



Introduction

As part of Natural England's responsibilities as set out in the Natural Environment White Paper,¹ Biodiversity 2020² and the European Landscape Convention,³ we are revising profiles for England's 159 National Character Areas (NCAs). These are areas that share similar landscape characteristics, and which follow natural lines in the landscape rather than administrative boundaries, making them a good decision-making framework for the natural environment.

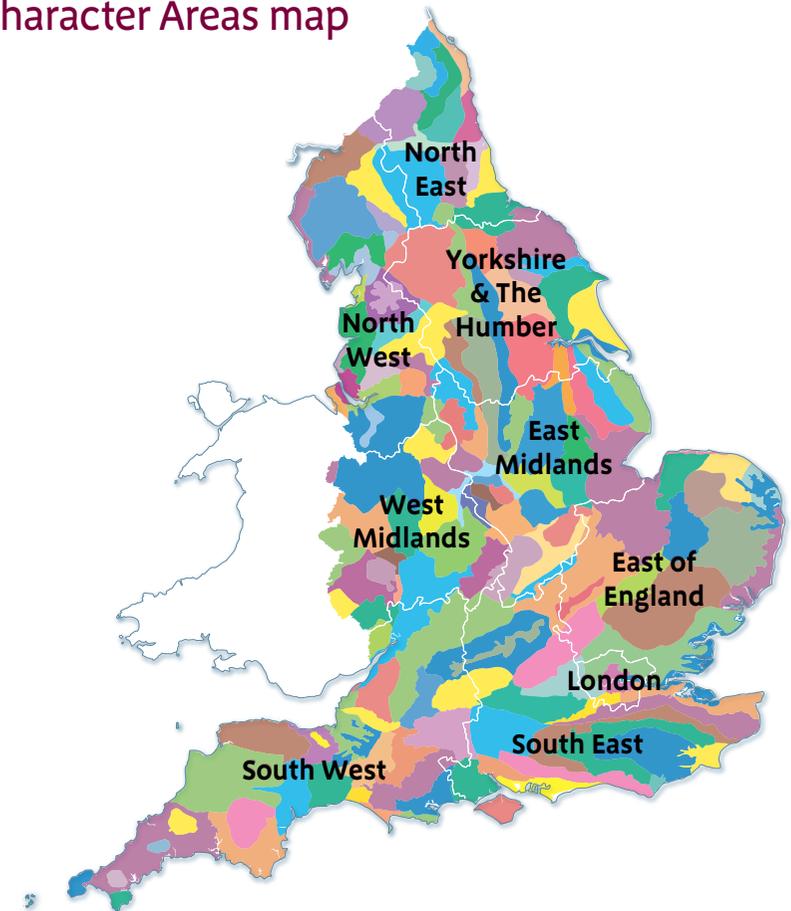
NCA profiles are guidance documents which can help communities to inform their decision-making about the places that they live in and care for. The information they contain will support the planning of conservation initiatives at a landscape scale, inform the delivery of Nature Improvement Areas and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

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

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

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

National Character Areas map



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

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

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

Summary

The North Northumberland Coastal Plain is a narrow, windswept strip that runs from the Anglo-Scottish border south to the mouth of the River Coquet, bounded by the sea to the east and the Northumberland Sandstone Hills to the west.

The gently undulating inland plain is dominated by arable farming, with large, regular fields bounded by gappy hedgerows and in some places grey sandstone walls, with some pasture for beef cattle and sheep. Woodland cover is sparse and predominantly confined to the river valleys that meander across the coastal plain and the estate woodlands around Howick.

The dramatic coastline is exceptionally varied, with rocky headlands and cliffs contrasting with long, sweeping sandy beaches backed by dunes, and extensive intertidal mudflats and salt marsh around Lindisfarne. The nationally important Whin Sill outcrops both inland and at the coast, supporting rare Whin grassland, and forming the distinctive rocky Farne Islands offshore.

The coast and coastal fringe are of national and international nature conservation importance for their geology, dune and coastal cliff habitats, offshore islands and intertidal habitats which support internationally significant populations of birds, grey seals and scarce plants. The coastline is therefore covered by a number of designations: Sites of Special Scientific Interest, Special Areas of Conservation, Special Protection Areas and Ramsar sites. Lindisfarne and the Farne Islands are designated as National Nature Reserves, and the coastline is a recognised Heritage Coast and designated as an Area of Outstanding Natural Beauty.

Early settlements through to historic fishing villages reflect the strong influence of the sea, while quarries and industrial heritage evidence the long history of mineral extraction. The Holy Island of Lindisfarne and religious buildings demonstrate the importance of ecclesiastical influences, and the coastal landmarks of Lindisfarne, Bamburgh and Dunstanburgh castles are part of the legacy of centuries of cross-border warfare and coastal defence.

The huge skies, striking views, tranquillity and natural beauty of this area draw large numbers of visitors and tourism is now a very important part of the local economy. Enabling people to experience and enjoy this area while ensuring that tourism and development are sustainable, that the essential qualities of the area are not eroded, and that sensitive habitats and species are not negatively impacted on will be some of the key challenges in this National Character Area.

Other challenges lie in responding to increasing demand for food provision while maintaining and improving the water quality of the rivers, streams and coastal waters, and in preserving and enhancing the valuable and dynamic coastal habitats which are vulnerable to coastal squeeze.

[Click map to enlarge; click again to reduce](#)

[Click map to enlarge; click again to reduce](#)

Statements of Environmental Opportunities:

- **SEO 1:** Improve public enjoyment and understanding of this wild coastal landscape, enabling people to experience the peace and beauty of the area and learn more about its coastal processes and biological, geological and heritage assets while managing visitor pressure to conserve the highly valued tranquillity and protect the sensitive semi-natural habitats and species found there.
- **SEO 2:** Conserve the special qualities of the coast and offshore islands, enabling natural coastal processes to operate, protecting nationally important geological features, and protecting and expanding the nationally and internationally important habitats found there including coastal sand dune systems, intertidal mudflats and coastal salt marsh.
- **SEO 3:** Conserve and enhance semi-natural inland habitats such as Whin grassland, native woodland and wetlands, improving their connectivity and resilience to climate change, benefiting climate regulation, water quality and soil quality and reinforcing sense of place.
- **SEO 4:** Manage and enhance the farmed environment to secure viable and sustainable farming, improving the water quality of the rivers, coast and Fell Sandstone aquifer, reducing soil erosion, strengthening landscape character, conserving archaeology and historic buildings, supporting the farmland birds and overwintering shorebird populations that are dependent on this area, and improving the connectivity and heterogeneity of this landscape.



Cereal crop with Bamburgh Castle in the distance.

Description

Physical and functional links to other National Character Areas

The sedimentary rocks that underlie this area are part of a band that stretches from the Tyne Valley to the Solway Firth. The Whin Sill, which outcrops around Holy Island and Craster and forms the Farne Islands, extends through central Northumberland, along the escarpment of Hadrian's Wall, south to Teesdale.

This National Character Area (NCA) is a narrow coastal strip, bounded by the ridge of the Northumberland Sandstone Hills to the west, which stretches from the Scottish border south to the River Coquet. Views inland are of the Northumberland Sandstone Hills with the Cheviot Hills beyond, and Scotland to the north. The sweeping sandy beaches, dunes and rocky headlands continue north into Scotland and south into the South East Northumberland Coastal Plain. The designated areas of the Northumbria Coast Special Protection Area (SPA) and Ramsar site and North Northumberland Heritage Coast extend south into the South East Northumberland Coastal Plain.

The coast falls within the St Abbs Head to Tyne sub-cell, which is within the St Abbs Head to Flamborough sediment cell; sediment is transferred along the coast from north to south. The coastline lies within the Northumberland and North Tyneside Shoreline Management Plan which covers the area from the Scottish border to the Tyne.

Three major rivers meander across the North Northumberland Coastal

Plain to the sea: the Tweed drains the Scottish Borders, joined by the Till which drains the Cheviots, and flows into the sea at Berwick-upon-Tweed; the Aln drains from Alnham in the Cheviot Fringe NCA, past Alnwick in the Northumberland Sandstone Hills NCA to the sea at Alnmouth; and the Coquet drains the Cheviots, flowing through the Cheviot Fringe and Northumberland Sandstone Hills NCAs before meandering along the southern boundary of this NCA to the sea at Amble in the South East Northumberland Coastal Plain.

The northern end of this NCA overlies the Fell Sandstone aquifer which extends under the Northumberland Sandstone Hills and the Cheviot Fringe.

There are close links with the adjacent Northumberland Sandstone Hills NCA as many of the large holdings with arable and grazing in the coastal plain also have in-bye and moorland grazing in the hills.

The coastal plain links Newcastle and more southern parts of Northumberland with Scotland as both the A1 and East Coast Main Line run through its length.



The windswept sand dunes are internationally important semi-natural habitats and contribute to a sense of place.

Key characteristics

- Narrow, low-lying coastal plain with wide views east of the coast and out to sea, and west to the Northumberland Sandstone Hills and Cheviots.
- Carboniferous sandstones, limestones and shales characterise much of the area with Whin Sill intrusions producing dramatic landscape features such as the coastal cliffs at Bamburgh and the Farne Islands and distinctive inland local landmarks, and supporting rare, semi-natural Whin grasslands.
- Diverse coastal scenery with the 'hard' coast of spectacular high cliffs, offshore islands and rocky headlands contrasting with the 'soft' coast of sweeping sandy bays, sand dunes, mudflats and salt marsh.
- The rivers Tweed, Aln and Coquet, as well as numerous smaller watercourses, meander across the coastal plain to the sea.
- Farmed landscape of predominantly large, open arable fields and permanent pasture, with some remnant semi-natural grassland in the valleys and coastal fringes. Fields are bounded by low, often fragmented hedgerows, grey sandstone walls and post-and-wire fences.
- Limited woodland cover confined to small but prominent blocks and shelterbelts adjacent to farmsteads and settlements, with larger areas of mixed broadleaved woodland in the river valleys and around the Howick estate.
- Holy Island, the Farne Islands and stretches of coast including the estuaries support internationally important habitats, bird populations and grey seals.
- Prominent and distinctive medieval castles, fortifications and religious buildings reflect the historic importance of ecclesiastical influences and the strategic defence of the coast and Anglo-Scottish border.
- Long history of mineral extraction including whinstone, sandstone and limestone quarrying, and open cast coal mining to the south-west of Berwick-upon-Tweed.
- Dispersed pattern of isolated large-scale farmsteads, small nucleated villages, fishing villages and small coastal resort towns, with buildings often single storey and commonly constructed from local sandstone with roofs of blue slate or red clay pantiles.
- Coastal trails, wildlife and historic sites attract large numbers of visitors to this popular area of coast, with access provided by the A1 and East Coast Main Line.



Bamburgh (pictured), Dunstanburgh and Lindisfarne castles are prominent in the landscape and reflect strategic defence of the coast and Anglo-Scottish border.

North Northumberland Coastal Plain today

The North Northumberland Coastal Plain is a narrow coastal strip that stretches from the Anglo-Scottish border south to the mouth of the River Coquet. Generally tranquil, the landscape combines open, windswept farmland and dramatic coastal scenery, dissected by the meandering rivers Tweed, Aln and Coquet, and punctuated by Whin Sill outcrops. It is framed on the western edge by the rounded forms of the Northumberland Sandstone Hills with views across to the Cheviots, which contrasts with the huge skies and striking seascape views to the east.

The coastal landscape is exceptionally varied. Spectacular and inaccessible high rocky sandstone cliffs characterise the coast to the north of the Tweed Estuary. To the south are lower-lying limestone cliffs, the sandy beaches of Cocklawburn and Cheswick, and the extensive intertidal mudflats, salt marsh and sand dunes of Lindisfarne. These contrast with the alternating series of rocky headlands, sandy coves and wave-cut platforms between Bamburgh and Seaton Point. Further south, sandy beaches backed by sand dunes extend along Alnmouth Bay to the Coquet Estuary. The high quality of coastline has led to its designation as an Area of Outstanding Natural Beauty and also recognition as Heritage Coast for its landscape, recreational and heritage interest.

Whin Sill, a hard dolerite which is especially resistant to weathering, is a nationally important geological feature, forming striking cliffs at Castle Point, Cullernose Point and Bamburgh. Offshore it forms the rocky Farne Islands which provide a remote refuge for thousands of breeding seabirds.

The inland farmed landscape is generally open and gently undulating. Fertile soils support broad expanses of intensively managed arable farmland dominated by cereal cropping, with some grazing for beef cattle and sheep.

Farms are typically large with a rectilinear field pattern defined by close-cropped, often fragmented hedgerows with post-and-wire fences, and in some places grey sandstone walls.

Woodland cover is generally sparse with larger areas of broadleaved woodland confined to river valleys and the estate woodlands around Howick, but shelterbelts and woodland blocks adjacent to farmsteads and settlements are important local features in the open landscape.

The coast is of national and international nature conservation importance for its geology, coastal sand dune complexes, maritime cliffs and slopes, offshore islands and intertidal habitats (including mudflats, coastal salt marsh and eelgrass beds) which support internationally significant populations of birds and grey seals, nationally important invertebrate assemblages and scarce plants. The whole length of coastline is therefore covered by Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), SPA and Ramsar designations. Lindisfarne and the Farne Islands are also designated as National Nature Reserves (NNRs).

Inland, Newham Fen NNR is designated as an SAC and SSSI for its fen, mire and carr woodland habitats. Whin Sill outcrops both on the coast and inland, supporting a unique Whin grassland community. The River Tweed is of international nature conservation importance for its sand and mudflats and salt marsh, and species such as sea and river lamprey, Atlantic salmon and otter are found in this and the River Coquet. The Coquet Valley contains nationally important native woodland and the mixed farming of the coastal plain supports a nationally important assemblage of farmland birds.

The dramatic coastal scenery is punctuated by the outstanding landmarks of Lindisfarne, Bamburgh and Dunstanburgh castles, and by Second World

War defences, which reflect the importance of ecclesiastical influences and the strategic defence of the Anglo-Scottish border and coast. The Holy Island of Lindisfarne has inspired religious and cultural works for more than 13 centuries, including JMW Turner's paintings of Lindisfarne Priory and the ruins of Dunstanburgh Castle, and today its religious heritage and scenic qualities attract visitors from all over the world.

The major towns and villages in the area are located on the coast, the largest of which is Berwick-upon-Tweed, a walled and extensively fortified town located at the river's mouth. Inland the coastal plain is characterised by small nucleated settlements of medieval origin, often located on higher ground or at river crossing points, and widely dispersed farm hamlets located within large, planned 19th-century estates.

Houses are frequently single storey, often huddled together into terraces and compact squares, clustered around large fortified houses or arranged around a central green. The architecture is generally simple and the use of grey sandstone and rubble characterises many of the farm hamlets and villages, with red pantiled or grey slate roofs. Only local mansions and churches show any embellishment where the use of the local Fell Sandstone is common. Whinstone has been used extensively to construct buildings in Bamburgh, Craster and Embleton where it gives a distinctive character to the cottages built from it.

The area has a long history of mineral extraction including whinstone and sandstone quarrying and small-scale coal mining; it is scattered with disused quarries which provide access to important geological sections as well as being of biological interest, and several large stone quarries are still active. Limestone was cut and burned to produce lime for improving pasture locally

and for export from the local harbours; large lime kilns such as those at Lindisfarne and Bamburgh are prominent historic buildings.

Important north-south routes – the A1 and the East Coast Main Line railway – run the length of the area, roughly parallel to the coast, linking Newcastle and more southern parts of Northumberland with Scotland.

This stretch of the Northumberland coast draws large numbers of visitors every year, attracted by the open, tranquil, windswept scenery, renowned wildlife, historic sites, long-distance walking and cycling routes, and the recreational opportunities afforded by the rivers and coast such as angling, wildlife watching, diving and watersports. Tourism is a mainstay of the local economy.



The major towns and villages such as here at Alnmouth, are located on the coast. Houses are traditionally constructed from grey sandstone and rubble with red pantiled or grey slate roofs. Inland, farm hamlets and small villages of medieval origin are often located within large, planned 19th-century estates.

The landscape through time

The North Northumberland Coastal Plain is underlain by sedimentary rocks formed during the Carboniferous Period. They consist of repetitive successions of limestones, shales and sandstones predominantly belonging to the Lower, Middle and Upper Limestone groups, with very small areas of the underlying Scremerston Coal group occurring locally.

At the end of the Carboniferous Period igneous activity intruded molten material into cracks which cooled to form the hard dolerite of the distinctive Whin Sill, which is particularly resistant to erosion. Outcrops of Whin Sill and related dolerite occur both inland and on the coast, forming striking cliffs and the rocky Farne Islands.

Along the coast the resistant dolerite and sandstone headlands alternate with sandy bays where the 'softer' rocks have eroded.

A thick layer of glacial till was deposited during the last ice age, creating the flat, fertile plain which characterises the present-day landscape, interspersed with localised deposits of sand and gravel and infrequent peat bogs. Wind-blown sand forms dune systems on Lindisfarne and along Alnmouth Bay, and the prevailing southerly inshore currents have created coastal mud banks and sand pits.

Evidence of humans hunting and fishing in this area exists from as far back as the late Mesolithic Period. During the Bronze Age there was a shift from hunter-gathering to settled farming communities, and burial mounds from this period are features of today's landscape.



Settlement has been greatly influenced by links with the sea for fishing and trade, and by strong ecclesiastical influences. Holy Island (on skyline) was the centre from which the 7th century conversion of the Anglo-Saxon Kingdom to Christianity occurred and is still an important pilgrimage site.

As the climate deteriorated into the Iron Age, increased competition for the resources of the fertile coastal plain led to the building of more fortified settlements such as Howick and Craster.

The area was extensively settled in the Romano-British period and the Devil's Causeway, one of the key military routes, ran up through Northumberland to Berwick-upon-Tweed; the remains of Roman camps are still evident.

A monastery was founded on the Holy Island of Lindisfarne by St Aiden in 635 ad, and Lindisfarne Priory, the home of St Cuthbert, was the centre from which the 7th-century conversion of the Anglo-Saxon kingdom to Christianity occurred.

By the early medieval period the area had been largely cleared of native woodland, forming a landscape of small, scattered settlements with complex field systems (including strip fields and substantial blocks of common land), a pattern which continued almost unchanged until the 17th century. Today native woodland is still largely confined to the river valleys.

The River Tweed formed a natural frontier between the kingdoms of England and Scotland and the landscape of the adjacent coastal plain bears the legacy of medieval cross-border warfare with fortified buildings and coastal castles strategically located on prominent Whin Sill outcrops and headlands at Lindisfarne, Bamburgh, Dunstanburgh and Warkworth (just south of this NCA in the South East Northumberland Coastal Plain). Berwick-upon-Tweed was extensively fortified and formed a cornerstone of Tudor defences.

From the late 16th century onwards the large estates of Northumberland had a major influence on the landscape, driving large-scale re-organisation

of the countryside in the 18th and 19th centuries. Large, planned farmsteads with regular fields enclosed by hedgerows and sandstone rubble walls replaced the previous pattern of nucleated settlement and farmland, linked to an intensification of production with emphasis on rotational cropping and fattening cattle and sheep for market. There was widespread drainage of land for agriculture resulting in a dramatic reduction in grazing marshes, wetlands, natural streams and open water, and an increase in cultivated land. These farmsteads are exceptionally large by national standards, comparable in their scale and adoption of horse and steam-powered machinery with the farmsteads of the Lothians and neighbouring parts of lowland Scotland which were also transformed by large estates. Provision of winter feed for livestock allowed the build-up of large herds which entailed the further enlargement and rebuilding of farmsteads and construction of the long, low overwintering sheds that distinguish Northumberland farmsteads. By the 1840s the medieval landscape had been replaced by an efficient, managed pattern of broad, open fields and large farm hamlets with workers' housing which is still apparent on the coastal plain today. Remnants of 18th-century and earlier cultivation and settlement, and some earlier steadings, are found throughout the area.

On the coast, villages and small towns began to rely on the trading of agricultural goods, particularly corn and lime, to supplement their fishing trade. Vast quantities of grain from the improved arable farms of Northumberland were exported from Alnmouth during the 16th and 17th centuries and lime was an important export from Beadnell in the 18th century. The coastal railway line opened new markets and supplies of materials such as Welsh slate in the 1840s, and stimulated the development of ports and seaside resorts. Associated with this period of growth in trade and industry was a distinctive architecture with agricultural warehouses,

merchant houses and large lime kilns which survive today. The development of the railway also heralded the start of tourism in the area.

The increased wealth of the major landowners led to the construction of stately houses with landscaped grounds of which Adderstone Hall near Belford and Howick Hall are prominent examples. Bamburgh Castle was rebuilt and modified in the 1890s, and the ruins of Lindisfarne Castle were restored by the architect Sir Edward Lutyens. Extensive tree planting undertaken on the Howick Hall estate altered the previously open landscape of the southern end of the coastal plain.

There is a long history of small-scale quarrying of sandstone for the construction of buildings and from the 20th century onwards whinstone extraction for roadstone became a large-scale commercial activity, with whinstone exported to the continent from Craster. Abandoned quarries dot the landscape and several whinstone quarries still operate, supplying the north of England with roadstone. Coal was mined around Scremerston and in the south near Shilbottle, but these mines are now closed.

Fishing still takes place from a number of the villages such as Craster and Boulmer, but many increasingly cater for the tourist industry. One of the most notable local events was the shipwreck of the Forfarshire on the Outer Farne Isles in 1838, and the subsequent heroic rescue of eight sailors by the lighthouse keeper's daughter, Grace Darling. This event has entered national folklore and is commemorated in the museum which bears her name at Bamburgh.

The long sandy beaches were seen as possible invasion sites and extensive defences were erected during the Second World War. Sea defences were

erected following the flooding events of 1953. Throughout the 20th century the number of tourists visiting the area increased considerably and consequently so have the number of caravan and chalet sites, hotels, holiday homes, golf courses and other leisure developments. Vertical structures such as communications masts and wind turbines are an increasingly common and prominent feature of the area. Coastal defences, infrastructure and agricultural practices have affected the natural development of dynamic habitats such as sand dunes and salt marsh locally; managed realignment and agri-environment schemes are being used to counteract this.



Tourism is now a mainstay of the local economy. Many of the coastal villages and towns have adapted to accommodate tourism and increasing numbers of caravan and chalet sites occupy prominent positions on the coast.

Ecosystem services

The North Northumberland Coastal Plain 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 North Northumberland Coastal Plain NCA is contained in the 'Analysis' section of this document.

Provisioning services (food, fibre and water supply)

- **Food provision:** The high-quality soils, maritime climate and gentle slopes make this area important for food production; much of the area is used for cereal and oilseed rape production with some grazing of beef cattle and sheep. Fishing is still an important commercial activity in the area, particularly for lobster and crab, while Craster is famous for its oak-smoked kippers.
- **Water availability:** The area around Berwick-upon-Tweed overlies the Fell Sandstone aquifer which is the primary source of public water supply to northern Northumberland but which has been assessed as 'no water available'. Water for public supply is also abstracted from the rivers Aln and Coquet which have 'water available'. The lower Tweed and Whiteadder Water is likely to move to 'water available' status but the Tweed is currently consented by Natural England due to its designation as an SAC. There are concerns that there may be insufficient groundwater to meet demand in the future.

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

- **Climate regulation:** Areas of salt marsh, eelgrass beds and sand dunes, although small, are important carbon stores and are threatened by coastal squeeze. The carbon sequestration potential of salt marshes and sand dunes could be increased by removing artificial landward barriers, allowing these dynamic habitats to extend inland.

Soil carbon levels are generally low (0–5 per cent) but are likely to be higher under areas of unimproved grassland and woodland. Protection of permanent pastures will retain these carbon stores and the amount of carbon stored in agricultural soils could be increased by improving soil organic matter content.
- **Regulating soil erosion:** Soils over approximately half of the NCA are prone to erosion through compaction causing increased run-off, and wind erosion. Sedimentation of watercourses as a result of soil erosion is currently recognised as an issue in this NCA. Encouraging land management practices that reduce the risk of damaging soils, reducing the intensity of cultivation on vulnerable soils, and restoring and reinstating hedgerows to reduce the risk of wind erosion could all help to regulate soil erosion.
- **Regulating water quality:** The ecological quality of the rivers is mixed but generally moderate; however, poor ecological quality is recorded for some coastal streams. There are issues with nutrient enrichment, pesticide levels and sedimentation from diffuse agricultural pollution and point source pollution such as septic tanks. This is affecting the condition of the SSSI

and SAC rivers and impacting on the internationally important intertidal habitats around Holy Island; the ecological quality of coastal waters is generally good but moderate in the areas of Holy Island and Budle Bay.

The chemical quality of groundwater is poor including for the small area of the Fell Sandstone aquifer in the north where elevated levels of nitrate, sulphate, potassium and volatile compounds have been detected.

The NCA falls within the Tweed, Aln, Coquet and Coastal Streams Priority Catchment designated under Defra's Catchment Sensitive Farming Project, and the areas around the Tweed and Holy Island are designated as nitrate vulnerable zones.

- **Regulating coastal flooding and erosion:** The rate of coastal erosion is relatively low due to the resilient hard rock exposures, headlands and wave-cut platforms although localised areas are vulnerable to erosion. Sea level is currently static or decreasing but is predicted to rise in the future. Some areas within the lower stretches of the Tweed, Aln and Coquet are at risk from tidal flooding.

The preferred policies for managing coastal erosion and sea level rise along the coast of this NCA are set out in the Shoreline Management Plan. Allowing coastal processes to take place unimpeded and enabling habitats to respond naturally to change can reduce the risk of flooding by absorbing wave energy or providing extra flood storage.

Cultural services (inspiration, education and wellbeing)

- **Sense of place/inspiration:** A sense of place is provided by the narrow, low-lying, windswept plain dominated by arable farming with some grazing for cattle and sheep, and by the huge skies, natural beauty and dramatic form of the coast. Whin Sill intrusions have produced dramatic cliffs and offshore islands which contrast with sandy bays, dunes, intertidal salt marsh and mudflats, all of national and international nature conservation importance as habitats and for the birds and species such as grey seal that they support. Strong links to the sea for fishing and trade are reinforced by the fishing villages strung along the coast. The strong ecclesiastical influences, strategic defence of the Anglo-Saxon border and coast, and long history of quarrying are all evident in the landscape, and use of local stone in buildings and walls reinforces links with the underlying geology.

Feelings of inspiration are likely to be most strongly associated with the strong and dramatic coastline, with striking views along the coast to distinctive landmarks including the tidal causeway, castle and priory of Lindisfarne which retains a remote, spiritual quality, and Bamburgh and Dunstanburgh castles. The coast is designated as an Area of Outstanding Natural Beauty and Heritage Coast.

- **Sense of history:** Fishing, farming and mineral extraction combined with the need for cross-border defence and defence of the coast, and strong ecclesiastical influences have all shaped the landscape. The historic fishing villages and fortified town of Berwick-upon-Tweed have retained much of their character, and castles, ecclesiastical buildings, large farmsteads, lime kilns, quarries and Second World War defences are all prominent in the landscape. Inland, the settlement pattern reflects the large-scale re-organisation of the landscape in the late 18th and 19th centuries driven by the large estates.

- **Tranquillity:** The NCA has experienced a significant decline in tranquillity since the 1960s with intrusion predominantly associated with Berwick-upon-Tweed, the A1 and the East Coast Main Line. Nevertheless, this is a landscape that evokes a strong sense of tranquillity, especially along its spectacular undeveloped coastline and in the wooded valleys of the Aln and Coquet rivers.
- **Recreation:** This stretch of the Northumberland coast draws large numbers of visitors every year, attracted by the dramatic coastal scenery, natural beauty and tranquillity, renowned wildlife, historic sites, long-distance walking and cycling routes, and the recreational opportunities afforded by the coast and rivers such as angling, diving and watersports. Tourism is very important to the area and visitors bring many socio-economic benefits, but visitor pressure can threaten sensitive habitats, species and landscape features if not managed appropriately and tourism needs to be sustainable.
- **Biodiversity:** The coastal and estuarine habitats are of particular biodiversity value and support nationally and internationally important populations of birds, grey seals and many other fauna and flora. As such the coastline is covered by SAC, SPA and Ramsar designations. Inland, there are additional outcrops of the rare Whin grassland, and Newham Fen SAC and the rivers Tweed and Coquet support internationally and nationally important species. The farmed coastal plain provides roosting and foraging grounds for overwintering shore birds and supports nationally important populations of farmland birds.

- **Geodiversity:** The coast offers some of the finest and most complete sections through the Lower Carboniferous rocks of northern England and these rocks, with Whin Sill intrusions, give rise to the characteristic and diverse coastline that is key to sense of place. The geology of the area represents an important resource for education and research as well as supporting internationally important habitats and providing the long-exploited sandstone, whinstone and limestone which has been exported across northern England and abroad.



The coast offers some of the finest and most complete sections through the Lower Carboniferous sandstones, limestones and shales in northern England, such as at Saltpan Rocks near Scremerston.

Statements of Environmental Opportunity

SEO 1: Improve public enjoyment and understanding of this wild coastal landscape, enabling people to experience the peace and beauty of the area and learn more about its coastal processes and biological, geological and heritage assets while managing visitor pressure to conserve the highly valued tranquillity and protect the sensitive semi-natural habitats and species found there.

For example, by:

- Encouraging low-impact activities such as walking and wildlife watching that directly connect people with the natural assets of the area but taking into account the impacts of increased numbers of visitors on wildlife and habitats.
- Encouraging research to quantify and understand the cumulative impacts on wildlife of disturbance from visitors and activities such as bait-digging.
- Seeking opportunities to increase public awareness and understanding of the impacts of disturbance on sensitive species such as overwintering waders, and managing visitor pressure to minimise this.
- Seeking opportunities to preserve and restore more historic sites, including preserving sites and features associated with the industrial use of geodiversity such as Beadnell and Seahouses lime kilns and the whinstone chippings silo base at Craster Harbour, providing imaginative interpretation of the landscape and its many features to interpret this legacy for the understanding and enjoyment of all.
- Encouraging the identification and designation of Local Geological Sites and promoting the use of key geological sites as an educational and research resource.
- Improving access to and interpretation of geological sites and features, including designated sites and quarries, and exploring the possibility of geo-trails, to enhance the public's understanding and enjoyment of the area, helping to link people to the landscape.
- Maintaining the character of historic villages and towns and of vernacular buildings and sandstone walls, using local stone in restoration where possible, to reinforce links with the underlying geology and strengthen sense of place.
- Enhancing the footpath and cycle way networks and providing opportunities for a range of abilities, including improving crossings of the A1 and East Coast Main Line and difficult river crossings, and addressing gaps in the bridleway network while preventing damage to habitats and wildlife.
- Supporting the implementation of the England Coastal Path to provide high-quality coastal access along the entire length of coast.
- Enhancing recreational facilities where appropriate but managing recreational use to avoid the disturbance of the most sensitive habitats and species by increasing public awareness and attempting to encourage use of less vulnerable areas.
- Sensitively managing visitor access and recreational facilities to avoid loss of tranquillity through the careful planning of transport routes, provision of public transport and cycle routes to minimise private car use, and design and management of public access routes and infrastructure.
- Continuing to address the problems of litter on the coast, both litter dropped by visitors and that deposited by maritime currents, but without removing the strandline.
- Increasing public awareness of the mechanisms and problems of spreading invasive non-native species such as pirri-pirri burr.

SEO 2: Conserve the special qualities of the coast and offshore islands, enabling natural coastal processes to operate, protecting nationally important geological features, and protecting and expanding the nationally and internationally important habitats found there including coastal sand dune systems, intertidal mudflats and coastal salt marsh.

For example, by:

- Protecting the undeveloped coast, ensuring that the impact of new developments on views, landscape character, tranquillity and light pollution is carefully considered and minimised, particularly in the case of vertical structures, and taking into account the sensitivity and capacity of areas for development as identified in the Northumberland Coast Area of Outstanding Natural Beauty Landscape Sensitivity and Capacity Study.
- Conserving and enhancing the dramatic and varied coastline which provides important and distinctive habitats that support internationally important seabird colonies by allowing the natural dynamic coastal processes to operate.
- Protecting and enhancing nationally important geological features.
- Protecting the internationally important intertidal habitats such as intertidal mudflats, coastal salt marsh and eelgrass beds around Lindisfarne by improving the water quality of the coastal streams and allowing natural processes to operate.
- Seeking opportunities to allow for the natural roll-back of sand dunes, particularly between Scremerston and Lindisfarne, by negotiating the reversion of arable land to grassland.
- Encouraging sustainable grazing of dune systems, salt marsh and coastal grasslands by native livestock breeds where appropriate.
- Protecting and restoring areas of fragmented coastal heathland.
- Adopting effective visitor management to minimise the erosion of sensitive habitats such as dune systems caused by recreational activities, and providing interpretation to improve public awareness of the sensitivity of these systems.
- Seeking opportunities to create or expand coastal salt marsh habitat and create a more resilient shoreline by negotiating tidal flooding of farmland through managed realignment, particularly to the north of Holy Island and behind Beadnell Bay, in line with the Shoreline Management Plan.
- Exploring opportunities to compensate in the wider area for the future loss of rocky shore through coastal squeeze as identified in the Shoreline Management Plan.
- Working with farmers and landowners to improve water quality, particularly of the coastal streams and the area around Lindisfarne, by reducing diffuse pollution from agriculture, in particular through establishing permanent grassland field margins and reedbeds.
- Ensuring that sustainable fishing practices are used to maintain and restore marine ecosystems.
- Ensuring that the economic and environmental importance of the coast and offshore fisheries is taken into account in the oil pollution emergency planning process.
- Monitoring and controlling non-native invasive species.
- Conserving and enhancing the coastal villages and towns which are integral to the character of the coast and are popular tourist destinations, working to secure a sustainable future for communities dependent on inshore fisheries, and planning for natural adaptation to coastal processes where maintaining defences is not sustainable.

SEO 3: Conserve and enhance semi-natural inland habitats such as Whin grassland, native woodland and wetlands, improving their connectivity and resilience to climate change, benefiting climate regulation, water quality and soil quality and reinforcing sense of place.

For example, by:

- Seeking opportunities to restore and expand semi-natural grasslands, heathlands, wetlands and scrub habitats, aiming to re-establish a fringe of semi-natural vegetation to buffer the coastal habitats from the effects of cultivation and creating links to the larger areas of semi-natural habitat in the Northumberland Sandstone Hills.
- Seeking opportunities to restore flood plain grassland to re-establish a more natural river morphology, aid infiltration, slow run-off and manage flood risk while providing an important habitat resource.
- Encouraging the establishment of reedbeds to improve water storage capacity and reduce diffuse pollution of watercourses.
- Working with landowners and quarry operators to protect and restore existing Whin grassland sites through scrub control and reinstating sustainable grazing where appropriate, and encouraging the restoration of former quarry sites to Whin grassland.
- Encouraging wet grassland management which will benefit waders, particularly around Newham Fen Special Area of Conservation, to improve the wider hydrological unit.
- Seeking opportunities to expand and link woodland fragments, particularly restoring woodland along watercourses, including enhancing the wooded character of the Aln and Coquet river valleys, and within the area around Howick.
- Bringing existing woodland under management and seeking opportunities for small-scale planting of deciduous species to generate a local supply of wood fuel.



Whin Sill outcrops provide distinctive local landmarks and support the rare Whin grassland.

SEO 4: Manage and enhance the farmed environment to secure viable and sustainable farming, improving the water quality of the rivers, coast and Fell Sandstone aquifer, reducing soil erosion, strengthening landscape character, conserving archaeology and historic buildings, supporting the farmland birds and overwintering shorebird populations that are dependent on this area, and improving the connectivity and heterogeneity of this landscape.

For example, by:

- Promoting best practice in soils, nutrient and pesticide management to reduce diffuse pollution from agriculture, including encouraging farmers to more accurately match nutrient inputs to needs, improving facilities for the storage of slurry and manure, managing stock movements and riparian grazing to avoid poaching and erosion of the banks of watercourses, and managing the timing of operations to protect soil condition.
- Encouraging especially careful soil and nutrient management where soils overlying the Fell Sandstone aquifer are particularly thin and vulnerable.
- Encouraging the restoration and reinstatement of hedgerows to enhance biodiversity value, improve landscape permeability, reduce wind erosion of soils and reinforce landscape character.
- Encouraging the establishment of permanent grass margins to reduce run-off to watercourses, provide wildlife corridors, benefit pollinators and connect fragmented semi-natural habitats.
- Encouraging the use of reedbeds, settling ponds and wetland areas to reduce diffuse pollution and enhance the biodiversity value of the farmed environment.
- Establishing and managing areas of permanent grassland, scrub and woodland along watercourses; the area inland of Holy Island has been identified as a priority area in the Woodland for Water Opportunity Mapping where woodland planting should significantly benefit water quality.
- Encouraging measures to support pollinators and farmland birds such as sowing wild bird seed and nectar flower mixes, establishing cereal headlands and cutting hedgerows later to provide food sources during the winter.
- Encouraging the use of overwintered stubbles and temporary grass, particularly along the coastal fringe, to benefit overwintering shorebirds such as light-bellied Brent goose.
- Promoting the retention of permanent pasture and ensuring that the management of pastures and meadows encourages the build-up of organic matter.
- Exploring opportunities for better management of below-ground archaeology on arable land, such as the establishment of permanent grassland, shallow cultivation or minimum tillage agriculture, and encouraging uptake of agri-environment schemes to fund such work.
- Promoting sustainable use of water including the use of winter storage reservoirs, ensuring that these positively contribute to landscape character and enhance biodiversity interest.
- Working with property owners to reduce point source pollution from septic tanks, particularly above the Fell Sandstone aquifer and along the coastal streams into Budle Bay.
- Promoting the development of supply chains and markets for high-quality local produce from traditional breeds, encouraging a green economy that supports local tourism, and capitalising on the environmental value of local breeds and their heritage and genetic value.

Supporting document 1: Key facts and data

Total Area: 37,669 ha

1. Landscape and nature conservation designations

Twenty-four per cent of the NCA (8,938 ha) is within the Northumberland Coast Area of Outstanding Natural Beauty (AONB). Twenty-four per cent of the NCA (9,112 ha) also lies within the North Northumberland Heritage Coast. These generally overlap, but the Heritage Coast recognition extends further north than the AONB and south into the South East Northumberland Coastal Plain NCA.

Management plans for the protected landscape can be found at:

- www.northumberland.gov.uk/

Source: Natural England (2011)

1.1 Designated nature conservation sites

The NCA includes the following statutory nature conservation designations:

Tier	Designation	Name	Area (ha)	Percentage of NCA
International	Ramsar	Lindisfarne, Northumbria Coast	610	2
European	Special Protection Area (SPA)	Northumbria Coast SPA, Farne Islands SPA, Lindisfarne SPA	647	2
	Special Area of Conservation (SAC)	Berwickshire and North Northumberland Coast SAC, North Northumberland Dunes SAC, Newham Fen SAC, River Tweed SAC, Tweed Estuary SAC	1,140	3
National	National Nature Reserve (NNR)	Lindisfarne NNR, Farne Islands NNR, Newham Bog NNR	431	1
National	Site of Special Scientific Interest (SSSI)	A total of 15 sites wholly or partly within the NCA	1,396	4

Source: Natural England (2011)

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

All the designated areas are SSSI and all international sites are contained within this area. There is also a large overlap between the internationally designated areas, only the SAC diverging from the SPA and Ramsar sites in areas of the dunes.

There are 19 local sites in the North Northumbria Coastal Plain NCA covering 545 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> – select 'Designations/Land-Based Designations/Statutory'

1.1.1 Condition of designated sites

SSSI condition category	Area (ha)	Percentage of SSSI in category condition
Unfavourable declining	125	9
Favourable	544	39
Unfavourable no change	0	0
Unfavourable recovering	727	52

Source: Natural England (March 2011)

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

2. Landform, geology and soils

2.1 Elevation

Elevation ranges from sea level along the coast to a maximum of 183 m at Shilbottle. The average elevation of the landscape is 45 m above sea level.

Source: Natural England 2010

2.2 Landform and process

This NCA is a low lying, gently undulating coastal plain overlain with glacial till and peat deposits but with intrusions of Whin Sill geology producing dramatic and characteristic landforms inland and offshore. Along the coastline there are a series of contrasting rocky headlands, sandy coves and bays, and wave cut platforms, with sandy beaches backed by sand dunes further south. There are extensive intertidal mud flats, tidal sands and salt marsh around Lindisfarne, and other rocky islands offshore are also a feature.

Source: North Northumberland Coastal Plain Countryside Character Area Description

2.3 Bedrock geology

The landscape is underlain by sedimentary rocks of the Carboniferous age, which consist of repeated successions of limestones, shales and sandstones with local deposits of thin coals. Intruded into the Carboniferous rocks is a group of roughly horizontal sheets of igneous rock collectively known as the Whin Sill. This forms striking cliffs and rocky offshore islands.

Source: North Northumberland Coastal Plain Countryside Character Area Description, Natural England (2010)

2.4 Superficial deposits

Inland, boulder clay deposited by ice sheets covers much of the area. Raised beaches formed as a result of the relative rise of land following the melting of ice at the end of the last glacial period, at Bamburgh and Holy Island. Other glacial features include crag and tail features at outcrops of Whin Sill for example at Spindlestones. Windblown sands form dunes on Lindisfarne and along Alnmouth Bay, while inshore currents create coastal mud and sand flats.

Source: North Northumberland Coastal Plain Countryside Character Area Description

2.5 Designated geological sites

Tier	Designation	Number
National	Geological Site of Special Scientific Interest (SSSI)	2
National	Mixed interest SSSI	4
Local	Local Geological Site	0

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

2.6 Soils and Agricultural Land Classification

The characteristic soils of the North Northumberland Coastal Plain are primarily slightly stony clay loam soils which support productive mixed and arable farming. In some areas such as Lucker and Ellingham there are lenses of more gravelly/sandy soils and on the coast extensive sand dune systems occur.

There are 6 main soilscape types in this NCA: slightly acid loamy and clayey soils with impeded drainage, covering 32 per cent of the NCA; slowly permeable seasonally wet acid loamy and clayey soils (31 per cent); slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils

(19 per cent); freely draining slightly acid loamy soils (8 per cent); loamy and clayey floodplain soils with naturally high groundwater (4 per cent) and sand dune soils (3 per cent).

Source: Northumberland Coastal Plain Countryside Character Area Description, National Soils Research Institute Soilscape Maps

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

Agricultural Land Classification	Area (ha)	Percentage of NCA
Grade 1	324	1
Grade 2	3,619	10
Grade 3	30,468	81
Grade 4	767	2
Grade 5	168	<1
Non-agricultural	1,822	5
Urban	502	1

Source: Natural England (2010)

Most of the NCA is Grade 3 agricultural land, with areas of Grade 2 around the Tweed valley in the north, and in pockets along the coastal strip, in particular inland of Bamburgh and Seahouses.

- 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 waterbodies and catchments

3.1 Major rivers/canals

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

Name	Length in NCA (km)
River Tweed	8
River Coquet	6
Whiteadder Water	3
River Aln	8

Source: Natural England (2010)

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

The lower reaches of several large rivers meander across the coastal plain from west to east. These include the Coquet, Aln, and Tweed, together with numerous smaller streams and ditches.

3.2 Water quality

The total area of Nitrate Vulnerable Zone is 9,321, 25 per cent of NCA.

Source: Natural England (2010)

3.3 Water Framework Directive

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

4. Trees and woodlands

4.1 Total woodland cover

This NCA contains 1,851 ha of woodlands over 2 ha, including 159 ha of ancient woodland. These woodlands cover 5 per cent of the NCA.

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

4.2 Distribution and size of woodland and trees in the landscape

Woodland cover is generally sparse and is limited to mixed coniferous shelterbelts and clumps adjacent to farmsteads and settlements. There are few hedgerow trees. Some remnant ancient semi-natural woodland can be found in the sheltered bends of the incised river valley along the lower reaches of the Coquet. The woodland resource elsewhere is limited to areas of broadleaved woodland found in the Aln and Coquet Valley, around the Howick Estate and along the Waren Burn valley.

Source: Northumberland Coastal Plain Countryside Character Area Description

4.3 Woodland types

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

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

Woodland type	Area (ha)	Percentage of NCA
Broadleaved	893	2
Coniferous	590	2
Mixed	186	<1
Other	182	<1

Source: Forestry Commission (2011)

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

Woodland type	Area (ha)	Percentage of NCA
Ancient semi-natural woodland	110	<1
Ancient re-planted woodland (PAWS)	49	<1

Source: Natural England (2004)

5. Boundary features and patterns

5.1 Boundary features

A combination of close cropped hedgerows and post-and-wire fences form the boundaries across most of the area. In places boundaries are formed by drystone walls of local grey sandstone.

Source: Northumberland Coastal Plain Countryside Character Area description; Countryside Quality Counts (2003)

5.2 Field patterns

Fields are predominantly large with very occasional pre-18th century irregular fields.

Source: Northumberland Coastal Plain Countryside Character Area description; Countryside Quality Counts (2003)

6. Agriculture

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

6.1 Farm type

Farm types are mixed with 55 per cent cereals and general cropping, 15 per cent mixed farming, and 16 per cent livestock farming in 2009. There was a reduction in the number of general cropping holdings between 2000 and 2009 and a slight increase in the number of grazing livestock holdings.

Source: Agricultural Census, Defra (2010)

6.2 Farm size

Farms tend to be large. In 2009 those over 100 ha were the most numerous (59 per cent), accounting for 91 per cent of the farmed area. Between 2000 and 2009 there was a slight reduction in the number of larger holdings (particularly those larger than 100 ha) and a slight increase in the number of medium sized holdings (20 to 50 ha).

Source: Agricultural Census, Defra (2010)

6.3 Farm ownership

2009: Total farmed area: 32,655 ha. Owned land: 16,169 ha (50 per cent)

2000: Total farmed area: 32,686 ha. Owned land: 15,215 ha (47 per cent)

Source: Agricultural Census, Defra (2010)

6.4 Land use

Cereals account for the most extensive land use covering 45 per cent of the farmed land, closely followed by grass and uncropped land at 40 per cent. Oilseeds account for 7 per cent with cash roots, stock feed, other arable crops

and vegetables accounting for a further 5 per cent. Land use patterns changed only slightly between 2000 and 2009, with a small reduction in the area of cereals and cash roots, and a slight increase in other arable crops, vegetables and grass and uncropped land.

Source: Agricultural Census, Defra (2010)

6.5 Livestock numbers

Sheep are the most numerous livestock type within this landscape (68,700 animals in 2009), followed by 13,200 cattle and 8,900 pigs. Sheep numbers fell by 27,200 (28 per cent) between 2000 and 2009, cattle numbers remained the same, while pig numbers increased significantly by 3,000 animals (51 per cent, although this is predominantly accounted for by the expansion of one large enterprise in the north of the NCA).

Source: Agricultural Census, Defra (2010)

6.6 Farm labour

The figures show that principal farmers are the main source of farm labour (54 per cent) followed by full time workers (24 per cent). The breakdown of farm labour remained largely unchanged between 2000 and 2009.

Source: Agricultural Census, Defra (2010)

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

7. Key habitats and species

7.1 Habitat distribution/coverage

As much of the area is devoted to arable cropping, semi-natural habitats are generally limited. Much of the coastal fringe, foreshore and off-lying islands are renowned for their range of natural habitats.

Dune complexes are found from Lindisfarne southwards, characterised by a single dune ridge system in the south, while north of Bamburgh more extensive multiple dune ridge systems occur. The Geranium sub type of rank dune grassland present on many dunes is rarely found elsewhere in Britain. On Holy Island the dunes and seasonally flooded slacks support pettlewort and the unique Lindisfarne helleborine. Intertidal habitats of sand beaches, sand banks and extensive mudflats are well developed around Lindisfarne. The rich invertebrate life, along with the extensive eelgrass beds and Enteromorpha mats support one of the most outstanding bird assemblages in the North East.

The estuaries of the Tweed, Aln and Coquet together with the offshore islands of Holy Island, the Farne Islands and Coquet Island are outstanding sites for their bird (arctic tern, common tern, purple sandpiper, light bellied brent goose) and grey seal populations.

Whin outcrops, with their unique flora, also occur along the coast and inland. The thin soils over this hard igneous rock carry short tufted clumps of the wild chives, the taller stems of crow garlic and bright flowers of maiden pink.

Sandstone cliffs to the north around Berwick-upon-Tweed support extensive areas of coastal grassland.

At Newham Fen, species-rich fen vegetation, including reintroduced greater water parsnip, has developed along with areas of reedbed and carr woodland.

Farmland birds such as corn bunting, lapwing, grey partridge, yellow wagtail and tree sparrow are found around the Seahouses area. These form part of a nationally important assemblage of arable birds found in this area.

Source: Malvern Hills and Teme Valley Natural Area Profile



The Farne Islands, Holy Island and large stretches of the coast support internationally important habitats, bird populations and grey seals.

7.2 Priority habitats

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

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

Priority habitat	Area (ha)	Percentage of NCA
Coastal sand dunes	956	3
Broadleaved mixed and yew woodland (broad habitat)	321	<1
Lowland heathland	316	<1
Coastal flood plain and grazing marsh	205	<1
Fens	120	<1
Maritime cliffs and slopes	109	<1
Reedbeds	69	<1
Lowland calcareous grassland	18	<1
Lowland meadows	11	<1
Mudflats	6	<1
Saline lagoons	1	<1

Source: Natural England (2011)

Maps showing locations of priority habitats are available at

- <http://magic.defra.gov.uk> - select 'Habitats and Species/Habitats'

7.3 Key species and assemblages of species

■ Maps showing locations of some key species are available at:

- <http://magic.defra.gov.uk> - select 'Habitats and Species/Habitats'
- Maps showing locations of 541 species are available at: <http://data.nbn.org.uk/>



The extensive saltmarsh and mudflats around Lindisfarne are of international nature conservation importance.

8. Settlement and development patterns

8.1 Settlement pattern

Inland the coastal plain is characterised by small nucleated settlements of early medieval origin, often located on higher ground or at river crossing points. The settlement pattern changed during the 18th and early 19th centuries, with large farmsteads and farm hamlets taking the place of several villages, with large planned 19th century estates also characteristic. Several towns and villages along the coast have developed around fishing and trade in agricultural produce, lime and coal. These include Seahouses, Beadnell, Craster, Howick and Alnmouth. The main settlements of Berwick and Alnwick (just to the west of this NCA) are linked by the north-south road, now the A1.

Source: North Northumberland Coastal Plain Countryside Character Area description; Countryside Quality Counts (2003)

8.2 Main settlements

Berwick-upon-Tweed is the main settlement and serves the north of the NCA and areas across the Scottish border. Other settlements include Alnmouth, Seahouses, Beadnell, Boulmer, Ellingham, Lindisfarne village and Belford. The total estimated population for this NCA (derived from ONS 2001 census data) is: 25,860.

Source: North Northumberland Countryside Character Area description; Countryside Quality Counts (2003)

8.3 Local vernacular and building materials

The area has a simple vernacular, usually single storey, built with grey sandstone rubble and red pantile or grey slate roofs. Larger mansions and churches show more embellishment and are built with local Fell Sandstone.

Source: North Northumberland Countryside Character Area description; Countryside Quality Counts (2003)

9. Key historic sites and features

9.1 Origin of historic features

The coastal plain was one of the earliest areas in Northumberland to be settled and exploited. Remains of a Mesolithic settlement are to be found at Howick. The monastery and later priory on the Holy Island of Lindisfarne was the centre from which the 7th century conversion to Christianity of the Anglo Saxon kingdoms was based. The prominent castles of the coast line at Holy Island, Bamburgh, Dunstanburgh and Warkworth are a legacy of the cross-border warfare dating from medieval times. The walled and fortified town of Berwick-upon-Tweed was the cornerstone of Tudor defences on the Scottish border. Coastal settlements developed through trading agricultural goods, lime and coal, along with their fishing industries, from the 16th century onwards.

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

9.2 Designated historic assets

This NCA has the following historic designations:

- 4 Registered Parks and Gardens covering 335 ha
- 1 Registered Battlefield covering 312 ha
- 55 Scheduled Monuments
- 935 Listed Buildings

Source: Natural England (2010)

- More information is available at the following address:
www.english-heritage.org.uk/caring/heritage-at-risk/
- www.english-heritage.org.uk/professional/protection/process/national-heritage-list-for-england/

10. Recreation and access

10.1 Public access

- One per cent of the NCA (454 ha) is classified as publically accessible.
- There are 422 km of public rights of way at a density of 1.1 km per km².
- There are no National Trails within the NCA, however, the Northumberland Coast Path, St. Oswald's Way and the Coast and Castles National Cycleway run the length of the NCA, and St. Cuthbert's Way long distance route crosses the northern end of the NCA.

Source: Natural England (2010)



The seascapes, historic sites, renowned wildlife and recreational opportunities draw large numbers of visitors to this stretch of the Northumberland coast every year.

The North Northumberland Coastal Plain is a major tourist attraction centred around the famous historic settlements of Holy Island, Dunstanburgh, Bamburgh and the walled town of Berwick-upon-Tweed. The expansive coastal landscape and famous wildlife reserves around Lindisfarne and the Farne Islands also bring people to this area. Consequently caravan parks and holiday homes are frequent throughout the NCA.

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

Access designation	Area (ha)	Percentage of NCA
National Trust (Accessible all year)	31	<1
Common Land	47	<1
Country Parks	19	<1
CROW Access Land (Section 4 and 16)	49	<1
CROW Section 15	11	<1
Village Greens	6	<1
Doorstep Greens	1	<1
Forestry Commission Walkers Welcome Grants	0	0
Local Nature Reserves (LNR)	0	0
Millennium Greens	0	0
Accessible National Nature Reserves (NNR)	348	<1
Agri-environment Scheme Access	10	<1
Woods for People	1	<1

Sources: Natural England (2011)

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

11. Experiential qualities

11.1 Tranquillity

Based on the CPRE map of tranquillity (2006) this is a relatively tranquil area, with the lowest scores for tranquillity at Berwick-upon-Tweed and along the A1 and East Coast Mainline railway corridor. The highest scores are scattered along the coastline at places including Holy Island and Budle Bay.

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

Category of tranquillity	Score
Highest	49
Lowest	-54
Mean	10

Sources: CPRE (2006)

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

11.2 Intrusion

The 2007 Intrusion Map (CPRE) shows the extent to which rural landscapes are 'intruded on' from urban development, noise (primarily traffic noise), and other sources of visual and auditory intrusion. This shows a similar pattern to the tranquillity map, indicating the A1, the East Coast Mainline railway, Berwick-upon-Tweed and Alnwick (which is in adjacent NCA) are areas of disturbed land.

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

Intrusion category	1960s (%)	1990s (%)	2007 (%)	Percentage change (1960s-2007)
Disturbed	1	12	36	37
Undisturbed	96	85	63	-33
Urban	0	n/a	1	1

Sources: CPRE (2007)

Notable trends from the 1960s to 2007 are the increase in disturbance since 1960 as a result of increased traffic along the A1 and railway traffic corridor. Relatively there still remains a large percentage of undisturbed land in the NCA, especially along the coast.

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



The walled and extensively fortified town of Berwick-upon-Tweed is the largest town in the area and was a cornerstone of Tudor defences, sitting at the mouth of the River Tweed in close proximity to the Anglo-Scottish border.

12. Data sources

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

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

Supporting document 2: Landscape change

Recent changes and trends

Trees and woodlands

- There has been a small increase in woodland area but limited uptake of Woodland Grant Scheme agreements for woodland management and restocking and of Environmental Stewardship for maintenance, restoration or creation of woodland. Most broadleaved planting has occurred in the south of the NCA around the Howick area.

Boundary features

- The uptake of Countryside Stewardship options for boundary restoration and management has been low with only 3 per cent of the total boundary length included in agreements between 1999 and 2003.
- The uptake of Environmental Stewardship options for ditches, hedgerows, stone walls, stone-faced hedge banks and woodland edges since 2005 has been significantly better, with over 500 km of hedgerow management options included between 2005 and 2011, but overall there has been a perceived deterioration in the condition of stone walls and hedgerows.

Agriculture

- The rate of loss of grassland observed up to 1999 has since slowed but not been reversed. More recently loss has been of temporary rather than permanent grass.

- Between 2000 and 2009 land use patterns changed slightly with a small reduction in the area of cereals and cash roots and a slight increase in other arable crops, vegetables and grass and uncropped land, but cereals still remain the dominant land use.
- While the number of cattle remained much the same between 2000 and 2009, the number of sheep fell by 28 per cent and the number of pigs increased significantly (51 per cent, although this is predominantly accounted for by the expansion of one large enterprise in the north of the NCA).



The gently undulating farmed plain is predominantly arable with some pasture. Large, open fields are bounded by hedgerows, post and wire fences and less frequently by grey sandstone walls.

Settlement and development

- The rate of development outside urban areas is relatively low but pressures from tourism and recreation have significantly increased.
- With the decline of the fishing and coal-mining industries and increasing importance of recreation and tourism, many of the coastal towns such as Alnmouth, Beadnell and Spittal have changed to accommodate tourism with large numbers of properties converted to holiday properties and bed and breakfasts.
- A number of caravan and chalet sites now occupy prominent positions on the coast and on fringes of traditional settlements and applications for new and extensions to existing sites continue to be received. The highly managed nature of golf courses contrasts sharply with the wildness of the adjacent coastal habitats.
- The use of jet skis and power boats is perceived to impact upon the solitude and remote character of the area in some localities.
- A number of vertical structures such as communications masts are now prominent in the wider landscape, with wind farms in the Northumberland Sandstone Hills clearly visible in views from the coastal plain. Planning applications for wind farms continue to be received.

Semi-natural habitat

- Countryside Stewardship and now Environmental Stewardship (ES) have been used to maintain and restore valuable habitats such as grasslands, saltmarsh and sand dunes. By 2013 over 140 ha of wet grassland creation, 70 ha of wet grassland restoration, and 146 ha of species-rich grassland creation were included in ES agreements, with 215 ha of sand dune habitat to be restored.
- There has been significant accretion of sediment around Lindisfarne over recent decades and this change in sediment pattern and a decline in water quality is thought to be responsible for the decline in eelgrass beds.
- Large areas of coastal saltmarsh have been created in the Aln Estuary as part of the Northumberland 4 Shores Project by removing sections of flood banks to allow flooding of agricultural land. Smaller areas have also been created north of Beal near Holy Island.
- Agri-environment schemes are being used to support dune roll-back to the north of Lindisfarne and restoration of Whin grassland in the farmed plain.
- The spread of non-native invasives such as pirri-pirri burr around Lindisfarne and Himalayan balsam and signal crayfish in the rivers has continued although a number of projects to monitor and control these species are under way.

Historic features

- Since 2005 there has been a strong uptake of Environmental Stewardship options for historic and landscape features with over 1,450 ha of land being managed for archaeological features by October 2013.
- A number of prominent historic buildings have been restored through Environmental Stewardship and English Heritage, including a medieval dovecote at Buckton, limekilns at Howick and various buildings on Lindisfarne.

Coast and rivers

- Introduced or alien species have expanded along some river reaches, with colonisation by giant hogweed, Himalayan balsam, Japanese knotweed and signal crayfish. There has been a concerted effort recently through the Tweed Invasives Project to control Himalayan balsam and signal crayfish in particular. Pirri-pirri burr and cord grass continue to be a growing problem around Lindisfarne and on other dune systems throughout north Northumberland.
- The water quality in the Fell Sandstone aquifer has deteriorated due to diffuse pollution from agricultural sources, localised industrial contamination, surface water contamination from mine water discharges and some contribution from non-mains drainage and mains sewer leakage.
- Increasing numbers of visitors and recreational usage of the coast is damaging coastal habitats, and activities such as dog-walking and bait-digging are believed to be increasingly disturbing over-wintering birds.

- Coastal defences and natural hard points are causing loss of intertidal habitats through increased wave action, and natural roll back of dune systems is prevented by arable farming practices and infrastructure.
- Tidal flooding of Alnmouth is being redressed through managed realignment which has created large areas of salt marsh.

Minerals

- Whinstone is still actively quarried at Howick. Some areas of the Longhoughton quarry are being restored to Whin grassland.



Overwintering shore bird populations and a number of coastal habitats for which the area is internationally important, are very vulnerable to the cumulative impacts of disturbance from recreation and other activities.

Drivers of change

Climate change

Climate change projections predict more frequent and intense rainfall events and a rise in the rate of temperature increase leading to drier summers and warmer but wetter winters in the longer term. They also predict sea level rise and increased storm surge events on the coast. This could result in:

- Increased 'flashiness' and volume of flows within all river catchments with potential for more frequent winter flooding and summer drought in this and upstream NCAs, exacerbating issues with over-abstraction, diffuse pollution and sedimentation and possibly leading to eutrophication and increased hydraulic scour.
- Increased risk of river and tidal flooding may also lead to construction of flood defences which may impact on natural fluvial and coastal processes, resulting in loss of habitat.
- Summer droughts drying vulnerable soils and wetland habitats such as Newham Fen/Bog SAC and NNR, with increased risk of wildfires and oxidation and loss of peat. This combined with heavy rainfall events could lead to significant increases in erosion and run-off.
- Species extinction or migration and loss of small or isolated habitats, and continued decline of biodiversity in fragmented habitats such as woodlands.
- An increase in drought-tolerant species and an increase in frequency and severity of pest attacks, resulting in overall change in species assemblages.
- The spread of tree diseases which poses a significant threat to native species such as ash and consequently has landscape-scale implications where species are common in field boundaries and woodlands.
- Change in species composition within woodlands and damage to or loss of veteran trees within managed parklands.
- Scope for new crop species, but increased risk of pests and diseases, resulting in some commercial species becoming less viable in the future.
- A decline in species such as salmon which are sensitive to thermal stress which would impact on the fishing and game fishing industries.
- Possible erosion or loss of access to the significant buried archaeology, built heritage assets and field boundaries from increased winter rainfall and summer drought.
- An increase in the need for water storage reservoirs on farms for watering stock and crops.
- Accelerated erosion of cliffs, clay slopes and soft rock cliffs, resulting in loss of important habitats and geological and buried heritage assets.
- Loss of sand dune systems where natural roll back is prevented by artificial barriers.
- Loss of intertidal mudflats, coastal salt marsh and rocky foreshore habitats due to coastal squeeze could have potentially devastating consequences for the water and wildfowl species that depend on them and could increase the risk of flooding.

Other key drivers

- The Natural Environment White Paper (2011) calls for joined-up efforts across the conservation sector and working at a landscape scale, to establish coherent and resilient ecological networks capable of adapting to environmental change and halting losses in biodiversity. An increased focus on connectivity and resilience of habitats should lead to greater networks of habitats, a more diverse mosaic of vegetation, and larger areas of semi-natural habitat.
- The Government's UK Low Carbon Transition Plan (2009), Forestry and Woodlands Policy Statement (2013) and the Regional Forestry Strategy for the North East of England (2005) indicate an increased rate of woodland creation over the next 15–20 years, alongside an increase in demand for timber and wood fuel. A requirement for increasing renewable energy generation could result in increased pressure for wind power, hydro power, wood fuel and biomass crops.
- The Growth and Infrastructure Act 2013 and roll-out of Next Generation Access communications networks may result in increased pressure to install new built structures such as communications masts and lines and new electricity supplies.
- The need to maintain or improve water and habitat quality in the Tweed Catchment Rivers SSSI and SAC and Coquet SSSI, coupled with implementation of the Water Framework Directive and the Wetland Vision initiative, and combined with the need to manage flood risk should improve ecological status of the rivers and waterbodies in the area.
- Delivery of the England Coast Path under the UK Marine and Coastal Access Act 2009 will ensure coastal access along the length of the coast, enabling people to walk within a wildlife and landscape corridor that offers enjoyment, understanding of the natural environment and a high quality experience.
- Visitor numbers are likely to continue to rise, with more people enjoying the coast and countryside, leading to improvements in their health and wellbeing, and with potential benefits for the local economy. The impacts of increased tourism and recreation on the habitats, species, geological and heritage assets need to be monitored and sensitively managed, and the impacts of disturbance particularly to bird species needs to be investigated. The increased risk of localised footpath/bridleway erosion, demand for car parks and signage, damage to vegetation, disturbance of sensitive habitats and species, and risk of wildfires all present challenges. Opportunities for green tourism and voluntary visitor payback should be explored to ensure maximum benefit for the local environment and economy.
- The Northumberland Core Strategy identifies Berwick-upon-Tweed as one of the main towns in the county and therefore a focus for sustainable new development. The service centres of Belford and Seahouses may also have capacity for sustainable development.
- Increasing demand for provision of food and stock fodder may result in more pressure to intensify arable production, resulting in increased loss of temporary grassland and increasing the risks of soil erosion and diffuse pollution entering water courses.
- The linear nature of this NCA accentuates the impact of even small changes to the landscape and new development therefore requires particularly careful consideration to minimise its intrusion and impact.

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.



Alnmouth

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 flooding and erosion	Sense of place / Inspiration	Sense of history	Tranquillity	Recreation	Biodiversity	Geodiversity
SEO 1: Improve public enjoyment and understanding of this wild coastal landscape, enabling people to experience the peace and beauty of the area and learn more about its coastal processes and biological, geological and heritage assets while managing visitor pressure to conserve the highly valued tranquillity and protect the sensitive semi-natural habitats and species found there.	↔**	↔**	↔**	↔**	↔**	↔**	↔**	↔**	↔**	↗**	↔**	↔**	↔**	↑***	↑***	↗***	↑***	↗**	↑**
SEO 2: Conserve the special qualities of the coast and offshore islands, enabling natural coastal processes to operate, protecting nationally important geological features, and protecting and expanding the nationally and internationally important habitats found there including coastal sand dune systems, intertidal mudflats and coastal salt marsh.	↔**	↔**	↔**	↗*	↔**	↗*	↗**	↗**	↗**	↗**	↗**	↗**	↗**	↑***	↑**	↔**	↑**	↑**	↗**
SEO 3: Conserve and enhance semi-natural inland habitats such as Whin grassland, native woodland and wetlands, improving their connectivity and resilience to climate change, benefiting climate regulation, water quality and soil quality and reinforcing sense of place.	↔**	↗*	↗**	↗*	↔*	↗*	↗**	↗**	↗**	↗**	↗**	↗**	↗**	↑**	↔**	↗**	↗*	↑**	↗*
SEO 4: Manage and enhance the farmed environment to secure viable and sustainable farming, improving the water quality of the rivers, coast and Fell Sandstone aquifer, reducing soil erosion, strengthening landscape character, conserving archaeology and historic buildings, supporting the farmland birds and overwintering shorebird populations that are dependent on this area, and improving the connectivity and heterogeneity of this landscape.	↗**	↔**	↗*	↗*	↔**	↗*	↑***	↗**	↗**	↑**	↗**	↗**	↔**	↗**	↗**	↗*	↗*	↑**	↗**

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.

■ National Importance; ■ Regional Importance; ■ Local Importance

Landscape attributes

Landscape attribute	Justification for selection
Narrow, low-lying, windswept coastal plain.	<ul style="list-style-type: none"> ■ The whole area is low-lying, ranging from sea level along the coast to 183 m above sea level at Shilbottle in the south of the area. ■ The low-lying and linear character of this NCA is emphasised by being bounded by the Northumberland Sandstone Hills to the west and sea to the east. ■ Key to sense of place are wide views out to sea, the striking views down the coast, and views inland of the Sandstone Hills and Cheviots.
Dramatic and diverse coast with high rocky cliffs, headlands, wave-cut platforms, sandy bays, dune systems, extensive intertidal sand and mud flats and saltmarsh, and offshore islands.	<ul style="list-style-type: none"> ■ The coast offers some of the finest and most complete sections through the Lower Carboniferous rocks of northern England and a number of sites both on the coast and inland are designated for their nationally important geological features. ■ The entire coastline is of national and international nature conservation importance for its sand dune complexes and coastal cliff habitats, offshore islands and intertidal habitats (including sand and mud flats, saltmarsh and eelgrass beds) which support internationally significant populations of shore birds and grey seals, nationally important invertebrate assemblages and scarce plants. It is therefore covered by a number of designations: Sites of Special Scientific Interest (SSSI), Special Areas of Conservation (SAC), Special Protection Areas (SPAs) and Ramsar sites. ■ The Farne Islands support approximately 10 per cent of the world population of grey seal. ■ Lindisfarne and the Farne Islands are designated as National Nature Reserves (NNRs). ■ The strong, dramatic coastline and vast sea and skies are associated with feelings of tranquillity and escapism and have inspired works such as JMW Turner's paintings of Lindisfarne priory and the ruins of Dunstanburgh Castle. ■ The striking seascapes of dramatic coastal scenery and wide open views, coastal habitats, wildlife, historic landmarks and recreational activities attract large numbers of visitors to this area every year. ■ The coast and coastal fringe is designated as an Area of Outstanding Natural Beauty (AONB) and recognised as Heritage Coast.
Underlying Carboniferous geology covered in a thick layer of glacial till with outcrops of the distinctive Whin Sill.	<ul style="list-style-type: none"> ■ The underlying geology and blanket of glacial till is responsible for the gently undulating, relatively featureless form of the coastal plain. ■ The gentle slopes and fertile soils make the area important for food production, particularly cereal and oilseed rape production. ■ The distinctive Whin Sill outcrops inland and on the coast, provide the prominent escarpments at Bamburgh and the Farne Islands. Whin Sill outcrops support the rare and nationally important Whin grassland community. ■ A long history of mineral exploitation has influenced the landscape in this area with sandstone quarried for building stone, Whinstone is extracted and crushed for road stone to supply the north of England, and lime extracted and burnt and exported by boat from several of the bigger harbours, and coal mined locally around Scremerston and Shilbottle.

Landscape attribute	Justification for selection
<p>Productive farmed landscape of large, regular arable fields bounded by gappy hedgerows, post-and-wire fences and occasionally grey sandstone walls, interspersed with permanent pasture for cattle and sheep grazing.</p>	<ul style="list-style-type: none"> ■ There is a long history of mixed farming although arable production predominates now. ■ Hedgerows are important habitats and provide valuable wildlife corridors in this farmed landscape, but the neglect of hedgerows and walls and proliferation of post-and-wire fencing is eroding landscape character. ■ This area is nationally important for its farmland bird assemblage. ■ Nationally and internationally important shorebirds such as light-bellied Brent goose use the fields along the coastal fringe for roosting and feeding.
<p>Rivers Tweed, Aln and Coquet, and numerous smaller streams, meander across the coastal plain to the sea.</p>	<ul style="list-style-type: none"> ■ The rivers along with the Fell Sandstone aquifer, which underlies the northern end of this NCA, provide public water supply to the local area. ■ The Tweed and Coquet rivers are of international and national nature conservation importance for species such as sea and river lamprey, Atlantic salmon and otter. ■ These rivers are also important game fisheries. ■ Invasive species such as Himalayan balsam, giant hogweed, Japanese knotweed and signal crayfish are causing problems for native species.
<p>Sparse woodland cover; small prominent shelter belts pepper the plain with broadleaved woodland generally confined to the river valleys and the area around Howick.</p>	<ul style="list-style-type: none"> ■ The wooded nature of the river valleys contrasts with the open, windswept plain and is associated with perceptions of tranquillity. ■ The Coquet valley contains nationally important native woodland. ■ The woodlands of the Howick estate provide texture in this landscape.
<p>Historic fishing villages and towns along the coast and nucleated villages, isolated farmsteads and hamlets across the coastal plain.</p>	<ul style="list-style-type: none"> ■ Small historic fishing villages and the fortified town of Berwick-upon-Tweed have evolved through centuries of association with the sea for fishing and trade. ■ Fishing has diminished but is still an important commercial activity along the coast including at Berwick-upon-Tweed, Seahouses and Craster. ■ Many coastal villages and towns now rely increasingly on tourism with many properties used as holiday accommodation or second homes, and caravan and chalet sites and other leisure developments now prominent features of the area. ■ A number of villages have medieval origins, strategically sited on higher ground or at river crossings. ■ The pattern of isolated farmsteads and hamlets reflect the 18th–19th-century large-scale re-organisation of the countryside driven by the large Northumberland estates. ■ Buildings often single storey and commonly constructed from local sandstone with roofs of blue slate or red clay pantiles; the use of local building materials reinforces links with the landscape and geology.

Landscape attribute	Justification for selection
<p>A historic landscape which reflects early settlement associated with the sea for fishing and later trade, exploitation of mineral assets, defence associated with the Anglo-Scottish border and the later World Wars, and ecclesiastical influences.</p>	<ul style="list-style-type: none"> ■ One of the earliest known Mesolithic settlement sites in northern England has been found at Howick. ■ The monastery founded on Holy Island in 635 ad was the centre from which the 7th-century conversion of the Anglo-Saxon kingdom to Christianity occurred and is still an important pilgrimage site with numerous visitors crossing the causeway every year. ■ The legacy of medieval cross-border warfare is still prominent in the landscape with fortified buildings, strategically-located coastal castles at Lindisfarne, Bamburgh and Dunstanburgh, and the extensively fortified walled town of Berwick-upon-Tweed which are all key landmarks and tourist destinations. ■ Fishing villages, medieval dovecotes, quarries and associated industrial buildings such as lime kilns, and farm buildings including threshing chimneys all reflect the long occupation and exploitation of the area. ■ Defences from the Second World War reflect the fact that the stretch of coast around Lindisfarne was believed to be a likely target for invasions. ■ The Registered Gardens at Howick are an important visitor attraction.
<p>A wild, dramatic and rural landscape, highly valued by visitors and residents alike for its natural beauty, peace and tranquillity, and dark night skies.</p>	<ul style="list-style-type: none"> ■ Tourism is now a very important part of the local economy and the area attracts large numbers of visitors every year. ■ Despite the increases in intrusion and light pollution from the A1 and larger conurbations, the area is still highly valued for its perceived tranquillity and good views of the night sky.

Landscape opportunities

- Conserve and maintain the undeveloped areas of coastline, the open, tranquil landscape, panoramic views and dark night skies by discouraging sources of disturbance, limiting inappropriate development, controlling lighting and allowing natural coastal processes to operate.
- Encourage the natural development of coastal habitats by allowing natural coastal and marine processes to operate unimpeded, restoring habitats and allowing roll back of coastal sand dunes, creating a fringe of semi-natural habitats along the coast to buffer the coastline from diffuse pollution from arable farming.
- Enhance the permeability of the arable landscape by restoring hedgerows and improving the network of arable margins and unimproved grassland which support invertebrates and farmland birds, improving connections between arable areas and more extensive areas of semi-natural habitat which supports pollinators in the Northumberland Sandstone Hills and other adjacent NCAs.
- Retain permanent pasture, encouraging management that will create a mosaic of grassland types and structures, and seek opportunities to revert arable to pasture to encourage dune roll back.
- Protect, restore and enhance the network of Whin grassland, where possible preventing damage or loss of sites through quarrying and restoring former quarry workings, and working with farmers to restore and buffer remaining 'islands' of Whin grassland in the arable landscape.
- Manage and enhance broadleaved woodland cover, particularly along rivers and streams and around the Howick area, creating an ecological network more resilient to climate change, helping to regulate water flow and strengthening landscape character.
- Protect and enhance water quality and riparian habitats of the rivers and streams through encouraging good soil and nutrient management throughout the catchment, retaining or reinstating a natural morphology, enabling fluvial processes and facilitating passage of fish, thus also maintaining their value for angling and wildlife watching.
- Preserve and enhance the historic settlement pattern and character of the fishing villages along the coast, the fortified town of Berwick-upon-Tweed, and the nucleated villages and isolated farmsteads and hamlets of the agricultural plain, through using local building materials and styles in restoration and conversions and discouraging inappropriate development.
- Protect and restore archaeology and above ground heritage assets including traditional buildings such as farmsteads and features associated with the area's industrial heritage, and encourage the restoration of sandstone walls and historic buildings using locally quarried stone where possible, ensuring any new developments are appropriate and in-keeping with the landscape and local vernacular.

- Manage and enhance the farmed plain to improve provision of suitable habitats such as wet grassland and winter stubbles for overwintering shore birds and farmland birds.
- Maintain and expand the footpath, cycleway and bridleway networks, enabling appropriate access for all abilities, providing information on the biological, geological and heritage assets and coastal processes of the area to improve public understanding and enjoyment of this landscape, while managing visitor pressure to avoid loss of tranquillity, minimise disturbance of wildlife, and minimise damage and erosion of semi-natural habitats.



Alnmouth

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	Underlying geology Fertile soils Semi-natural habitats Available water Shellfish and fish stocks	<p>There is a long tradition of mixed farming in this NCA due to the high quality soils, the maritime climate and gentle slopes. The area is important for cereal production, particularly winter-sown wheat, barley and oilseed rape. In 2009, 45 per cent of the NCA was used for growing cereals. The majority of soils (80 per cent) are Grade 3 and therefore of moderate productivity, while 10 per cent is Grade 2.</p> <p>There is also a long tradition of grazing livestock, particularly fattening stock for market. In 2009, 40 per cent of the area was rough grazing or uncropped, supporting 13,219 cattle, 68,726 sheep and 8,900 pigs.</p> <p>Although it has diminished substantially, fishing continues to be an important commercial activity in the area. The main target species are lobster and crab but seasonal fisheries for fish and other shellfish also occur. Craster is famous for its oak-smoked kippers.</p>	Regional	<p>Integrating productive arable farming with the conservation of wildlife and valued landscape features can be challenging. Overly intensive production and inappropriate stocking rates can result in soil erosion, diffuse pollution, reductions in soil quality and carbon storage, loss and fragmentation of sensitive habitats such as Whinstone grassland, dune systems and deciduous woodland, and loss of traditional field patterns and hedgerows.</p> <p>The future may bring further intensification of agricultural practices as demand for food provision increases and climatic conditions become more favourable for some arable production such as wheat for animal feed.</p> <p>Many of the target and non-target fish and shellfish species are assessed as having declined and in many cases being at the low end or below recommended sustainable levels.⁴</p>	<p>Seek to manage food production sustainably, working with the farming community to ensure good soil and nutrient management to maintain and improve soil and water quality and protect the historic environment.</p> <p>Promote the marketing of local food which can play an important role in supporting tourism in the area, and in the process help encourage a locally sustainable green economy.</p> <p>Encourage sensitive design and siting of new farm buildings to help maintain or restore traditional character.</p> <p>Ensure that agri-environment schemes are used to best effect to preserve and enhance wildlife-rich habitats.</p> <p>Promote nectar and seed-rich margins and field corners, restoring or reinstating hedgerows wherever possible to benefit pollinators and pest regulators.</p> <p>Ensure sustainable fishing practices are adopted to maintain and restore marine ecosystems.</p>	<p>Food provision</p> <p>Regulating water quality</p> <p>Water availability</p> <p>Regulating soil quality</p> <p>Regulating soil erosion</p> <p>Sense of place/ inspiration</p>

⁴ Northumberland IFCA Strategic Environmental Assessment Scoping Report, Mott MacDonald for Northumberland Inshore Fisheries and Conservation Authority (2013)

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Timber provision	Soils Woodland	Woodland cover is sparse in this NCA (5 per cent) and there is very little commercial forestry. Of the 1,851 ha of woodland only 590 ha are mature conifer plantations.	Local	<p>The open nature of this landscape, the high proportion of productive arable land, lack of timber production infrastructure and lack of local demand mean there are very limited opportunities to increase timber production.</p> <p>Small-scale planting for timber products, if appropriately sited has the potential to provide environmental benefits such as expanding and linking woodland fragments, stabilising soils and reducing overland flows, while providing social and economic benefits.</p> <p>Bringing existing deciduous woodland under management could create a local supply of timber and wood fuel.</p> <p>Woodland management in the area buffering the Kyloe red squirrel reserve must take account of this species.</p>	<p>Manage and enhance existing woodlands to provide a local source of timber and wood fuel where appropriate.</p> <p>Encourage small-scale tree planting in appropriate locations such as along water courses to provide a source of timber, stabilise soils, aid infiltration, and improve connectivity within the woodland network.</p> <p>Opportunities should be sought to enhance the wooded character of river valleys, particularly the Aln and Coquet valleys and of the area around Howick, and more generally to plant trees along water courses to stabilise banks and improve infiltration.</p>	<p>Timber provision</p> <p>Biomass provision</p> <p>Climate regulation</p> <p>Regulating water flow</p> <p>Sense of place / inspiration</p> <p>Biodiversity</p>

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Water availability	Precipitation Watercourses including the Tweed, Aln and Coquet Aquifer	The area around Berwick overlies the northern tip of the Fell Sandstone aquifer which is the primary source of groundwater in the area, providing public water supply to northern Northumberland. This has been assessed as 'no water available'. ⁵ The rivers Aln and Coquet have water available. ⁶ Most abstraction is for public water supply. The River Tweed has no regulatory body to control surface water abstraction or impoundment but currently Natural England consents abstractions due to its designation as a SSSI and SAC. The Lower Tweed and Whiteadder Water are likely to move to a status of 'water available'.	Regional	Climate change is likely to result in more intense precipitation events with warmer, drier summers in the long term, and future demand for water both for crop irrigation and public water supply is likely to increase. There are concerns that there may be insufficient groundwater available to meet future demand. High levels of unsustainable abstraction create low flow levels that negatively impact on biodiversity and water quality so the amount of water licensed for abstraction may need to be reduced. It is imperative that water is used sustainably and land management practices are employed which will increase water infiltration to facilitate groundwater recharge of the aquifer and help slow the run-off into rivers and out into the North Sea, thereby moderating peaks and troughs in water availability. There may also be a move towards installing more storage reservoirs on farms. Land management practices upstream of this NCA are probably more critical in addressing the availability of water.	Seek opportunities to restore and extend semi-natural habitats such as flood plain grassland and woodland to improve water storage capacity and infiltration and slow run-off while improving habitat networks and ecosystem resilience to climate change. Improve sustainable use of water and sympathetic land management practices such as storage reservoirs constructed to form positive features within the local landscape and increase biodiversity interest, and water conservation measures in new development. Encourage best practice in soil management to increase infiltration rates and water holding capacity and slow run off. This may involve techniques such as minimum tillage, controlling farm traffic, limiting poaching and compaction by stock, use of green manures to increase organic matter, planting cover crops, and establishing in-field grass strips and beetle banks to protect soil structure and reduce rates of run-off.	Water availability Food production Regulating water quality Regulating water flow Regulating soil quality Regulating soil erosion Biodiversity
Genetic diversity	Native livestock breeds	Native breeds of cattle are kept on a number of farms.	Local	Native livestock breeds which are better suited to wetter ground and poorer grazing could play an important role in the restoration of wetland areas and grazing of Whin and dune grasslands.	Encourage grazing by native livestock breeds to facilitate restoration of wetlands and dune and Whin grasslands. Encourage the promotion and development of supply chains and markets for high-quality local produce from traditional breeds, encouraging a green economy that supports local tourism, and capitalising on the environmental value of local breeds and their heritage/genetic value.	Genetic diversity Food provision Sense of place / inspiration Biodiversity

⁵ Till Abstraction Licensing Strategy, Environment Agency (February 2013; URL: www.environment-agency.gov.uk/business/topics/water/119945.aspx)

⁶ Northumberland Rivers Abstraction Licensing Strategy, Environment Agency (February 2013; URL: www.environment-agency.gov.uk/business/topics/water/119945.aspx)

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Biomass energy	Soils Woodland Biomass crops	<p>The existing woodland cover (5 per cent) offers limited potential for the provision of biomass, either through bringing unmanaged woodland under management or as a by-product of commercial timber production.</p> <p>The NCA has medium potential yield for short rotation coppice (SRC) across most of its area with areas of high potential yield on the mainland adjacent to Holy Island and Budle Bay and to the south-west of Berwick-upon-Tweed.</p> <p>Potential miscanthus yield is medium. A small number of farms are growing miscanthus.</p> <p>For information on the potential landscape impacts of biomass plantings within the NCA, refer to the tables on the Natural England website.</p> <p>There are four biomass boilers and two wood fuel suppliers in the area.</p>	Local	<p>Potential yields of both SRC and miscanthus are already reasonable across much of the area and climate change may result in improved conditions for the growth of biomass crops. However, siting of these crops should consider the impacts on landscape character, historic environment, water courses and soil erosion.</p> <p>Bringing existing deciduous woodland under management could create a local supply of timber and wood fuel. Such management should incorporate nature conservation objectives and ensure that woodlands retain standing and fallen dead wood, as well as a diverse age structure.</p>	<p>Work with the farming community to identify suitable opportunities to increase the net yield of biomass crops, seeking to locate these where they may be accommodated within local landscape character and realise multiple objectives for the environment.</p> <p>Bring existing woodland under management and seek opportunities for small-scale planting of deciduous species to generate a local supply of wood fuel.</p>	<p>Biomass energy</p> <p>Timber provision</p> <p>Biodiversity</p>

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Climate regulation	Soils under semi-natural habitat	<p>Soil carbon levels are generally low (0–5 per cent) but are likely to be higher under the NCA's areas of unimproved grassland habitats, reedbeds, grazing marsh, sand dunes, salt marsh and eel grass beds.⁷</p> <p>Soils under the 1,851 ha (5 per cent of NCA area) of woodland within the NCA will also be relatively high in carbon and the woodland itself will provide carbon storage.</p>	Regional	<p>The amount of carbon stored in agricultural soils could be increased by improving soil organic matter content through measures such as incorporation of manure/straw/other organic matter, use of green manures and minimum tillage.</p> <p>Cultivation of permanent pasture can cause release of large quantities of carbon, so protection of permanent pastures will retain these carbon stores.</p> <p>Areas of saltmarsh, eel grass beds and sand dunes, although small, are important carbon stores and are threatened by coastal squeeze. The carbon sequestration potential of salt marshes and sand dunes could be increased by removing artificial landward barriers, allowing these dynamic habitats to extend inland, and by reducing the nutrient load that marshes receive from rivers and sea water, which can limit below ground carbon storage. Saltmarsh creation from agricultural land should therefore increase carbon storage substantially.</p> <p>Increasing the area of woodland would also help to sequester and store more carbon.</p>	<p>Encourage good soil and nutrient practice to increase soil organic content and minimise diffuse pollution to watercourses and the sea.</p> <p>Encourage the retention of permanent pasture.</p> <p>Enable movement and development of dynamic coastal habitats such as dunes and negotiate managed realignment to create saltmarsh.</p> <p>Seek opportunities to expand and create woodland in locations that will help with adaptation to climate change while increasing carbon sequestration and storage.</p>	<p>Climate regulation</p> <p>Regulating water quality</p> <p>Regulating soil quality</p> <p>Biodiversity</p>

⁷ Carbon storage by habitat: Review of the evidence of impacts of management decisions and condition of carbon stores and sources, Natural England Research Report NERR043, Natural England (May 2012)

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
<p>Regulating water quality</p> <p><i>continued on next page</i></p>	<p>Geology</p> <p>Precipitation</p> <p>Soils</p> <p>Semi-natural habitats</p> <p>Farming practices</p>	<p>Ecological river water quality is mixed but generally moderate. Poor ecological quality is recorded for some coastal streams between Berwick and Holy Island, a coastal stream in the area of Budle Bay, a tributary of the Aln, and a tributary of the Coquet in the south of the NCA.^{8,9,10} Tyelaw Burn, another tributary of the Coquet fails to achieve good chemical status and is recorded as bad ecological potential due to contamination from a former coal mine at Shilbottle.</p> <p>Stretches of the Tweed SSSI and SAC and River Coquet SSSI have been assessed as 'unfavourable no change or 'unfavourable recovering' due to diffuse pollution.</p> <p>The ecological quality of coastal waters is generally good but moderate in the areas of Holy Island and Budle Bay.</p> <p>The chemical quality of surface waters is generally not assessed.</p> <p>The chemical quality of groundwater is poor including for the small area of the Fell Sandstone aquifer in the north where elevated levels of nitrate, sulphate, potassium and volatile</p>	National	<p>Diffuse pollution from agricultural land resulting in sedimentation, nutrient enrichment and contamination from pesticides such as metaldehyde is one of the main issues affecting water quality in this NCA.</p> <p>Pollution from point sources such as septic tanks on converted steadings are an issue particularly around Berwick contributing to raised nitrate levels in groundwater, and on the coastal streams draining into Budle Bay, and these are currently being addressed.</p> <p>There is also some localised contamination from old mine workings at Shilbottle.</p> <p>The quality of coastal waters is generally good and upgrading of the coastal sewage treatment network has significantly improved water quality but run-off from agricultural land and point source pollution are causing elevated nutrient levels which are thought to be responsible for algal growth (<i>Ulva intestinalis</i>) on mudflats around Holy Island. This is creating anoxic conditions and smothering eelgrass beds.</p> <p>The major rivers and coastal environment are of national and international importance for the flora and fauna they support and water quality is critical to their survival.</p> <p>Improving water quality will also benefit recreation as Spittal Beach is currently failing to achieve bathing water status.</p>	<p>Continue to work with the farming community to promote best practice in soils, nutrient and pesticide management to reduce diffuse pollution from agriculture. This will include encouraging farmers to more accurately match nutrient inputs to needs, improve facilities for the storage of slurry and manure (sufficient to cope with more extreme weather conditions), manage stock movements and riparian grazing to avoid poaching and erosion of the banks of watercourses, and manage the timing of operations to protect soil condition.</p> <p>Encouraging especially careful soil and nutrient management where soils overlying the Fell Sandstone aquifer are particularly thin and vulnerable.</p> <p>The use of reedbeds and settlement ponds, in-field margins, headlands, under-sowing, changes in crop type and winter cover crops on farms would help reduce run-off and sedimentation.</p> <p>Manage and extend areas of permanent grassland, scrub and woodland along watercourses.</p> <p>Work with property owners to reduce point source pollution from septic tanks.</p>	<p>Regulating water quality</p> <p>Water availability</p> <p>Regulating soil quality</p> <p>Regulating soil erosion</p> <p>Recreation</p> <p>Biodiversity</p>

⁸ River Basin Management Plan Interactive Mapping, Environment Agency (accessed October 2013 from http://maps.environment-agency.gov.uk/wiyby/dataSearchController?lang=e&textonly=off&topic=wfd_rivers)

⁹ Northumbria River Basin Management Plan, Environment Agency (December 2009; accessed from www.environment-agency.gov.uk/research/planning/33106.aspx)

¹⁰ WFD classification for Whiteadder Water and River Tweed, Scottish Environment Protection Agency (2011; accessed October 2013; URL: www.sepa.org.uk/water/monitoring_and_classification/classification/classification_results.aspx)

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
<p>Regulating water quality</p> <p><i>continued from previous page</i></p>		<p>compounds have been detected.^{11,12,13}</p> <p>Thin soils overlying the aquifer to the southwest of Berwick-upon-Tweed are particularly thin and consequently good soil and nutrient management here is essential.</p> <p>Issues of diffuse pollution are being addressed by land management measures supported by Defra's Catchment Sensitive Farming and Agri-Environment Scheme programmes; the whole of the NCA falls within the Tweed, Aln, Coquet and Coastal Streams Priority Catchment designated under Defra's Catchment Sensitive Farming initiative, and the areas around the Tweed and Holy Island are designated as Nitrate Vulnerable Zones.</p>		<p>Oil pollution remains a real and constant threat to marine life, coastal habitats and sea birds along the whole of the Northumberland coast.</p> <p>More extreme rainfall events as a result of climate change are likely to increase the risk of sediment and nutrient run-off, which could cause increased hydraulic scour and eutrophication effects. Warmer summers may raise water temperatures causing greater incidences of algal blooms and concentration of pollutants, thus affecting fish populations and other freshwater and marine organisms.</p> <p>Good farming practices to help reduce pollution in the NCA will therefore become even more important.</p> <p>Tree planting along watercourses and in the wider catchment could help to reduce diffuse pollution and sedimentation, and areas of the farmed coastal plain, particularly inland of Holy Island, have been identified as priority areas that would benefit from woodland planting for this purpose.¹⁴</p> <p>Invasive species such as Himalayan balsam, giant hogweed, Japanese knotweed and signal crayfish are problematic in the lower stretches of the Aln, Tweed and Coquet catchments. Continuing to monitor and control these species is critical to ensuring the continued good ecological status of these watercourses.</p>	<p>Seek opportunities to reduce pollution from mine water discharges, and work with water companies to reduce the level of pollutants discharged into watercourses and the sea from water treatment works.</p> <p>Ensure that new developments include sustainable urban drainage systems and water efficiency features.</p> <p>Ensure that the economic and environmental importance of the coast and offshore fisheries are taken into account in the oil pollution emergency planning process.</p> <p>Continue to monitor and control the spread of invasive species in the watercourses and coastal environment.</p>	

¹¹ WFD classification for Till Fell Sandstone Aquifer, Scottish Environment Protection Agency (2011; 1) (accessed April 2013; URL: www.sepa.org.uk/water/monitoring_and_classification/classification/classification_results.aspx)

¹² Northumbria River Basin Management Plan, Environment Agency (December 2009; accessed from www.environment-agency.gov.uk/research/planning/33106.aspx)

¹³ Solway Tweed River Basin Management Plan, Environment Agency and Natural Scotland (accessed from www.sepa.org.uk/water/river_basin_planning.aspx)

¹⁴ Woodland for Water Opportunity Mapping, Forest Research (2012; accessed October 2013; URL: www.forestry.gov.uk/fr/INFD-97XGXX)

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating water flow	Geology Soils Semi-natural habitats	<p>The main rivers within the NCA are the Tweed and its tributary Whiteadder Water, the Aln and the Coquet.</p> <p>River flooding is not a significant issue in the Tweed catchment within the NCA.¹⁵</p> <p>Flooding on the Aln has been reported since 1770 but damage has been limited to bridges and agricultural land. The urban centre of Alnmouth is at risk of tidal flooding.¹⁶</p> <p>The physical characteristics of the Coquet catchment mean that it responds quickly to rainfall leading to a rapid onset of flooding. While flooding of settlements is not an issue in this NCA, properties are at risk in Rothbury (upstream of this NCA) and in Warkworth at the mouth of the Coquet, just south of this NCA.</p> <p>Floods have also been a problem in Belford which lies on a coastal stream draining to Budle Bay but generally flood risk from the coastal streams is to agricultural land only.¹⁷</p>	Local	<p>Measures within upstream NCAs such as investigating the opportunity for floodwater storage in gravel pits and the benefit of afforestation in upland parts of the catchment will have the greatest impact on water flow as only short stretches of the lowest reaches of the rivers cross this area.</p> <p>The Environment Agency's preferred approach to managing flood risk on the lower stretches of these rivers includes avoidance of inappropriate development in the floodplain of the Coquet and promotion of sustainable land management practices that reduce the amount and rate of run-off and erosion.</p> <p>Within this NCA improving the infiltration speed of water, particularly through arable soils could help to reduce rates of rainwater run-off and moderate peak and low flows.</p> <p>The Coquet in particular is a very dynamic river which still has a natural and dynamic morphology. This is critical to its biodiversity and geomorphological interest and key to the landscape character of the area.</p> <p>The risk of major flood events is likely to increase with climate change and there is a major opportunity to significantly enhance the regulation of water flow by restoring and creating multi-functional wetlands within the main river corridors and encourage the river systems to operate naturally.</p>	<p>Encourage good management of agricultural soils to improve water infiltration rates, slow run-off and increase water-holding capacity.</p> <p>Seek opportunities to improve flood storage along river corridors, through restoring and expanding wetland habitats such as wet pastures, reedbeds and ponds.</p> <p>Encourage tree planting and hedgerow restoration to help slow run-off into rivers.</p> <p>Seek opportunities to restore natural fluvial processes along rivers and coastal streams which will also facilitate fish passage.</p>	<p>Regulating water flow</p> <p>Water availability</p> <p>Regulating water quality</p> <p>Regulating soil quality</p> <p>Regulating soil erosion</p> <p>Sense of place/ inspiration</p> <p>Recreation</p> <p>Biodiversity</p>

¹⁵ Till and Breamish Catchment Flood Management Plan Summary Report, Environment Agency (December 2009; accessed from www.environment-agency.gov.uk/research/planning/33586.aspx)

¹⁶ North East Northumberland Catchment Flood Management Plan Summary Report, Environment Agency (December 2009; accessed from www.environment-agency.gov.uk/research/planning/33586.aspx)

¹⁷ Ibid

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating soil quality	<p>Geology</p> <p>Soil types</p> <p>Semi-natural habitats</p> <p>Land management</p>	<p>There are six main soilscape types in this NCA:</p> <ul style="list-style-type: none"> ■ Slightly acid loamy and clayey soils with impeded drainage (covering 32 per cent of the NCA). ■ Slowly permeable, seasonally wet, acid loamy and clayey soils (31 per cent). ■ Slowly permeable, seasonally wet, slightly acid but base-rich loamy and clayey soils (19 per cent). ■ Freely draining, slightly acid loamy soils (8 per cent). ■ Loamy and clayey floodplain soils with naturally high groundwater (4 per cent). ■ Sand dune soils (3 per cent). 	Local	<p>The slightly acid, loamy and clayey soils with impeded drainage have a weak topsoil structure that can easily be poached by livestock and compacted by machinery when wet. Careful timing of activities is required to reduce this likelihood.</p> <p>Similarly, the slowly permeable seasonally wet soils may suffer compaction and/or capping as they are easily damaged when wet. This may lead to increasingly poor water infiltration and diffuse pollution as a result of surface water run-off. Management measures that increase organic matter levels can help reduce these problems.</p> <p>Improving soil structure and organic content will not only increase agricultural productivity but also carbon and water storage capability, and improve rates of rainwater infiltration, helping to reduce surface run-off.</p>	<p>Encourage careful timing of mechanised activities and stock movement to avoid compaction of wet soils.</p> <p>Promote informed infield nutrient application and the use of green manure crops and winter stubbles in arable rotations to replace nutrients and bind soil.</p> <p>Ensure the management of pastures and meadows encourages the build-up of organic matter, for example through extensive grazing regimes which will also reduce the risk of poaching.</p>	<p>Regulating soil quality</p> <p>Food provision</p> <p>Climate regulation</p> <p>Regulating water quality</p> <p>Regulating water flow</p> <p>Regulating soil erosion</p> <p>Biodiversity</p>

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating soil erosion	<p>Geology</p> <p>Soils with impeded drainage</p> <p>Semi-natural vegetation</p> <p>Land management practices</p>	<p>The soils over approximately half of this NCA (54 per cent) are at low risk of erosion.</p> <p>In contrast, the slightly acid loamy and clayey soils with impeded drainage (32 per cent of the NCA) are easily compacted by machinery or livestock when wet and are prone to capping or slaking, increasing the risks of soil erosion by surface water run-off, especially on steeper slopes.</p> <p>The freely draining slightly acid loamy soils (8 per cent) are easily eroded on steeper slopes where cultivated or bare soil is exposed, especially if organic matter levels are low after continuous arable cultivation or where soils are compacted.</p> <p>Coarse textured, cultivated variants are also prone to wind erosion in common with the sand dune soils that cover 3 per cent of the NCA. The risk of wind erosion to the latter is increased by disturbance along paths and tracks but decreased where vegetation has stabilised the dune system or when the land surface approaches ground water level.</p>	Local	<p>Soil erosion causing sedimentation of water courses is already recognised as an issue in this NCA¹⁸ and is likely to be exacerbated in the future by more frequent and more intense storm events and warmer, drier summers. Encouraging land management practices that will reduce the risks of soil erosion is therefore essential.</p> <p>The majority of the NCA falls within the Tweed, Aln, Coquet and Coastal Streams Priority Catchment designated under Defra's Catchment Sensitive Farming initiative which supports management measures to reduce sediment, nutrient and pesticide run-off.</p>	<p>Encourage good soil management including careful timing of activities, use of machinery and stock management to avoid damaging wet soils.</p> <p>Encourage the use of cover crops, under-sowing, green manures and in-field grass strips to improve organic content of soils, reduce exposure of bare soils and reduce rates of run-off.</p> <p>Establish permanent grass buffers alongside watercourses.</p> <p>Encourage less intensive management of pastures and meadows to facilitate the build-up of organic matter, for example through extensive grazing regimes which will also reduce the risk of poaching.</p> <p>Encourage more permanent pasture on those soils most prone to erosion.</p> <p>Encourage the restoration and reinstatement of hedgerows and the characteristic grey sandstone walls to reduce wind erosion as well as improving the valuable network of wildlife corridors and reinforcing landscape character.</p> <p>Manage the rights of way network to reduce the impact of footpaths and recreation on vulnerable sand dune soils and encourage the development of dune vegetation where appropriate.</p>	<p>Regulating soil erosion</p> <p>Food provision</p> <p>Regulating water quality</p> <p>Regulating water flow</p> <p>Regulating soil quality</p> <p>Sense of place/ inspiration</p> <p>Biodiversity</p>

¹⁸ Catchment 25: Tweed, Aln, Coquet and Coastal Streams, Capital Grant Scheme - Funding Priority Statement 2013/14, Natural England (accessed from www.naturalengland.org.uk/ourwork/farming/csf/cgs/catchments.aspx)

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Pollination	Semi-natural habitats	<p>Pollination by insects is critical to yields of certain crops such as oilseeds (7 per cent of land cover in this NCA) as well as many wild plant species and domestically grown fruit.</p> <p>Within this NCA the main habitats for pollinating insects are the small areas of semi-natural grasslands and heath along the coastal fringe and on Whin Sill outcrops, but this resource is fragmented and dispersed.</p>	Local	<p>Ensuring the presence of nectar and pollen sources throughout the flying season and the habitat structure required for all stages of their life cycles at a landscape scale, should help to increase pollinators which will benefit crops such as oilseed rape and field beans.</p> <p>Improving the permeability of the landscape by increasing the prevalence and connectivity of suitable habitat and nectar sources, particularly within the arable farmland, and creating links with areas of more extensive semi-natural habitat in adjacent NCAs such as the Northumberland Sandstone Hills, will improve provision of this service.</p> <p>Changes in temperature, humidity and soil moisture as a result of climate change may decouple the phenologies of pollinators from their host plants, change exposure to pollinator pathogens and increase exposure to pesticides if summer rainfall declines. These potential impacts highlight the need for greater connectivity of habitats to allow species to shift and adapt.</p>	<p>Encourage the restoration and creation of nectar-rich habitats such as herb-rich grasslands and heathlands.</p> <p>Protect and restore hedgerows and encourage less frequent cutting to allow greater flowering.</p> <p>Seek opportunities to provide a network of nectar-rich habitats in the farmed landscape, with particular emphasis on arable areas, through pollen and nectar mix areas, flower-rich margins and road verges.</p>	<p>Pollination</p> <p>Food provision</p> <p>Regulating water quality</p> <p>Regulating soil erosion</p> <p>Regulating water flow</p> <p>Pest regulation</p> <p>Biodiversity</p>
Pest regulation	Semi-natural habitats	The main habitats for pest-regulating species are the small and fragmented areas of semi-natural habitats along the coastal fringe.	Local	Increasing the diversity, complexity and extent of habitats should improve the provision of appropriate habitats and resources for predator and parasitoid species. ¹⁹	Seek opportunities to enhance the networks of species-rich grasslands, heathlands, woodland, wetlands, hedgerows and field margins to encourage movement of natural predators and link arable areas with areas of more extensive semi-natural habitats in adjacent NCAs.	<p>Pest regulation</p> <p>Food provision</p> <p>Regulating water quality</p> <p>Regulating soil erosion</p> <p>Regulating water flow</p> <p>Pollination</p> <p>Biodiversity</p>

¹⁹ NECR102 - Ecosystem Services from Environmental Stewardship that benefit agricultural production, Natural England (2012; accessed from <http://publications.naturalengland.org.uk/publication/2322452>)

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating coastal erosion and flooding	<p>Geology</p> <p>Coastal processes</p> <p>Semi-natural habitats including dunes, salt marsh and sand and mud flats</p>	<p>The coastline comprises high rocky cliffs in the north, extensive intertidal sand and mud flats, saltmarsh and sand dunes around Holy Island, a series of rocky headlands, sandy coves and wave-cut platforms south of this between Bamburgh and Seaton Point, and further south sandy beaches backed by sand dunes extend along Alnmouth Bay to the Coquet estuary.</p> <p>The hard rock exposures and headlands are resilient with the best estimates of erosion being less than 0.1m/yr. These resistant areas and the reduced rate of erosion due to wave-cut platforms has allowed the bays to reach a high degree of stability.</p> <p>However, localised sections of the coast are vulnerable to erosion: the more vulnerable areas include Spittal to the south of Tweedmouth which relies on a breakwater to inhibit erosion, and Beadnell which is dependent on the harbour for protection. Sea defences were erected following flooding events of 1953 but these may not be sustainable in the future.</p> <p>The predominant wave direction is from the north-east along this coastline causing a net movement of material from north to south.</p> <p>Holy Island provides a significant barrier to the movement of sediment southwards causing accumulation of sands and finer material in the lee of the island. The transport of sediment is relatively low, mostly occurring within bays.</p> <p>Over recent times sea level has been static or even slightly decreasing along this stretch of coast (due to isostatic rebound following the last de-glaciation) but sea level rise is predicted in the future.</p>	Regional	<p>The preferred policies to manage coastal erosion and sea level rise along the coast of this NCA, as set out in the Shoreline Management Plan (SMP),²⁰ are mainly 'no active intervention' or 'managed realignment' in order to maintain or enhance the naturalness of the coast. A 'hold the line' policy will be followed where specific assets are to be protected such as Berwick-upon-Tweed, Beadnell Village and Harbour and Alnmouth.</p> <p>Within the lower sections of the River Tweed and in the lower reaches of the Coquet and Aln there are some areas which are at risk from tidal flooding.</p> <p>Natural development of coastal habitats such as sand dunes, salt marsh and mudflats is currently affected by artificial barriers and management practices: deflection of waves by hard defences can increase erosion and change sedimentation patterns, and natural roll back is prevented by infrastructure and arable farming.</p> <p>Designated features such as sand dunes and intertidal habitats will be subject to coastal squeeze when sea level rises. There will also be natural loss due to natural hard points (such as the Bamburgh dune system being squeezed against higher ground).</p> <p>Managed realignment of defences to low-lying agricultural land will help to redress the impact of sea level rise on designated habitat. Large areas of saltmarsh have recently been created through managed realignment in the Aln estuary for biodiversity gain and to reduce flood risk in Alnmouth.</p> <p>The preferred policies in the SMP will result in net loss of rocky shore including intertidal reef and rock; in some places the foreshore will be 'squeezed' against static defences by sea level rise but the main issue along this stretch of coast is that more foreshore will be lost to sea level rise than will be gained by cliff recession due to the resistance and profile of the upper foreshore. While it is anticipated that this will not impact significantly on the functionality of the designated sites, all losses must be mitigated or compensated for and it is therefore crucial that the appropriate authorities take this forward on a wider scale than that offered within the SMP.</p> <p>Allowing coastal processes to operate unimpeded and enabling habitats to respond naturally to change can reduce the risk of flooding by absorbing wave energy and providing flood water storage.</p>	<p>Protect and enhance the naturalness of the coast and seek opportunities to enable natural development of coastal systems.</p> <p>Continue to encourage dune roll back to the east of Scremerston through agri-environment schemes.</p> <p>Explore opportunities for managed realignment of the area to the north of Holy Island to facilitate natural development of the coastal system.</p> <p>Explore the possibility of flooding the hinterland behind Beadnell Bay to create a more resilient shoreline and enhance ecological value, as recommended in the SMP.</p> <p>Explore the possibility of managed realignment in the Coquet estuary.</p> <p>Explore opportunities to compensate for the loss of rocky shore as determined by the SMP.</p>	<p>Regulating coastal erosion and flooding</p> <p>Climate regulation</p> <p>Regulating water quality</p> <p>Regulating soil erosion</p> <p>Sense of place/ Inspiration</p> <p>Sense of history</p> <p>Tranquillity</p> <p>Recreation</p> <p>Biodiversity</p> <p>Geodiversity</p>

²⁰ Northumberland and North Tyneside Shoreline Management Plan 2, Final Report 2009, Northumbrian Coastal Group (accessed from www.northumberland-smp2.org.uk/)

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Sense of place/ inspiration	<p>Distinctive geology including the Whin Sill</p> <p>Varied coast</p> <p>Offshore islands</p> <p>Open coastal plain</p> <p>Characteristic habitats</p> <p>Rivers and streams</p> <p>Castles</p> <p>Historic fishing villages</p> <p>Open views</p>	<p>A sense of place is provided by the narrow, low-lying, windswept coastal plain cut by a series of watercourses.</p> <p>The landscape varies from open, gently undulating, intensively managed mixed arable and grazing land, with limited tree cover and planned rectilinear field patterns bounded by low hedges or sandstone walls inland, to permanent pasture and small remaining areas of semi-natural grassland along the coastal fringe and within valleys, with pockets of ancient woodland.</p> <p>The coastal scenery is diverse, dominated by high cliffs and offshore islands in the north to sandy bays, dunes, intertidal flats and saltmarsh in the south.</p> <p>The offshore islands, coast and coastal fringe support numerous iconic species such as puffin, little tern, light-bellied Brent goose and grey seal.</p> <p>Whin Sill intrusions have produced dramatic landscape features including the raised beaches at Bamburgh and distinctive inland outcrops as well as being an important habitat for rare Whin grasslands.</p> <p>This coastline falls within the Northumberland Coast AONB and is recognised Heritage Coast.</p> <p>Fishing villages and towns are strung along the coast, with the fortified town of Berwick-upon-Tweed at the mouth of the Tweed. Inland, settlement is nucleated with dispersed farm hamlets located within large, planned 19th century estates, and small villages, often medieval in origin, on higher ground or at river crossings. Materials are typically local grey sandstone with red pantiled or grey slate roofs.</p> <p>Feelings of inspiration and escapism are likely to be most strongly associated with the strong and dramatic coastline, with striking views along the coast to dramatic coastal landmarks including the tidal causeway, castle and priory of Lindisfarne which retains a remote, spiritual quality.</p> <p>The landscape is celebrated through JMW Turner's paintings of Lindisfarne priory and the ruins of Dunstanburgh Castle.</p>	National	<p>The varied nature of the coastline contributes greatly to a sense of place. Enabling natural dynamic processes such as dune roll back and reducing the impacts of coastal squeeze through measures such as managed realignment will be critical in maintaining the highly valued coastal diversity.</p> <p>Panoramic views of the coastal plain, out to sea and of the Northumberland Sandstone Hills and Cheviots are key to sense of place but vertical structures are becoming increasingly prominent in the landscape. There will be challenges in allowing the area to evolve, responding to changing pressures such as demand for renewable energy while protecting the landscape character and strengthening the sense of place.²¹</p> <p>The strong sense of place and inspiration plays a central role in attracting high numbers of visitors to the area but provision of facilities such as caravan parks, holiday and second homes and golf courses needs to be carefully managed to ensure it does not weaken landscape character.</p> <p>There is a long history of mixed farming and it is important for sense of place and biodiversity that grazing of permanent pasture is retained, even in the face of increased demand for food provision.</p> <p>The deterioration of hedgerows and sandstone walls and proliferation of post-and-wire fencing is weakening landscape character.</p>	<p>Protect the coastline and seek opportunities to facilitate the natural dynamic coastal processes.</p> <p>Maintain and restore the distinctive habitats such as Whin grassland, sand dunes and salt marshes, and protect the iconic species that they support.</p> <p>Ensure that developments and conversions respect the historic settlement patterns, using materials in keeping with the vernacular architecture.</p> <p>Ensure that the impact of new developments on views, landscape character, tranquillity and light pollution are carefully considered and minimised, particularly in the case of vertical structures, taking into account the sensitivities and capacities of landscape areas.</p> <p>Maintain and restore the wealth of historic buildings and other heritage assets using local materials where possible, promoting public access and interpretation where appropriate.</p> <p>Support the retention of permanent pasture and grazing of cattle and sheep to ensure the continuation of mixed farming which is characteristic of the area.</p> <p>Encourage the maintenance and restoration of hedgerows and sandstone walls to strengthen landscape character.</p> <p>Continue to encourage access to and enjoyment of the area by the public, enhancing recreation facilities where appropriate but managing recreational use of the area to minimise sensitive habitats and species by increasing public awareness and attempting to encourage use of less vulnerable areas.</p>	<p>Sense of place/ inspiration</p> <p>Sense of history</p> <p>Tranquillity</p> <p>Biodiversity</p> <p>Geodiversity</p>

²¹ Northumberland Coast Area of Outstanding Natural Beauty, Landscape Sensitivity and Capacity Study, Northumberland Coast AONB (August 2013; accessed from www.northumberland.gov.uk/Default.aspx?page=6882)

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Sense of history	<p>Archaeological sites</p> <p>Castles and other fortified buildings and towns</p> <p>Lindisfarne Priory</p> <p>Industrial heritage</p> <p>Fishing villages</p> <p>Country houses with grounds and parklands</p> <p>Field boundaries</p>	<p>A sense of history is evident in the NCA's links to an early settled and heavily exploited past. Fishing, farming and mineral extraction combined with the need for cross border defence have all shaped the landscape. There have also been strong ecclesiastical influences including the Holy Island of Lindisfarne and Lindisfarne Priory (the home of St Cuthbert and the birthplace of Christianity in England).</p> <p>This history is strongly evident in a legacy of archaeology from the Mesolithic onwards²² including the Devil's Causeway (Roman military route), battlefields, fortified buildings, the fortified town of Berwick-upon-Tweed, a number of striking ecclesiastical buildings, and defences from the Second World War. A number of these buildings are outstanding coastal landmarks such as the strategically located coastal castles at Lindisfarne (restored by Lutyens), Bamburgh and Dunstanburgh.</p> <p>Villages and towns such as Seahouses and Beadnell which developed around fishing and trade in agricultural produce, lime and coal now increasingly cater for tourists.</p> <p>Inland many villages have Medieval origins while isolated farm hamlets reflect the large-scale reorganisation by large estates in the late 18th- and 19th- centuries. Medieval dovecotes and 19th-century threshing chimneys are notable features of the area.</p> <p>There are houses with parklands and gardens including Howick Hall with its extensive tree planting which is a Registered Garden.</p> <p>The whole coast line of this NCA is recognised as Heritage Coast.</p>	National	<p>Buried archaeology including a number of Scheduled Monuments is particularly threatened by ploughing in this arable landscape and this may escalate in the future with changes in climate and increasing demand for food provision.</p> <p>Heritage assets along the coast are vulnerable to loss through coastal erosion and this is likely to be exacerbated by future climate change. Where possible sites should be excavated, catalogued and interpreted before they are lost.</p> <p>The restoration of historic buildings including those relating to quarrying and mining should be encouraged, but training of practitioners in the use of traditional building techniques and materials may be required.</p> <p>Future developments should promote the use of vernacular design where appropriate and respect historic settlement patterns.</p> <p>Loss of hedgerows and the distinctive sandstone walls of the area through removal and neglect has weakened the historic character of the area; the restoration of these boundaries should be encouraged.</p>	<p>Explore opportunities for better management of below-ground archaeology on arable land, such as establishment of permanent grassland, shallow cultivation or minimum tillage agriculture, and encourage uptake of agri-environment schemes to fund such work.</p> <p>Excavate record and interpret archaeological sites that are at risk of coastal erosion.</p> <p>Encourage the maintenance and restoration of Scheduled Monuments, historic buildings, parkland features, traditional farm buildings and defensive structures using local building materials and styles where appropriate.</p> <p>Promote training of practitioners in the use of traditional building techniques and materials to ensure the skills required to conserve the historic built environment are available and support the local economy.</p> <p>Encourage management of sites to control encroachment by vegetation and erosion by animals.</p> <p>Encourage the maintenance and restoration of hedgerows and sandstone walls.</p> <p>Ensure new developments and conversions respect the historic settlement patterns and reflect the local vernacular in terms of building materials, scale and location.</p> <p>Provide clear and imaginative interpretation of sites and landscapes to improve the understanding of the links between geology, history and current landscapes for enjoyment of the public.</p>	<p>Sense of history</p> <p>Regulating soil erosion</p> <p>Sense of place/inspiration</p> <p>Recreation</p> <p>Biodiversity</p> <p>Geodiversity</p>

²² A Mesolithic settlement site at Howick, Northumberland: a preliminary report. Archaeologia Aeliana 5th Series, 32: 1–12, C Waddington et al. (2003)

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Tranquillity	<p>Undeveloped coast</p> <p>Wooded valleys</p> <p>Panoramic views</p>	<p>The NCA has experienced a significant decline in tranquillity since the 1960s. Undisturbed areas have decreased from 96 per cent in the 1960s to 63 per cent in 2007. Areas of low tranquillity are concentrated around Berwick-upon-Tweed, the A1 and the main London to Edinburgh railway line.</p> <p>Nevertheless, this is a landscape that maintains a strong sense of tranquillity especially along its spectacular undeveloped coastline, with the most tranquil spots being Holy Island and Budle Bay. Other areas associated with perceived tranquillity include the wooded valleys of the rivers Coquet and Aln, and the more intimate, occasionally wooded and rolling landscapes around Caster and other historic villages.</p> <p>Some areas offer good views of the dark night sky, valued by visitors and residents alike, but light pollution of night skies in this area is increasing significantly.</p>	Regional	<p>While this is still perceived as a relatively tranquil part of the country the increasing intrusion from development and traffic needs addressing if it is to remain an attractive place for quiet enjoyment and recreation.</p> <p>It is necessary to consider the cumulative impacts of development including the “creeping urbanisation” of light and noise pollution when planning and assessing new developments.</p> <p>It is important that people are still encouraged to enjoy the tranquillity of this place, with benefits for health and well-being, but sensitive management of visitors numbers will be needed to minimise the negative effects of tourism such as disturbance, including through careful planning of transport routes, provision of public transport and cycle routes to minimise private car use, and design and management of public access routes and infrastructure.</p>	<p>Protect the undeveloped coast.</p> <p>Seek opportunities to maintain and enhance the wooded character of the Aln and Coquet river valleys.</p> <p>Protect the open vistas and tranquillity by carefully considering the impact of new developments, minimising the impact of vertical structures such as wind turbines both in this and adjacent NCAs, and controlling intrusion from development and light pollution.</p> <p>Sensitively manage visitor access and recreational facilities to avoid loss of tranquillity through the careful planning of transport routes, provision of public transport and cycle routes to minimise private car use, and design and management of public access routes and infrastructure.</p>	<p>Tranquillity</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
Recreation <i>continued on next page</i>	Coast Off shore islands Sea Wooded valleys National Nature Reserves AONB and Heritage Coast Castles Country houses and gardens A wealth of heritage assets Game fisheries Public rights of way Long distance trails	<p>The NCA offers a network of rights of way totalling 421 km at a density of 1 km per km² including a number of long distance routes such as St Cuthbert's Way, St Oswald's Way and the Northumberland Coast Path. There is also the Coast and Castles National Cycle Route.</p> <p>The coastline provides additional recreational opportunities such as angling, diving and water sports, and the area is nationally renowned for its nature-based tourism, particularly around the Farne Islands, Lindisfarne and Beadnell Bay.</p> <p>The rivers Tweed and Coquet are important game fisheries.</p> <p>Popular locations for recreation include the historic walled town of Berwick-upon-Tweed, the internationally important Lindisfarne, the coastal castles of Bamburgh and Dunstanburgh, and the gardens at Howick Hall.</p>	National	<p>The coastal fringe provides a wide range of recreational opportunities and destinations and draws large numbers of visitors every year.</p> <p>Tourism is very important to the area, particularly to the local economy, but visitor pressure can threaten sensitive habitats, species and landscape features if not managed appropriately.</p> <p>Low-impact activities such as walking and wildlife watching that directly connect people with the natural assets of the area and enable quiet enjoyment of the natural environment should be encouraged but taking into account the impacts of increased visitor numbers on wildlife and habitats.</p> <p>Visitor pressure is also associated with problems of low household incomes, high levels of second and holiday homes, and high house prices, particularly within and on the fringes of the Northumberland Coast AONB. Caravan and chalet parks and other developments associated with tourism are prevalent along the coast and can be visually intrusive.</p> <p>The cumulative impacts of disturbance on key species and habitats needs to be quantified, investigated and monitored to better understand the impacts of recreation on this sensitive landscape and its internationally important species.</p>	<p>Endeavour to ensure that tourism development is sustainable, sensitively utilises the landscape resource and brings socioeconomic benefits to local communities.</p> <p>Sensitively manage visitor access and recreational facilities to minimise impact on the assets of this landscape through the careful planning of transport routes, provision of public transport and cycle routes to minimise private car use, and design and management of public access routes and infrastructure.</p> <p>Encourage activities that depend upon and support the qualities of the natural environment such as walking, riding, bird and wildlife watching, angling.</p> <p>Encourage initiatives that emphasise local distinctiveness, promoting local produce and linking it to the landscape.</p> <p>Encourage research to quantify and understand the impacts of disturbance from visitors on wildlife.</p> <p>Seek opportunities to increase public understanding of the impacts of disturbance on sensitive species such as over-wintering waders and manage visitor pressure to minimise this.</p> <p>Ensure trampling of dunes does not result in loss of vegetation while allowing natural dune processes to continue.</p>	Recreation Regulating water quality Regulating soil erosion Sense of place/inspiration Sense of history Tranquillity Biodiversity Geodiversity

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Recreation <i>continued from previous page</i>				<p>The footpath and cycle networks are relatively good although there are opportunities to improve these further, particularly including improving crossings of the A1 and East Coast Main Line, and several river crossings. The bridleway network is limited and fragmented.²³ Delivery of the England Coast Path will be implemented in this area in the next few years ensuring high quality coastal access along the length of the coast.²⁴</p> <p>Enjoyment and understanding of the landscape, with its many geological and historic features, and the area's biodiversity can be improved through imaginative interpretation.</p> <p>Litter, particularly on beaches, is an ongoing problem although much is deposited by the sea rather than being dropped by visitors.</p> <p>In the future warmer, drier summers are likely to increase the risks of wildfires and may also result in reduced water levels in waterbodies used for recreation. Species such as salmon which are sensitive to thermal stress may decline which will impact on the game fishing industry.</p> <p>Water quality should be maintained and improved wherever possible for the benefit of both wildlife and recreational users.</p> <p>Recreation can also play a role in spreading non-native invasive species such as pirri-pirri burr.</p>	<p>Seek opportunities to enhance the footpath, cycleway and bridleway networks, including supporting implementation of the England Coastal Path, providing opportunities for a range of abilities and high quality coastal access along the entire length of coast, addressing gaps and crossings of the A1 and East Coast Main Line railway, but preventing damage to habitats and wildlife.</p> <p>Seek opportunities to restore more historic, industrial and geological sites, providing imaginative interpretation of the landscape and its many features to interpret this legacy for the understanding and enjoyment of all.</p> <p>Continue to address the problems of litter on the coast, both litter dropped by visitors and that deposited by maritime currents, but without removing the strandline.</p> <p>Seek opportunities to increase public awareness of the mechanisms and problems of spreading invasive non-native species such as pirri-pirri burr.</p> <p>Seek opportunities to improve water quality for the benefit of wildlife and recreational activities.</p>	

²³ Northumberland Rights of Way Improvement Plan, Northumberland County Council (accessed from www.northumberland.gov.uk/default.aspx?page=2223#Rights)

²⁴ Coastal Access in England, Natural England (accessed from www.naturalengland.org.uk/ourwork/access/coastalaccess/default.aspx)

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
<p>Biodiversity</p> <p><i>continued on next page</i></p>	<p>Geology</p> <p>Streams and rivers</p> <p>Coast</p> <p>Diverse semi-natural habitats</p> <p>Sites designated for nature conservation</p>	<p>The NCA contains 5 SAC, 3 SPA, 2 Ramsar sites, 3 NNR and 15 SSSI. Many of these designated sites are concentrated around the coast, reflecting the diverse range of nationally and internationally important habitats and species found there including calcareous, acid, Whin and maritime grasslands, lowland and cliff-top heaths, dune systems, saltmarsh, eel grass beds and reed beds.</p> <p>The coast, estuaries and offshore islands provide important over-wintering and breeding grounds for large numbers of wildfowl, waders and seabirds. The Farne Islands also support approximately 10 per cent of the world population of grey seal.</p> <p>Some of the rare Whin grassland is protected within designated sites such as Bamburgh Coast and Hills SSSI but a number of outcrops are unprotected and in some cases are threatened by extension of stone quarries.</p> <p>Newham Fen SAC is a eutrophic basin mire in the middle of the coastal plain.</p>	International	<p>A number of sensitive habitats such as dunes, saltmarsh, Whin grassland and maritime cliff and slope habitats are being damaged by trampling due to increased recreational pressure. Disturbance from recreation and activities such as bait-digging, particularly of over-wintering shorebirds, is also recognised as a problem, and it is predicted that visitor numbers will continue to rise.</p> <p>Inappropriate grazing regimes and scrub encroachment threaten dunes, saltmarsh, grasslands and heathland. A number of the remaining Whin grassland sites are not currently protected and may be lost to quarrying.</p> <p>Natural development of coastal habitats such as sand dunes, salt marsh and mudflats is currently affected by artificial barriers and management practices. These habitats, along with rocky foreshore habitats will also be vulnerable to coastal squeeze as sea level rises.</p> <p>Ensuring good water quality in streams, rivers and coastal waters, restoring as natural a morphology as possible and controlling invasives such as Himalayan balsam, Japanese knotweed and signal crayfish will benefit the nationally and internationally important species found there and will ensure the continuing reputation of the rivers in this NCA as important game fisheries.</p>	<p>Encourage research to quantify and understand the impacts of disturbance on wildlife from visitors and activities such as bait-digging.</p> <p>Seek opportunities to increase public understanding of the impacts of disturbance on sensitive species and habitats, including disturbance to over-wintering waders and damage to sensitive habitats caused by trampling. Manage visitor pressure to minimise this.</p> <p>Encourage sustainable grazing of dune systems, saltmarsh and grasslands and manage scrub where appropriate.</p> <p>Seek opportunities to protect existing Whin grassland sites from loss through quarrying and restore former quarry workings back to Whin grassland.</p> <p>Seek opportunities to restore and expand semi-natural grasslands, heathlands, wetlands and scrub habitats, aiming to re-establish and expand the fringe of semi-natural vegetation all along the coast.</p> <p>Enable natural coastal processes to operate wherever possible while maintaining essential sea defences as recommended in the Shoreline Management Plan.</p> <p>Seek opportunities to allow natural roll back of sand dunes, particularly between Scremerston and Lindisfarne, by reversion of the coastal strip to grassland.</p> <p>Seek opportunities to negotiate the creation or expansion of saltmarsh habitat by allowing tidal flooding of farmland.</p>	<p>Biodiversity</p> <p>Food provision</p> <p>Climate regulation</p> <p>Regulating water quality</p> <p>Regulating soil erosion</p> <p>Regulating coastal erosion and flooding</p> <p>Pollination</p> <p>Pest regulation</p> <p>Sense of place / inspiration</p> <p>Tranquillity</p> <p>Recreation</p>

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
<p>Biodiversity</p> <p><i>continued from previous page</i></p>		<p>The River Tweed is designated as a SAC and the Coquet as SSSI due to their importance for species such as sea and river lamprey, Atlantic salmon and otter, and the Coquet valley contains nationally important native woodland.</p> <p>The farmed plain provides roosting and foraging grounds for the overwintering shore birds and supports nationally important populations of farmland birds.</p> <p>Kyloe Forest in the Northumberland Sandstone Hills NCA runs to the boundary of this NCA and has been designated as a red squirrel reserve.</p>		<p>Other non-native invasive species such as pirri-pirri burr and cord grass also need to be monitored and controlled to ensure they do not displace important native species.</p> <p>There are opportunities to buffer Newham Fen SAC by improving the wider hydrological unit through wet grassland management in the surrounding area.</p> <p>There are opportunities to greatly enhance the heterogeneity and permeability of the farmed plain by restoring hedgerows, establishing grass margins, encouraging the use of overwinter stubbles and temporary grass, field corners for nectar and wild-bird seed mixes, and reedbeds. This will benefit farmland birds and overwintering shorebirds and buffer the sensitive coastal habitats and watercourses.</p> <p>Native woodland is predominantly confined to river valleys and the area around Howick. Restoring and extending these woodland fragments, particularly by planting along water courses, should create a more coherent ecological network which will be more resilient to climate change, while strengthening landscape character.</p> <p>The area buffering the Kyloe red squirrel reserve needs to consider management for this species.</p>	<p>Work with farmers, fishermen, local residents and water companies to improve water quality in rivers, estuaries and along the coast, and to reduce the amount of litter washed up and left on the area's beaches.</p> <p>Encourage the establishment of buffer strips, reed beds, settling ponds and wetland areas to reduce diffuse pollution and enhance the biodiversity value of the farmed environment.</p> <p>Monitor and control non-native invasive species.</p> <p>Encourage wet grassland management which will benefit waders, particularly around Newham Fen SAC.</p> <p>In arable areas encourage measures to support pollinators and farmland birds, such as sowing wild bird seed and nectar flower mixes and establishing cereal headlands. Encourage the use of over-wintered stubbles, and temporary grass, particularly along the coastal fringe, to benefit overwintering shorebirds.</p> <p>Increase connectivity within the landscape through hedgerow restoration, field margin management and tree planting along watercourses.</p> <p>Buffer the Kyloe red squirrel reserve by controlling grey squirrels and avoiding planting of large-seeded deciduous species in the vicinity.</p> <p>Seek opportunities to expand and link woodland fragments, particularly along water courses and within the area around Howick.</p>	

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Geodiversity	<p>Geology</p> <p>Coastal processes</p> <p>Water courses</p> <p>Soils</p>	<p>The underlying Carboniferous rocks give rise to the characteristic and diverse coastline with the resistant dolerite and sandstone headlands alternating with sandy bays where 'softer' rocks have eroded.</p> <p>This area has nationally important geological features with two geological SSSI and four mixed interest SSSI.</p> <p>Outcrops of the nationally important Whin Sill and related dolerite occur both inland and on the coast forming striking cliffs at Castle Point and Cullernose Point, the outcrops on which Bamburgh and Lindisfarne castles sit, and the rocky, offshore Farne Islands.</p> <p>The geology is associated with a number of nationally and internationally important habitats such as Whin grassland, sand dune systems and salt marsh communities.</p> <p>Inland the thick layer of glacial till that overlays the bedrock gives rise to fertile agricultural soils that support arable production with some grazing.</p> <p>There is a long history of hard stone quarrying. Sandstone was quarried for building stone and whinstone has long been quarried for road stone, although it has also been used extensively for buildings in Bamburgh, Craster and Embleton where it gives a distinctive character to the cottages built from it. There are currently four active stone quarries.</p> <p>Limestone was quarried and burnt on a large-scale at Holy Island, Seahouses and Beadnell and the limekilns are still prominent features.</p> <p>Coal was mined around Scremerston and in the south of the NCA around Shilbottle but these mines are now closed and there are no plans for further coal mining in the NCA.²⁵</p>	National	<p>The geology and landform of the coast and outcrops of the Whin Sill combined with the use of local grey sandstone in the construction of traditional buildings and stone walls are key to the strong sense of place. Improving interpretation of and access to the geodiversity of the area would enhance public understanding and enjoyment of the area and strengthen sense of place.</p> <p>The coast offers some of the finest and most complete sections through the Lower Carboniferous rocks of northern England. These sites, along with quarries and geological SSSI provide vital education and research opportunities, both to demonstrate the essential characteristics of these rocks, and to learn about the processes that created them.²⁶</p> <p>There are currently no Local Geological Sites. Identification and designation of Local Geological Sites would provide additional protection for key geological features as well as providing new opportunities for education and interpretation.</p> <p>There are no plans for future coal mining in this NCA but stone quarrying will continue as this area is important for supplying the north of England with road stone and local stone is required for restoration and new developments to reinforce landscape character.</p>	<p>Conserve and enhance nationally important and designated geological features and encourage the use of key geological sites as an educational and research resource.</p> <p>Encourage the identification and designation of Local Geological Sites.</p> <p>Exploit opportunities presented by quarries to accurately record geological sections, and collect and curate representative specimens to further knowledge and understanding of the local geology.</p> <p>Improve access to and interpretation of geological sites and features, including designated sites and quarries, and explore the possibility of geo-trails, to enhance the public's understanding and enjoyment of the area.</p> <p>Preserve sites and features associated with the industrial use of geodiversity, such as Beadnell and Seahouses lime kilns and the whinstone chippings silo base at Craster Harbour, and provide interpretation.</p> <p>Maintain vernacular buildings and dry stone walls using local stone wherever possible to reinforce links with the underlying geology and strengthen sense of place.</p>	<p>Geodiversity</p> <p>Sense of place/ inspiration</p> <p>Sense of history</p> <p>Recreation</p> <p>Biodiversity</p>

²⁵ Northumberland Minerals Local Plan, Northumberland County Council (2000; accessed from www.northumberland.gov.uk/default.aspx?page=770)

²⁶ Northumberland Coast Area of Outstanding Natural Beauty and European Marine Site, Geodiversity Audit and Action Plan – accessed from <http://www.northumberland.gov.uk/default.aspx?page=6890>

Photo credits

Cover photo: The coastal scenery is exceptionally diverse with spectacular rocky cliffs to the north, off-shore islands and rocky headlands contrasting with sweeping sandy beaches, sand dunes, mudflats and saltmarsh. © Steve Pullan/Natural England

Pages 4, 8, 11, 14, 24, 25, 27 & 32 © Andrew Hayward/Natural England

Pages 5, 17 & 30 © Steve Pullan/Natural England

Page 6 © Jacqui McHugh/Natural England

Page 9 © Andy Tryner/Natural England

Page 28 © Charlie Hedley/Natural England

Pages 35 & 41 © Alison Chapman/Natural England



Natural England is here to secure a healthy natural environment for people to enjoy, where wildlife is protected and England's traditional landscapes are safeguarded for future generations.

Catalogue Code: NE516

ISBN: 978-78367-076-5

Should an alternative format of this publication be required, please contact our enquiries line for more information: 0845 600 3078 or email enquiries@naturalengland.org.uk

www.gov.uk/natural-england

This note [report/publication] is published by Natural England under the Open Government Licence - OGLv2.0 for public sector information. You are encouraged to use, and reuse, information subject to certain conditions.

For details of the licence visit www.naturalengland.org.uk/copyright

Natural England photographs are only available for non commercial purposes. If any other information such as maps or data cannot be used commercially this will be made clear within the note [report/publication].

© **Natural England 2015**