliser input encouraged, ensuring carbon capture.</p> <p>The carbon sequestration role of forests and woodlands can be maintained and increased through appropriate management. Increasing woodland cover will be most appropriate on valley slopes, where it will not impact on the most valuable farmland or on other habitats with an important carbon capture role including areas of deep peat. Woodland also helps to reduce water temperature in streams and rivers, reducing the impact of climate change on aquatic organisms.</p>	<p>Manage woodlands and plantations appropriately to improve their role in carbon capture.</p> <p>Increase broadleaved woodland cover on valley slopes, avoiding planting on deep peat.</p>	

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating water quality	Rivers	<p>The water quality of tributaries of the River Lyne and Eden within the south west part of the NCA varies from good to poor, while groundwater quality in this part of the NCA is good⁷.</p> <p>The ecological status or potential of the headwaters of the River North Tyne and tributaries is generally moderate with the exception of most of the River Rede which is good. Kielder Water and Catcleugh Reservoir have moderate ecological potential.</p> <p>The chemical status of groundwater in the North Tyne catchment is poor.</p> <p>The chemical status of surface water bodies in the North Tyne catchment is moderate. This is principally due to copper content and is caused by the naturally high acidity of the water⁸.</p> <p>Water quality fails to meet Water Framework Directive targets if assessed as moderate or poor.</p>	Regional	<p>Erosion of upland peat soils causes an increase in sediment entering watercourses, often resulting in the discolouration of water, increased acidity and a reduction in water quality. The increase in storm events and summer droughts resulting from climate change may exacerbate peat erosion.</p> <p>Although the large extent of woodland cover can help to stabilise soil, coniferous trees increase acidification of watercourses and the encroachment of conifers onto mire and wet heath habitat can cause drying out of the peat, thereby increasing the risk of erosion. Forestry operations such as drainage, forest road construction and harvesting have the potential to increase sedimentation and acidification of watercourses. Clear felling in particular poses the risk of siltation.</p> <p>Poaching by livestock around watercourses on upland farmland can lead to increased run-off and diffuse pollution. This can be reduced by implementing more active livestock husbandry and by restricting access by livestock to the river banks, which are particularly vulnerable to poaching. Permanent grassland, scrub and woodland strips alongside watercourses will also help to reduce sediment run-off on upland farmland by increasing infiltration rates. Sheep dips pose a constant risk of water pollution and their use will need to continue to be very carefully managed.</p>	<p>Seek to avoid any damage to peat through burning practices, and limit the effect of artificial drainage upon the hydrology.</p> <p>Avoid damage to woodland soils, sedimentation and acidification by following good forestry practice.</p> <p>Encourage extensive livestock rearing in upland pastures and restrict access to vulnerable river banks by livestock.</p> <p>Maintain permanent grassland and woodland strips alongside watercourses within upland pastures.</p> <p>Manage the use of sheep dips and subsequent stock movement to reduce the risk of pollution to soils and watercourses.</p>	<p>Biodiversity</p> <p>Geodiversity</p> <p>Climate regulation</p> <p>Water availability</p> <p>Regulating water quality</p> <p>Regulating water quality</p> <p>Regulating soil quality</p> <p>Regulating soil erosion</p>

⁷ Solway Tweed River Basin Management Plan, Environment Agency and Natural Scotland (2012; accessed from: www.sepa.org.uk/water/river_basin_planning.aspx)

⁸ Northumbria River Basin Management Plan, Environment Agency (December 2009; accessed from: www.environment-agency.gov.uk/research/planning/33106.aspx)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating water flow	Rivers	<p>The majority of this NCA is drained by tributaries of the River North Tyne, one of the two main tributaries of the River Tyne which has a long history of flooding. In addition to the River North Tyne itself which drains Kielder Water, these include the River Rede (which drains Catcleugh Reservoir), Chirdon Burn, Blacka Burn, and Warks Burn. These headwaters drain remote moorland and flow through narrow, steep valleys over soils often saturated by heavy rainfall, leading to a propensity to downstream flood risk, notably in the settlements of Hexham in Tyne Gap and Hadrian's Wall NCA, and Newcastle and Gateshead in Tyne and Wear Lowlands NCA. However, downstream water flow is regulated by the two major reservoirs.</p> <p>Continued on next page...</p>	Regional	<p>The Environment Agency's preferred approach to river flood risk management includes promotion of upland land management practices that reduce the amount and rate of run-off⁹. Ensuring active blanket bog formation and the growth of bryophytes increases surface roughness, affording increased water storage and reducing run-off rates within associated sub catchments.</p> <p>Interception of rainfall by the large extent of woodland within this NCA also plays an important role in flood regulation, although inappropriate drainage in managed forests has the potential to increase soil erosion and run-off rates.</p> <p>Reducing compaction on upland pastures can also help to reduce run-off rates, and creating woodland and permanent grassland strips alongside watercourses will help to increase infiltration.</p>	<p>Encourage the growth of bryophyte and other vegetation associated with active blanket bog formation.</p> <p>Avoid damage to woodland soils and reduce run-off rates by using appropriate drainage techniques within managed forests.</p> <p>Encourage extensive livestock rearing in upland pastures and restrict access to the river banks which are most vulnerable to erosion by livestock, in order to reduce run-off rates.</p> <p>Maintain permanent grassland and woodland strips alongside watercourses within upland pastures.</p> <p>Enable natural river flows in order to support natural dynamic processes.</p>	<p>Biodiversity</p> <p>Geodiversity</p> <p>Climate regulation</p> <p>Water availability</p> <p>Regulating water quality</p> <p>Regulating water flow</p> <p>Regulating soil quality</p> <p>Regulating soil erosion</p>

⁹ Tyne Catchment Flood Management Plan Summary Report, Environment Agency (December 2009; accessed from www.environment-agency.gov.uk/research/planning/33586.aspx)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating water flow cont		<p>... continued from previous page</p> <p>The south-western part of the NCA is drained by headwaters of the River Lyne (Black Lyne and White Lyne) and River Eden (River Irthing and King Water) which flow to the Solway Firth in Solway Basin NCA. It is in Carlisle and low lying agricultural land in this adjoining lowland NCA where the main fluvial flood risk in the Eden catchment occurs. Carlisle experienced major flooding in January 2005 and November 2009.</p>		<p>Allowing rivers to follow their natural course will support active natural dynamic processes that contribute to the formation of geomorphological features such as gravel shoals and sandbanks.</p> <p>In the rural parts of the catchment of the Rivers Lyne and Eden, the Environment Agency recommends the take-up of Environmental Stewardship schemes to contribute to flood risk management¹⁰.</p>		

¹⁰ *Eden Catchment Flood Management Plan Summary Report*, Environment Agency (December 2009; accessed from: <http://www.environment-agency.gov.uk/research/planning/33586.aspx>)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating soil quality	Peaty soils Other upland, valley side and valley bottom soils	The majority of soils in this NCA are wet upland soils. Slowly permeable very wet very acid upland soils with a peaty surface make up 50 per cent of the NCA and blanket bog peat soils 21 per cent. Other soils include slowly permeable seasonally wet slightly acid but base-rich but loamy and clayey soils (9 per cent), raised bog peat soils (6 per cent), very acid loamy upland soils with a wet peaty surface (5 per cent), slowly permeable seasonally wet acid loamy and clayey soils (5 per cent) and loamy soils with naturally high groundwater (2 per cent).	Local	Peat soils can store and sequester carbon when they are appropriately managed, but oxidation can occur when they dry out, causing the loss of organic matter and increasing their vulnerability to erosion. This has been exacerbated in the past by drainage, and the encroachment of coniferous woodland onto areas of wet heath and mire may also cause soils to dry out. Woodland soils are also vulnerable to damage from forestry operations. The integrity of peat soils has been much improved by recent work to restore active bogs across much of the area. Continuing land management practices which encourage an appropriate level of vegetation growth, as well as the control of conifer encroachment, will help to maintain the organic content of peat soils. Extensive livestock rearing regimes will ensure that organic content of upland soils is maintained.	Avoid any damage to peat through burning, and limit the effect of artificial drainage upon the hydrology. Avoid damage to woodland soils by following good forestry practice. Control the spread of coniferous woodland into mire sites and deep peat habitats, for example by manual pulling. Use moorland management techniques such as grip blocking where required, to restore the hydrology and an appropriate level of vegetation cover on peat soils which encourages active bog formation upon areas of deep peat. Encourage extensive livestock rearing and manage grazing levels in upland pastures, with limited or no use of artificial fertilisers to increase organic content of the soil.	Biodiversity Geodiversity Climate regulation Water availability Regulating water quality Regulating water flow Regulating soil quality Regulating soil erosion

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating soil erosion	Peaty soils Other upland, valley side and valley bottom soils	The majority of soils in this NCA are wet upland soils. Slowly permeable very wet very acid upland soils with a peaty surface make up 50 per cent of the NCA and blanket bog peat soils 21 per cent. Other soils include slowly permeable seasonally wet slightly acid but base-rich but loamy and clayey soils (9 per cent), raised bog peat soils (6 per cent), very acid loamy upland soils with a wet peaty surface (5 per cent), slowly permeable seasonally wet acid loamy and clayey soils (5 per cent) and loamy soils with naturally high groundwater (2 per cent).	Local	<p>Peat soils are vulnerable to erosion at times of high water flow and during high winds. Oxidation caused by drying out of peat increases their vulnerability to erosion. This has previously been exacerbated by moorland drainage overgrazing and unsustainable moorland management. This coupled with the increased incidence of storm events and summer droughts resulting from climate change is likely to increase the erosion risk. Maintaining an appropriate vegetation cover on upland peat soils helps to reduce erosion rates and much work has been done in recent years to restore active blanket bogs.</p> <p>There is a localised erosion risk as a result of trampling and compaction along the Pennine Way National Trail, and this will need to be carefully managed.</p> <p>Although the large extent of woodland cover can help to maintain soil stability across the uplands as a whole, the encroachment of coniferous woodland into areas of mire and wet heath may cause soils to dry out locally and therefore increase erosion risk. This can also be the case where forestry has been established upon areas of deep peat. Clear felled and recently planted woodland areas are also vulnerable to erosion, and forestry operations such as the construction of roads have the potential to destabilise soils.</p> <p>Continued on next page...</p>	<p>Avoid any damage to peat through burning, and limit the effect of artificial drainage upon the hydrology.</p> <p>Manage the impact of trampling and compaction along the Pennine Way.</p> <p>Avoid damage to peat and woodland soils by following good forestry practice.</p> <p>Control the spread of coniferous woodland into mire sites, for example by manual pulling.</p> <p>Use moorland management techniques, such as grip blocking where required, to restore the hydrology and an appropriate level of vegetation cover on peat soils which encourages encourage active bog formation upon areas of deep peat.</p> <p>Encourage extensive livestock rearing and appropriate cutting regimes, with limited or no use of artificial fertilisers to increase organic content of the soil.</p>	<p>Biodiversity</p> <p>Geodiversity</p> <p>Climate regulation</p> <p>Water availability</p> <p>Regulating water quality</p> <p>Regulating water flow</p> <p>Regulating soil quality</p> <p>Regulating soil erosion</p>

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating soil erosion cont				<p>... continued from previous page</p> <p>Upland pastures are vulnerable to compaction and erosion due to overgrazing, and extensive livestock rearing and appropriate cutting regimes will help to minimise this.</p>	<p>Restrict access to watercourses by livestock, to avoid poaching and sedimentation of water.</p>	
Pollination	<p>Heather moorland</p> <p>Mire habitats</p> <p>Species-rich grassland</p>	<p>Heather moorland offers an important habitat for pollinating insects. Other valuable semi-natural habitats in the NCA offering opportunities for pollination include the mosaic of upland mire habitats and species-rich upland grassland.</p>	Local	<p>Although reduced due to afforestation, there is still a large extent of semi-natural habitats supporting pollinating insects in the NCA.</p> <p>Within this landscape there few commercially grown food crops to benefits from the population of pollinating invertebrates and any benefit is likely to be small scale.</p>	<p>Ensure heather moorland is managed appropriately to maintain a high level of vegetative cover.</p> <p>Protect, and seek opportunities to expand, species-rich grasslands within the farmed landscape of sheltered valleys.</p>	<p>Pollination</p> <p>Biodiversity</p>
Pest regulation	Woodland	Single species conifer stands are vulnerable to outbreaks of disease.	Local	The risk of disease outbreaks can be reduced by maintaining a high species diversity and planting disease-resistant strains.	Increase species diversity of both coniferous and broad-leaved woodlands.	

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
A sense of place/ inspiration	<p>Large scale upland landscape</p> <p>Extensive coniferous forest</p> <p>Enclosed valleys</p> <p>Upland pastures</p> <p>Stone farmhouses</p> <p>Archaeological remains</p>	<p>A sense of place is provided by the large scale of this high undulating plateau of sweeping moorland, wide, long distance views, and dark skies, which is likely to inspire feelings of inspiration, escapism and solitude.</p> <p>The treeless moorlands contrast with the vast areas of coniferous forest, consisting of a patchwork of felled areas and different age-classes of non-native conifers, which dominate large parts of the NCA, with Kielder Forest forming a dramatic landscape around Kielder water reservoir.</p> <p>Isolated and enclosed valleys punctuate the undulating plateau, accommodating a network of small rivers and streams and providing sheltered sites for a few hamlets and small villages.</p> <p>The upland pastures in the larger valleys are characterised by large open, rectangular, windswept fields subdivided by dry stone walls or thin hedgerows.</p> <p>The sense of place is further reinforced by the vernacular building style of the scattered stone farmhouses with slate roofs on the upper slopes, contrasting with the more modern timber construction in Forestry Commission housing and some military buildings.</p> <p>Archaeological remains are to be found throughout the NCA.</p>	National	<p>The large-scale, sparsely populated upland nature of this NCA is the principal feature which determines its sense of place, with inspiration provided by long distance views, and feelings of remoteness and wildness.</p> <p>Kielder Water and the large tracts of coniferous forest, although recent additions to the landscape, add to its dramatic nature and are important in defining the sense of place.</p> <p>Valleys dividing the uplands, with their farmsteads and upland pastures grazed by traditional breeds of sheep and cattle, are also important in defining sense of place.</p>	<p>Protect the sense of remoteness of the upland landscape by controlling inappropriate development.</p> <p>Protect the traditionally built stone farmhouses, using local materials and building styles when repairing and restoring.</p> <p>Protect the character of small hamlets and villages in the river valleys by avoiding inappropriate development.</p> <p>Support the upland farmland economy by marketing local produce, and encouraging uptake of agri-environment schemes supporting sustainable farming using traditional breeds.</p> <p>Maintain and restore drystone walls.</p>	<p>Food provision</p> <p>Sense of place / inspiration</p> <p>Tranquillity</p>

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Sense of history	<p>Underlying geology</p> <p>Archaeological evidence of prehistoric land use</p> <p>Roman remains</p> <p>Fortified 'bastles'</p> <p>Shieling settlements</p> <p>Enclosed pastures, drystone walls</p> <p>Coal mining remains</p>	<p>A sense of landscape history and evolution is given by the underlying geodiversity that underpins the characteristics of the NCA. Geological deposits preserve evidence of past environments, biodiversity and climates.</p> <p>Archaeological evidence of prehistoric land use, settlements and ritual sites such as burial cairns are evident throughout the NCA.</p> <p>Roman forts and marching camps are evident along the Roman road of Dere Street. The road itself is also well preserved, together with a branch road towards the east coast.</p> <p>Defensible farmhouses ('bastles') are notable in the eastern valleys, which are attributable to the border warfare up to the 16th century.</p> <p>The presence of shieling settlements is an indication of seasonal occupation of the uplands. Linear farmsteads are common in the lower valleys of the North Tyne and Redesdale, while 18th and 19th century agricultural improvements in the form of enclosed pasture divided by walls and fences are also evident.</p> <p>Continued on next page...</p>	National	<p>There is a strong sense of history in this NCA, with evidence from many periods from pre-history to more recent times.</p> <p>Many aspects of history are strongly associated with the location of the NCA on the English - Scottish border. This was close to the northernmost limit of the Roman Empire in Britain, as evidenced by the Roman forts and marching camps. The post-mediaeval period of intermittent border warfare involving the Border Rievers influenced settlement patterns and has left its mark on the landscape, with fortified farmhouses dating from this period.</p> <p>The history of farming, with a gradual transition from seasonal occupation to more settled agriculture, is evident in the landscape and is attributable to both a amelioration in climate and a reduction in border warfare.</p>	<p>Preserve architectural remains of prehistoric features, Roman forts and roads, and shieling settlements, and take measures to prevent damage to them due to inappropriate land management and erosion.</p> <p>Support further research to identify archaeological and historic features, record new finds and provide interpretation and educational experiences to help people understand their significance.</p> <p>Identify local landscapes where there are a number of related features and seek to protect them and provide interpretation of the evidence from different historic periods.</p> <p>Control inappropriate conversion of fortified farmsteads to prevent the loss of historic features.</p>	<p>Sense of history</p> <p>Sense of place/ inspiration</p> <p>Recreation</p>

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Sense of history cont		<p>... continued from previous page</p> <p>Reminders of an industrial past are also evident in the remains of widespread small scale coal mining, including spoil heaps and disused railway lines.</p>			<p>Restore vernacular and historic buildings using local materials and building styles.</p> <p>Identify and interpret coal mining and other industrial artefacts and features.</p>	

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Tranquillity	<p>Remote upland moorlands and forests</p> <p>Quiet rural valleys</p> <p>Lack of settlements</p> <p>Dark night skies</p>	<p>Tranquillity is a significant feature of the NCA. 100 per cent of the area is classified as 'undisturbed' according to CPRE data. Against this measure, this NCA and the neighbouring Cheviots NCA are some of the most undisturbed areas in England. This NCA is also one of the most tranquil in England.</p> <p>With its low population and lack of settlements and consequent low level of light pollution, the area has some of the darkest night skies in the country.</p>	National	<p>The sparse nature of settlement in this NCA creates a sense of remoteness, tranquillity and solitude. Transport links are also sparse with only one major road running through the NCA. Dark night skies also contribute to the sense of tranquillity and, at the time of writing (2013), the Northumberland National Park has applied to be awarded International Dark Skies Reserve status.</p> <p>The large Kielder and Catcleugh Reservoirs also contribute to the sense of tranquillity, as do the more intimate upland valleys with their tumbling small rivers and streams, and the quiet rural lower valley sections.</p> <p>Perceptions of tranquillity and solitude are affected by military training activities at Spadeadam Forest and Otterburn and to some extent by forestry operations, although effects from the latter are generally very localised.</p> <p>It will be important to protect the tranquillity of the NCA so that it can continue to have a calming and restorative effect on peoples' health and well-being.</p>	<p>Protect the tranquillity and sense of remoteness and solitude of the upland landscape by controlling inappropriate development.</p> <p>Protect dark skies by controlling the amount and type of lighting used, and increasing efficiency and shielding of existing lighting.</p>	<p>Sense of place / inspiration</p> <p>Tranquillity</p>

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Recreation	Open access land	There is a very large amount of Access Land covering 85,772 ha or just over 67 per cent of the NCA. In addition, accessible woodlands account for 56,068 ha or 44 per cent of the NCA, and Accessible National Nature Reserves cover 5,383 ha or 4 per cent of the area.	National	<p>The upland nature of the NCA, with large amounts of uncultivated open access land, makes it highly suitable for active recreation and this is one of the most important services offered by the NCA. The dramatic landscapes, sense of wildness and remoteness, iconic wildlife species and dark night skies are likely to appeal to those seeking an escape from large urban centres.</p> <p>Although there is a fairly limited network of rights of way, the forests are able to absorb large number of visitors and much of the public forest estate is accessible. Kielder Forest in particular is well equipped with trails for walkers, cyclists and horse riders.</p> <p>The Pennine Way National Trail provides the challenge of a long distance walking route through and beyond this NCA. Trampling and compaction along this popular route poses a risk of localised erosion, and this will need to be carefully managed, for instance by maintaining a good quality surface along the route which will help to minimise spreading.</p> <p>Continued on next page...</p>	<p>Maintain open access opportunities and recreational opportunities in forests and on Kielder Reservoir for walkers, cyclists, horse riders and for water based activities, providing suitable provision for users of all abilities.</p> <p>Maintain and repair the Pennine Way National Trail, and other access routes to allow its continued enjoyment by walkers while helping to reduce erosion on surrounding land.</p> <p>Protect dark skies by controlling the amount and type of lighting used, and increasing efficiency and shielding of existing lighting.</p>	Recreation
	Accessible woodland					
	Accessible National Nature Reserves					
	Public rights of way	Rights of way in the NCA total 828 km, at a density of just over 0.65 km per km ² , including the Pennine Way National Trail, as well as the 'Reivers Way' long distance footpath.				
	Pennine Way and Pennine Bridleway National Trails	Kielder Water offers opportunities for angling and other water sports, and the surrounding Kielder Forest has art installations and trails for walkers and mountain bikers, with an easy access trail around the reservoir. There are also opportunities for watching ospreys and other wildlife, and for angling on the River Tyne.				
	Long distance footpaths	Dark night skies provide an attraction for star gazers and amateur astronomers, supported by the Kielder Observatory.				
	Kielder Water	Grouse shooting is carried out on some areas of heather moorland.				
	Kielder Forest	Northumberland National Park, which covers 39 per cent of the NCA, offers further opportunities for public access and tourism.				
	Northumberland National Park					
Dark night skies						

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Recreation cont				<p>... continued from previous page</p> <p>Much of the more heavily waterlogged moorland is not particularly suitable for recreation. It will be important to ensure that access in these areas, including provision of tracks for grouse shooting, is managed appropriately to prevent damage to sensitive upland habitats.</p>		

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Biodiversity	<p>Internationally and nationally designated sites</p> <p>BAP priority habitats</p> <p>Protected and priority species</p>	<p>The NCA has five Special Areas of Conservation covering 11,957 ha, including Border Mires, Kielder–Butterburn SAC, Harbottle Moors SAC, Roman Wall Loughs SAC, River Eden (part) SAC and North Pennine Dales Meadows SAC. Part of Kielder–Butterburn SAC is also designated as Kielderhead Mires Ramsar site.</p> <p>There are 30 Sites of Special Scientific Interest covering 17,054 ha.</p> <p>There is a significant extent of BAP priority habitats within the NCA including 22,015 ha of blanket bog (17 per cent of the NCA), 7,409 ha of upland heathland (6 per cent) and 1,094 ha of fen (1 per cent).</p> <p>The NCA supports a number of protected and priority species including red squirrel, otter, osprey, salmon and freshwater pearl mussel. Black grouse occurs in the NCA, although there has recently been a rapid population decline. There have also been sightings of pine marten.</p>	International	<p>The NCA has the largest extent of upland mire habitat in Northern England, including a variety of blanket bog, raised bog and fen habitats, many of which are internationally designated. These habitats have become significantly fragmented due to afforestation; however, recent rehabilitation projects have increased the area of mire habitat and enhanced existing mires using techniques such as damming grips and clearing areas of conifer regeneration. It will be important to ensure that the fragmentation of mire habitats continues to be addressed, and that mire habitats continue to be conserved and enhanced through appropriate moorland management.</p> <p>Upland hay meadows are a valuable biodiversity resource, and species-rich pastures provide an important foraging habitat for upland waders. It will be important to protect and enhance these habitats which are vulnerable to erosion and fragmentation.</p> <p>Continued on next page...</p>	<p>Protect the internationally important upland mire habitats, by using measures such as grip blocking and controlled grazing regimes to ensure good vegetative cover.</p> <p>Address fragmentation of mires by clearing forestry from key sites and pulling conifer plantations back from mires, restoring mires and upland heathland where possible, and finding compensation sites in more suitable locations for example on lower slopes of hillsides.</p> <p>Seek to buffer and expand broadleaved woodlands by encouraging natural regeneration of native broadleaved species, and connecting woodlands where possible.</p> <p>Protect populations of priority species from disturbance and illegal persecution, and control invasive non-native species which may be a threat to both individual species and the ecology of the area.</p>	<p>Biodiversity</p> <p>Geodiversity</p> <p>Climate regulation</p> <p>Water availability</p> <p>Regulating water quality</p> <p>Regulating water flow</p> <p>Regulating soil quality</p> <p>Regulating soil erosion</p>

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Biodiversity cont				<p>... continued from previous page</p> <p>Other internationally designated habitats in the NCA include wet woodland, gravel shoals and sand banks along the River Irthing. Riparian habitats in the NCA provide an important habitat for a number of priority species and it will be important to ensure that their ecological integrity is maintained by minimising pollution of watercourses.</p> <p>Coniferous woodlands provide important habitat for priority species. However, it will be important to control the spread of conifer woodland to prevent its encroachment into mire habitat.</p> <p>Ancient semi-natural woodlands are also nationally important and there are opportunities to increase broadleaved woodland planting, for instance alongside watercourses within conifer plantations. Feral goat numbers will also need to be managed to enable the natural regeneration of broadleaved woodland.</p> <p>Continued on next page...</p>	<p>Manage coniferous woodland favourably for red squirrels by avoiding clear felling and planting of small seed tree species within defined locations.</p> <p>Create small areas of scrub and woodland on the moorland fringes to benefit black grouse.</p> <p>Manage upland catchments and watercourses to provide suitable habitat for freshwater pearl mussel.</p> <p>Ensure all species-rich meadows and pastures are under good management, with extensive livestock systems using low or no inputs of artificial fertilisers.</p> <p>Support farmers in finding ways to expand, restore and manage areas of species-rich meadows and pastures.</p>	

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Biodiversity cont				<p>... continued from previous page</p> <p>This NCA is one of the last strongholds in England for the red squirrel, although the population is under threat from the encroachment of grey squirrels. This can be addressed through avoiding clear felling, planting of small seed species in areas favoured by red squirrels, and the continued control of grey squirrels.</p> <p>As well as protecting the remaining populations of priority species from persecution and habitat loss, there are opportunities to restore populations which are rapidly declining, or which no longer occur in the area. These include moorland management for black grouse and the preparation of watercourses for freshwater pearl mussel. The latter has been proposed by the Tyne Rivers Trust in conjunction with a captive breeding programme¹¹.</p>		

¹¹ Tyne Catchment Plan: A plan to improve the Tyne and its tributaries, Tyne Rivers Trust (December 2009)

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Geodiversity	<p>Silurian rocks</p> <p>Carboniferous sedimentary rocks</p> <p>Glacial till and boulder clay</p> <p>Fluvial sand and gravels</p> <p>Peat</p>	<p>Shale outcrops of Silurian age, forming part of the Riccarton Formation, are present on the border ridge in this NCA.</p> <p>The underlying sedimentary rocks of Carboniferous age consist of the Ballagan Formation, the Fell Sandstone Formation, the Alston Formation and the Tyne Limestone Formation (a sequence of limestones, shales and sandstones, locally with thin beds of coals and ironstones). The Whin Sill escarpment borders the NCA to the south.</p> <p>A thick layer of glacial sediment was deposited over the area during the last glaciation, while deposition of fluvial sands and gravel has occurred in the lower valleys.</p> <p>Extensive peat deposits have formed over the uplands, varying in depth due to the presence of hollows in the surface of glacial deposits. These deposits preserve palaeoenvironmental records of ecological and climatic changes since they began accumulating at the end of the last ice age.</p> <p>Continued on next page...</p>	International	<p>The landscape in this NCA reflects the underlying geology, with more resistant sandstones, and less resistant limestones, having left their influence by forming a 'cuesta' landscape of craggy outcrops in places. However, glacial deposits have been more influential in determining soil types. The Silurian outcrops have had a limited impact on the landscape, but represent the only example of basement rocks within this part of Northern England.</p> <p>Carboniferous rocks, in particular the Fell Sandstones, have formed the principal building material for many of the traditional buildings still seen in the landscape today, and has given rise to the distinctive local vernacular of this and neighbouring NCAs.</p>	<p>Conserve the geological interest features in the NCA such as the cuesta landscape formed by sandstone outcrops.</p> <p>Protect views of geological features of interest, and provide opportunities for access to and interpretation of such features to raise awareness and increase understanding and enjoyment.</p> <p>Protect upland peat deposits by using grip blocking and other management measures where appropriate to prevent erosion maintain vegetative cover.</p> <p>Allow rivers to flow along their natural channels to enable dynamic geomorphological processes to continue.</p>	<p>Biodiversity</p> <p>Geodiversity</p> <p>Climate regulation</p> <p>Water availability</p> <p>Regulating water quality</p> <p>Regulating water flow</p> <p>Regulating soil quality</p> <p>Regulating soil erosion</p>

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Geodiversity cont		<p>... continued from previous page</p> <p>Within this NCA, there are geological sites of significant importance both nationally and internationally. The NCA contains seven geological Sites of Special Scientific Interest (SSSIs) and is also intersected by a further geological SSSI. There are also three Local Geological Sites. Evidence of volcanic activity is preserved at Cottonshope Head Quarry SSSI. The in situ fossil forests of Kingwater SSSI, preserved in life position, provide valuable evidence of past biodiversity. Several geological 'type sites' have also been defined on the basis of deposits within this NCA.</p>		<p>Forest clearance from the Neolithic period, combined with climatic conditions led to the formation of peat deposits in the uplands, and subsequently the development of extensive mire habitats. Palaeoenvironmental records in peat can potentially give us valuable insights into future climate change.</p> <p>The River Irthing is of significant geomorphological interest with its gravel shoals and sandbanks.</p>		

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