National Character Area profile:

# 110. Chilterns



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# Introduction

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

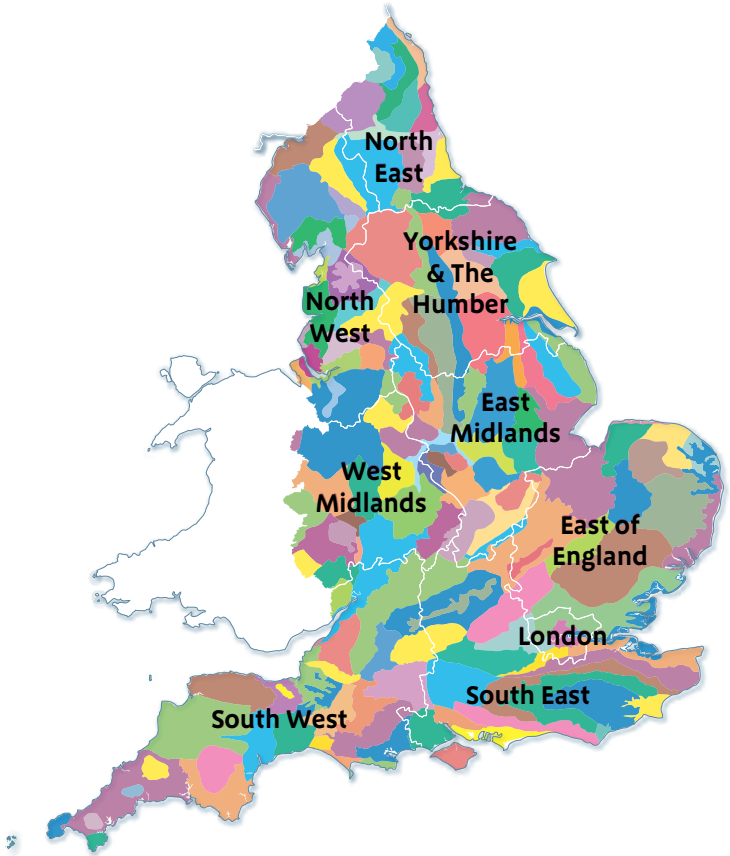
NCA profiles are guidance documents which can help communities to inform their decision-making about the places that they live in and care for. The information they contain will support the planning of conservation initiatives at a landscape scale, inform the delivery of Nature Improvement Areas and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

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

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

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

## National Character Areas map




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

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

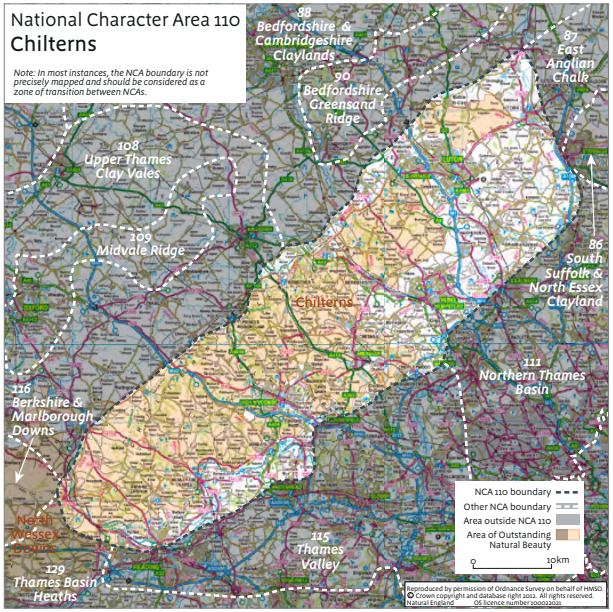
[3] European Landscape Convention, Council of Europe (2000; URL: http://conventions.coe.int/Treaty/en/Treaties/Html/176.htm)

# Summary

The extensively wooded and farmed Chilterns landscape is underlain by chalk bedrock that rises up from the London Basin to form a north-west-facing escarpment offering long views over the adjacent vales. From the vales, the River Thames breaches the escarpment in the south at the Goring Gap and flows on past riverside towns such as Henley. Small streams flow on chalk down some of the dip slope valleys or from the scarp foot, passing through numerous settlements. The major sources of public water supply for the Chilterns and the London area are the chalk aquifer and the Thames.

The countryside is a patchwork of mixed agriculture with woodland, set within hedged boundaries. Furthest from London, the natural and built features of the countryside are recognised as special and attractive in approximately half the National Character Area (NCA) by the designation of the Chilterns Area of Outstanding Natural Beauty (AONB) and, in a small area south of the River Thames, by the North Wessex Downs AONB. Outside the AONBs there are major settlements that incorporate extensive urban fringe and growth areas, including Luton, Hemel Hempstead and High Wycombe. Motorways and railways make the area very accessible to visitors and connect the Chilterns to nearby London. Opportunities for residents and visitors to enjoy the outdoors are wide-ranging, including extensive rights of way; open access commons, woods and downland; Registered Parks and Gardens open to the public; golf courses; shooting estates; and urban green spaces. The Ridgeway and the Thames Path National Trails pass through the Chilterns, and the River Thames and Grand Union Canal are major water-based recreation corridors.

Human history dates back to the Palaeolithic, as evidenced by flint scatters. Farming of the valleys and escarpment began in the Neolithic and continues to this day as a major land use. Arable farming is concentrated on deep, well-drained soils found in the valleys, along the scarp foot and beneath the hills in the north. Nucleated settlements, often featuring historic buildings dating back to medieval times, are found in the valleys and along the scarp foot, as are the major routes. Chalk streams are found only in the main valleys and can be dry in their upper reaches.




Click map to enlarge; click again to reduce.

Above the valley floors, cultivation is made difficult by steep slopes, convoluted terrain and extensive clay-with-flint soils on the dip slope ridges. This has given rise to a diversity of land management practices throughout history, including mixed farming, woodland, extensively grazed downland and common land. Settlement on the plateau is characterised by dispersed farmsteads and villages linked by historic, small-scale routes including sunken lanes.

**Walkers can enjoy an extensive rights of way network across farmland and woodland.**

Today, common land and downland exist as fragments of their former extents. Commons are numerous across the plateau, providing green space near to people's homes. Historic downland is largely confined to the scarp and is strongly associated with prehistoric archaeology; its species-rich grassland and scrub include areas designated as a National Nature Reserve (NNR) and Special Areas of Conservation (SAC). Woodland cover accounts for 14 per cent of the NCA and makes the Chilterns one of the most wooded lowland landscapes in the country. Woods are found on poor agricultural soils, on commons and 'hanging' on steep slopes. A long history of a wood-based economy has helped to maintain many woodlands on ancient sites and generate rich woodland archaeology. More recently, local demand for wood fuel is helping to maintain the woodland resource. Chilterns NCA is renowned for its native beechwoods, a number of which are designated as SAC for their ecological interest.

Throughout the area, historic buildings and also some more recent constructions display locally distinctive uses of local materials, particularly brick and flint. Large mansions and follies are frequent in the countryside, many relating to Registered Parks and Gardens.

## Statements of Environmental Opportunity

- **SEO 1**: Manage the wooded landscape, the woodlands (including internationally important Chilterns beechwoods), hedgerows, commons and parklands with the aims of conserving and enhancing biodiversity and the historic landscape and its significant features; maximising the potential for recreation; and securing sustainable production of biomass and timber.

- **SEO 2**: In pockets of historic land use where natural and cultural heritage are both particularly rich, aim to restore and strengthen the historic landscape, ecological resilience and heterogeneity, and to conserve soils. Ensure that species-rich habitats are conserved and extended, including internationally important species-rich Chiltern downland. Secure environmentally and economically sustainable management to ensure conservation in the long term.

- **SEO 3**: Conserve the Chilterns' groundwater resource, River Thames and chalk streams by working in partnership to tackle inter-related issues at a catchment scale and also across the water supply network area. Seek to secure, now and in the future, sustainable water use and thriving flood plain landscapes that are valued by the public.

- **SEO 4**: Enhance local distinctiveness and create or enhance green infrastructure within existing settlements and through new development, particularly in relation to the urban fringe and growth areas such as Luton. Ensure that communities can enjoy good access to the countryside.

**Remnant downland is rich with orchids and other flowering plants.**

# Description

## Physical and functional links to other National Character Areas

Chilterns is one of several NCAs that make up an outcrop of the Chalk stretching from East Anglia to Dorset and to the South Downs. To the north-east, the Chiltern escarpment lowers into the East Anglian Chalk. In the south-west, the neighbouring escarpments of the Chilterns and the Berkshire and Marlborough Downs face each other across the Thames at the Goring Gap. From the north-west-facing escarpment, the Chilterns dip slope descends to the south-east into the London Basin, where the Chalk is overlain by younger bedrock.

**The escarpment offers panoramic views across the vales and hills to the north-west.**

Adjacent to the low-lying NCAs of Bedfordshire and Cambridgeshire Claylands and Upper Thames Clay Vales, the Chilterns scarp is prominent and offers panoramic views of the adjacent vales, principally Aylesbury Vale, from viewpoints such as Ivinghoe Beacon. Across the vales there is inter-visibility between Chilterns and other elevated NCAs such as Midvale Ridge and Bedfordshire Greensand Ridge.

From the northern end of the scarp, the rivers Flit and Ouzel (also known as Lovat) flow north onto the Bedfordshire and Cambridgeshire Claylands as part of the Anglian catchment. Along the remainder of the scarp, watercourses flow into the Upper Thames Clay Vales to feed the Thames catchment. The Thames flows from the Upper Thames Clay Vales through the Chiltern ridge at the Goring Gap to enter the London Basin.

Within the London Basin, the Chilterns' natural groundwater and surface water flows are linked to those of the wider basin which centres upon London and the Thames. These links are significant since the Chilterns function as the larger of the two principal aquifers in the basin (the other being the North Downs). Infiltration in the Chilterns supports groundwater levels and quality in London's confined aquifer and base flow in the Thames, which passes through the Thames Valley and inner London.

The Chilterns are linked into a modern transport network of motorways and railways radiating from nearby London. Outside London, major roads around Reading, Maidenhead, Slough and Aylesbury also link to the Chilterns. Long-distance historic routes that now function as key recreation corridors pass through the Chilterns: the Grand Union Canal, the Thames and the Ridgeway.

## Distinct areas

- Thames Valley

## Key characteristics

- The chalk plateau is incised by parallel branching valleys gently shelving to the south-east into the London Basin. The large chalk aquifer is abstracted for water to supply London and its surrounds and also supports flows of springs, chalk streams and the River Thames.
- There are several chalk streams. Features associated with a history of modification include historic mills, watercress beds, culverts and habitat enhancements.
- The north-west-facing escarpment is an abrupt relief feature beside low-lying vales, breached notably by the Thames at the Goring Gap. The escarpment lowers northwards, terminating as distinct hills. The Chiltern ridge offers panoramic views.
- Within the Chilterns, views are enclosed within branching valleys, sunken routeways and extensive woodland and hedgerow-enclosed fields. There are hidden, tranquil pockets along single track lanes and rights of way.
- A mixture of arable, grassland and woodland and the numerous commons reflects the dominance of Grade 3 agricultural land. Ancient woodland has remained on extensive clay-with-flint deposits, while very steep slopes are rarely cultivated. There are, however, not inconsiderable areas of Grade 1 and 2 land that are associated with lower-lying areas and river valleys.
- The Chilterns are one of the most wooded lowland landscapes in England. The area is particularly renowned for its extensive native beechwoods, several of which are designated as part of the Chilterns Beechwoods Special Area of Conservation (SAC). Other distinctive features include rare box woods, 'hanging' woods on steep slopes and rare yew woods, including Hartslock Wood SAC.

**The River Thames offers a variety of recreation opportunities, particularly as it passes through towns fronting the river such as Marlow shown here.**

## Key characteristics continued

- Pre-18th-century fields defined by ancient, often sinuous hedged boundaries are scattered throughout, including co-axial fields. Parliamentary enclosure fields are limited. Large modern fields, usually with ancient boundaries, cover the better agricultural land, most notably in the north-east.
- Remnants of various historic land use types can combine rich and diverse habitats and archaeology. Many key places are publicly accessible, including Registered Parks and Gardens, historic downland and common land. Traditional flood plain landscapes and orchards are the most restricted in extent. Historic routeways, hedged boundaries and watercourses provide connectivity.
- Historic downland preserves prehistoric archaeology and supports high numbers of rare and scarce chalk grassland vascular plants, mosses and liverworts. Diversity is enhanced by a mosaic of chalk grassland, scrub and woodland, with Hartslock Wood SAC being one example.
- Species strongly associated with the Chilterns include the red kite, pasque flower, stag beetle, Chiltern gentian, shepherd's needle, chalkhill blue butterfly and native box. Aston Rowant SAC protects an internationally important juniper scrub population. Farmland birds and deer are a feature of the wider countryside.
- Nucleated settlements of medieval origin and land farmed since prehistory are found alongside watercourses and springs in the through-valleys and at the foot of the scarp. Elsewhere, dispersed farmsteads dating from the medieval period and mid-19th-century development around commons are characteristic of the plateau.
- The River Thames and its flood plain mark a distinctive area in the south. The river is a focus for settlement, abstraction and recreation.
- Major transport routes, including motorways, radiate from adjacent Greater London, associated with significant 20th-century development and extensive urban fringe areas.
- Brick and flint are the dominant traditional building materials, with Totternhoe Stone (clunch) being less common, but still a distinctive
- Numerous parkland landscapes define large, historic estates. Designs by Humphry Repton and Lancelot 'Capability' Brown are represented, and the houses, follies and wooded features provide local landmarks.
- Extensive rights of way, commons, open access downland, woodland and some parklands provide access to the countryside. The Thames Path, the Ridgeway and the Grand Union Canal are high-profile recreation routes; locally promoted routes include the Chilterns Cycleway. Private leisure land uses, including golf courses and horse paddocks, are common near urban centres.

## Chilterns today

The Chilterns are a distinctive outcrop of the Chalk, with a dramatic scarp forming the north-western boundary. From the long, north-west-facing scarp there are extensive, panoramic views over the adjacent vales. The dip slope, with the character of a plateau, falls gently to the south-east, cut by a series of branching valleys. The enclosed character of the valleys contrasts with the open plateau and long views from the scarp. Rising to just above 260 m, the hills stretch from the Thames in Oxfordshire at their south-western point, across Buckinghamshire and Hertfordshire to Bedfordshire in the north-east. The area includes the lower-lying substantial settlements of Luton, Dunstable, Hemel Hempstead, Berkhamsted, Chesham, Amersham and High Wycombe, as well as sections of the M40 and M1 motorway corridors. The south-western boundary is formed by the River Thames as it flows past Wallingford, Reading, Henley and Marlow. Although part of the Chilterns, this belt of countryside is dominated by the river and its flood plain rather than by the hills.

While many of the dip slope valleys are dry, there are several chalk rivers flowing through others, such as the Chess. Springs and watercourses also issue from the foot of the scarp, such as the Ewelme Brook. Many of the watercourses are 'bournes' or 'winterbournes', which dry up near their source when groundwater levels are low. Many chalk streams receive treated discharges, often to counter low flows caused by abstraction. The presence of accessible and reliable water sources has determined, in large part, the location of settlement, including major urban centres. Canalisation, relict watercress beds, mills, sewage treatment works, habitat enhancements and riverside green spaces catalogue a history of use and modification and the significance of water in a chalk landscape.

The countryside of the Chilterns combines mixed agriculture with numerous woodlands and hedgerow boundaries that are often ancient. Steeper ground is often characterised by small fields, and there is a notable concentration of pre-18th-century fields, including assarts and co-axial fields, in the Buckinghamshire and Oxfordshire parts of the NCA. There are localised concentrations of arable production in the north, around Luton, and in the 'Ipsden prairie' of Oxfordshire. Livestock farming is dominated by sheep and cattle and, across the remaining fragments of historic downland, grazing

**The nucleated village of Fingest lies in a valley. Woodland cover is considerable and sheep graze the grasslands.**

Large flocks of red kites are common.

animals help to conserve open grassland. Meadows remain alongside watercourses but are rarely traditionally managed. Cherry orchards, once a widespread feature of the central part of the NCA, are now encountered only occasionally. Farmland supports a wide range of birds, including corn bunting, yellow hammer and grey partridge, and also arable weeds, such as prickly poppy and shepherd's needle.

Woodland cover is extensive, making the Chilterns one of the most wooded lowland landscapes in England. Large woods, dominated by beech, are found on the plateau and as 'hanging' woods above the valleys; there are also small farm woodlands. Secondary woodland can be found on once-open common land and downland but, elsewhere, many woods are ancient. Chilterns beechwoods are renowned for 'cathedral-like' qualities and bright autumn colours, and their importance is recognised through SAC designation. Local variations include the very rare natural box woods that occur on the scarp, as well as mosaics of habitats such as at Hartslock Wood SAC, which includes a species-rich area of chalk downland within a mosaic of beech and yew woodland. Soaring above the woods and valleys, the distinctive forked tail of the red kite is now a common sight. Deer are often glimpsed in woodlands and fields.

Remnant areas of heathland, acid grassland and wood pasture are scattered across the plateau, often associated with common land and parkland on low-fertility agricultural soils. The scarp and some dry valley slopes are characterised by fragmented areas of species-rich chalk grassland with scrub. Colourful flowers are a feature of these grasslands during spring and summer and include the rare Chiltern gentian, pasque flower and a number of orchids. Butterflies, including the restricted Duke of Burgundy and chalkhill blue, can also be spotted. There are also a few small areas of rare chalk heath.

Aston Rowant SAC features an internationally important juniper population. Dispersed farmsteads and hamlets are found on the high plateau, with nucleated towns and villages in valleys and at the foot of the scarp. Some linear villages dating from the mid-19th century occur on the plateau, usually associated with common land. Many lower-lying settlements contain historic centres, often dating back to the medieval period. St Albans contains remains of the major Roman town of Verulamium. Historic, and some modern, buildings use local, traditional materials, including flint, brick, clay tiles and occasionally thatch. Clunch, an impure and harder form of chalk, is sometimes used as a highly distinctive building material. Designed parklands and gardens make a dramatic contribution to the area, with follies and grand houses often located in prominent positions and featuring other distinctive attributes such as tree avenues and gatehouses. A number of landscaped parklands and gardens are the work of famous 18th-century designers such as Bridgeman, Brown and Repton.

Major roads and railway lines follow the valleys cutting through the escarpment, linking London and the Midlands. Settlements along main routes have expanded considerably during the 20th century, with major urban centres found near motorways at Luton and High Wycombe. There is also an airport near Luton. Business and industrial parks adjacent to watercourses are often located on the sites of former mills. Ancient, often sunken lanes can be found beyond the network of major routes, some running straight along valley bottoms or ridgetops and others winding up the scarp or valley sides. Away from main settlements, roads and railways are areas with high levels of tranquillity, many associated with concentrations of well-preserved prehistoric monuments, including bronze-age burial mounds and iron-age hill forts and dykes.

With a large population in or near the area, demand for recreation has generated a considerable number of golf courses, horse paddocks and managed public green spaces near settlements. Numerous parklands and woodlands are also open to the public, alongside the designated open access commons and downland. The Thames Path and the Ridgeway National Trails pass through the area. Boating is popular on the River Thames, and horse riding, walking and cycling are supported by an extensive rights of way network that includes locally promoted routes such as the Grand Union Canal, the Chilterns Cycleway and the Icknield Way Riders' Route. Easy access has resulted in some busy 'honeypot' sites, such as Ashridge, with accompanying, prominent visitor facilities – car parks, information panels and signage.

Overall, the countryside has a predominantly quiet and prosperous farming and estate character, and the scenic qualities in the half of the NCA furthest from London are recognised by their Area of Outstanding Natural Beauty (AONB) designations.

## The landscape through time

The NCA is defined by a Chalk outcrop that formed between 95 and 70 million years ago during the Upper Cretaceous. Deposits on the bed of warm, shallow, lime-rich seas built up over Upper Greensand and Gault Clay to create distinct bands of chalk recording changing conditions. They contain marine fossils, including ammonites. Massive earth movements 60 to 40 million years ago during the Palaeogene tilted the Chilterns and the wider area into a downfold to form the London Basin. High on the northern rim of the London Basin, the Chilterns were exposed to erosion, causing a reduction in the height and westward extent of the Chalk. During the Quaternary, ice sheets overrode the outcrop in the north, lowering the escarpment and blocking the passage of the Thames through the Vale of St Albans. The Thames, forced southwards, carved its gorge through the escarpment at Goring and shaped its gravel deposits into terraces. Upon the frozen ground of the dip slope, water could not percolate into the Chalk and so carved branching valleys down into the London Basin, eroding as deep as the Melbourn Rock in the main valleys. Various Quaternary deposits were laid down on the Chalk, the most extensive being clay-with-flint deposits, which were created through disintegration of upper chalk bedrock by freeze–thaw action.

Quaternary deposits are associated with the earliest humans in the Chilterns. Extensive flint-working sites at Caddington and the largest Palaeolithic hand axe in Britain – and probably Europe – have been dated to the early Palaeolithic. Finds of Mesolithic flint implements are widespread.

Monuments, boundaries and tracks remain visible today as tangible evidence of prehistoric people in the Chilterns. The oldest monuments, for example the long barrow overlooking Princes Risborough, date from the Neolithic. The Bronze Age is largely represented by burial mounds, while iron-age monuments consist of simple hill forts, such as Pulpit Hill, and dykes – earth boundaries – including Grim's Dyke. There is a notable concentration of iron-age defensive features commanding prominent hills overlooking key routes such as the Thames, the Ridgeway and the Icknield Way.

**Country mansions, follies and parkland are frequent across the Chilterns. West Wycombe mausoleum occupies a prominent position in the valley.**

The management of woodland for a range of products or to release land for agriculture defines much of this landscape. Farming in the Chilterns began in the Neolithic when woods were cleared along the scarp and river valleys. Favourable farmland in the valleys and along the springline attracted late iron-age settlers. Existing farmsteads were later adapted into Roman villas. Thriving Roman markets, such as Verulamium (now St Albans), and a growing population encouraged farmers onto marginal soils, evidenced by the remains of Roman farmsteads and fields, many of which are now preserved under woodland. Verulamium was connected to London by Watling Street through the Ver Valley – now the modern A5 – and to the west by Akeman Street following the Bulbourne Valley – now the A41. Charcoal produced from the extensive woodlands was an important resource for the Roman iron smelting industry in the area.

In contrast to the more productive valley and scarp foot soils, the marginal agricultural land of the plateau lent itself to woodland and rough grazing. Minor droveways developed linking the vales to the plateau. Saxon estate boundaries, many still discernable today, indicate the equal apportionment and distribution of resources of clay vale, springline, chalk escarpment and wooded plateau. The marginal nature of growing conditions on the plateau made farming sensitive to phases of reclamation and abandonment. Population declines and a collapse in agricultural markets in the 5th and 6th centuries led to abandonment to rough grazing and woodland. By the time of Domesday in 1085–86, woodland had spread to exceed today's cover.

'Manorial wastes' were established between the 10th and 13th centuries across the plateau, often linked together by thin tracts of land. Commons developed providing small centres for industry, producing bricks, tiles and lime, and were used for occasional grazing, providing firewood and places for local gatherings.

The 12th century saw another period of population growth and 'land hunger' driving renewed woodland clearance to allow cultivation, and the establishment of farms and settlement. Some steeper slopes were cultivated for the first time. Medieval assarts and strip lynchets provide evidence of intense agricultural activity in the Chilterns during this period. Monasteries, such as Missenden Abbey, were also accumulating land into large estates and establishing priories. Clearance of common woods slowed towards the end of the 13th century.

**Sunken routeway through beech woodland.**

Despite increased demands for farmland, the value of woodland produce and the low fertility of some areas were sufficient to ensure the retention of substantial areas of woodland. In the 13th century, the demand from the adjacent vales for timber and firewood made Chilterns woodlands valuable and stemmed the steady clearance that had begun in the preceding century. Many wooded commons were enclosed as private property, and further woodland was enclosed in parks.

Tudor population increases instigated resurgence in clearance for agriculture, which included enclosing common heaths. Woodlands in the south were saved from clearance by London's demand for firewood and timber, combined with their proximity to the Thames shipping route.

Since 1600, approximately 12,000 ha have remained under continuous woodland cover, assisted in the 18th and 19th centuries by the demand from the local furniture industry for beech timber. This grew from its 'cottage industry' beginnings to a nationally recognised, large-scale industry known for the 'Windsor' chair. This industry drove widespread planting of beech and the conversion of many semi-natural mixed woods into beech woodland. Coppice for charcoal was devalued by the opening of the Grand Union Canal, which made coal more readily available. Secondary woodland cover also increased. Ancient woodlands were extended, particularly in Oxfordshire, and the agricultural depression of 1880 to 1940 led to the scrubbing up of downland and commons, including Totternhoe and Naphill.

Further change in the 18th and 19th centuries was associated with agricultural improvements involving Parliamentary enclosure of commons and the re-organisation of farm and older boundaries. Some commons were lost entirely, including Wycombe, while others, such as Berkhamsted, survived intact. The Chilterns, within easy travelling distance of London, also became a focus for the wealthy, who established grand houses and fashionable parks and gardens. Many had earlier antecedents as hunting parks but were substantially remodelled or expanded. Designed landscapes include examples by Lancelot 'Capability' Brown and Humphry Repton. Many large estates survive, having diversified to include schools, tourist attractions and shooting estates.

Water-powered mills, which first appeared during medieval times, gradually increased in number, but it was not until the 19th century that the paper industry reached an industrial scale along the Wye and Gade. At a similar time the Chilterns became famous for their apples and soft fruit, with orchards surviving, particularly around the 'cherry pie villages' of Seer Green and Holmer Green.

The 19th century saw the first deliberate construction of transport networks since Roman times. Turnpike trusts improved all the main routes running along the through-valleys. The Grand Union Canal, railways (including three London mainlines) and motorways followed. The effect of improved connections with the capital was dramatic, leading to development of light industry and suburbs. This is most clearly seen in the 'Metroland' suburbs along the Metropolitan Line, which were promoted to commuters as accessible rural retreats away from the city. With suburbanisation came an increase in recreational land use, with areas of downland converted to golf courses, such as near Luton and Dunstable.

Many towns and villages have retained their historic core, with notable medieval buildings and Norman churches, but many have expanded substantially. Settlements on the plateau have more recent origins in the

19th century. Luton was targeted for growth as an early 'new town' and remains a focus for growth. Old mill sites along chalk streams have been redeveloped as business and industrial estates. Three industrial-scale cement works extracted material from the scarp in the 20th century but have subsequently closed.

In the countryside there has also been recent change. Post-war enlargement of fields by hedgerow removal saw the creation of some prairie fields, particularly concentrated in Hertfordshire and Bedfordshire. Across the commons and downs, the continuing decline of livestock farming led to further significant areas of open land being lost to scrub and woodland. Traditional grazing and clearance of scrub became a conservation activity. The woodland resource also fell out of management with the demise of the local furniture industry, although increasing local demand for wood fuel in recent years has incentivised management in some woods. Farms have evolved to include increasing numbers of 'hobby' farms and historic farm buildings converted to dwellings and offices. In the face of change, the scenic qualities and natural beauty of the countryside furthest from London have been conserved by AONB designations: the Chilterns AONB to the north of the Thames (designated in 1965) and the North Wessex Downs AONB to the south of the Thames (designated in 1972).

## Ecosystem services

The Chilterns 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 Chilterns NCA is contained in the 'Analysis' section of this document.

### Provisioning services (food, fibre and water supply)

- **Food provision**: As a result of the predominance of Grade 3 agricultural land, farming is mixed, with average levels of productivity. There is a concentration of arable production on Grade 1 and 2 land along the Thames Valley, beneath the hills in the north and along the scarp foot. Cereals dominate arable production, with wheat being a predominant crop. There are limited but well-established sheep farms and localised areas of dairy and beef production.

- **Water availability**: The Chalk is the most significant aquifer of southern England and is of national importance in terms of abstracted volume and development for abstraction. Groundwater abstraction volumes far outweigh those from surface waters in the Chilterns, with much of it being for public water supply. A large and growing population combined with high consumption rates per person put significant demands on the resource. Chilterns water resources also support London's groundwater supplies in the confined aquifer and the Thames river system downstream of the Chilterns. Unsustainable abstraction currently takes place in the north of the Chilterns, where the rivers Ver, Misbourne, Mimram and Lee are considered to be over-

abstracted and hence experience low flows exacerbated by abstraction pressures. There is hydraulic continuity between the aquifer and watercourses, which means that changes in groundwater levels directly affect surface water levels. The Thames is relatively resilient to abstraction but alleviation schemes and monitoring have been required for the Chilterns' small chalk streams to address negative impacts of low flows on valued biodiversity.

- **Biomass energy**: The extensive woodland cover represents a source of wood fuel, particularly since timber quality is limited in the immediate future. The market for firewood is growing significantly in parts of the Chilterns. The potential for miscanthus is limited and there have been very few plantings. Short rotation coppice coverage is minimal and is discouraged in areas such as the Chilterns where there are water availability concerns.

**The Chilterns countryside is accessible to many people along major road and rail links radiating out from London. The M40 passes through Aston Rowant National Nature Reserve.**

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

- **Climate regulation**: Across most of the NCA, carbon stored in the topsoil horizon is typically in the range of 0–5 per cent, which is good for mineral soils in agricultural use. The considerable area of undisturbed soils beneath remnant historic land uses such as ancient woodlands and downland represents a large, longstanding carbon store with maximised storage capacity. The extensive tree cover also sequesters carbon, although trees make a greater contribution to carbon reduction by providing alternatives to fossil fuels.

- **Regulating water quality**: Since the Chalk aquifer is nationally important for water supplies and chalk stream biodiversity is influenced by water quality, pollution is a concern across the NCA. Nitrate concentrations in groundwater exceed drinking water standards at points across the Chilterns and appear to be rising in some areas. Steep slopes increase rates of run-off, potentially increasing the movement of sediment and chemicals from cultivated or damaged soils into watercourses. Catchment sensitive farming measures are being promoted across some catchments, with a particular focus in the north. A dense hedgerow network, extensive woodlands and permanent grasslands will contribute to trapping mobile soils and pollutants and to slowing rapid run-off. Point sources of pollution are also associated with settlements and highways, such as High Wycombe, Luton and Dunstable. Extensive settlement entails numerous sewage treatment works, which pose pollution risks.

- **Regulating water flow (flooding)**: The Thames Valley has a fairly high risk of flooding, with riverside settlements including Reading, Henley and Marlow susceptible. The Thames Valley also offers potential floodwater storage areas. Smaller-scale flooding may also affect those settlements adjacent to chalk streams in the dip slope valleys but, historically, low flows have been a more significant issue, with natural flows needing to be artificially supplemented in many cases. Natural river processes are often constrained by channel modifications in urban and developed areas, for example canalisation in Luton and High Wycombe.

- **Regulating soil quality**: Agricultural opportunities are optimal across the Grade 1 and 2 land found in valley bottoms, along the scarp foot and in other lower-lying areas. Historic land uses with a long history of low or zero chemical input and limited or no cultivation, including traditionally managed downland, parkland and ancient woodland, represent areas of soil that have benefited from a long continuity of conservation practices and natural soil processes. Soil quality is at risk across much of the NCA due to compaction. The role of soil quality in water filtration to the aquifer and water pollution is of significance to groundwater quality in the Chilterns' principal aquifer and to the biodiversity of chalk streams.

### Cultural services (inspiration, education and wellbeing)

- **Sense of place/inspiration**: Landscape character ranges from enclosed and intimate folded valley landforms to the exposed plateau tops and scarp that afford extensive views, with the separate character of the Thames flood plain to the south. The unifying elements include sunken lanes, woodland, downland, chalk streams, parkland and a distinctive vernacular architecture. Red kites are now a common sight adding to sense of place. Prominent landmarks include grand houses and follies (as at West Wycombe), chalk figures (such as Whiteleaf Cross) and monuments (such as Coombe Hill Monument). The undeveloped commons and dry valleys evoke a sense of rural endurance, particularly when contrasted with nearby London and its fringe. The Chilterns landscape inspired John Milton, Stanley Spencer[4], John Nash[5] and Roald Dahl. Properties owned by key historic figures include Benjamin Disraeli's country estate, Hughenden Manor, and the Rothschild family's Natural History Museum at Tring.

- **Sense of history**: Extensive flint-working sites and finds date from the early Palaeolithic Period. The prehistoric routeways of the Ridgeway and the Icknield Way and associated prehistoric monuments create a particularly strong sense of prehistory along the escarpment. Roman influence on the landscape is still evident, primarily through the communications network and settlement pattern. Many villages, farmsteads and field patterns are of medieval origin, including rare co-axial fields. Commons and woodlands rich with archaeology are widespread. Historic buildings and more recent constructions make use of traditional materials such as flint, brick, and tiles and, in places, weatherboard and thatch. Designed parklands and large gardens are prominent, covering 3 per cent of the area, and many are included on the national Register of Historic Parks and Gardens. There are examples by key landscape designers such as Brown and Repton. More recent heritage features include the Grand Union Canal and the 'Metroland' towns along the London Underground Metropolitan Line.

[4] URL: www.chilternsaonb.org/about-chilterns/people-and-history.html#1325
[5] URL: www.chilternsaonb.org/about-chilterns/people-and-history.html#1345

- **Tranquillity**: Contrasting with nearby London, this area offers relative tranquillity. Tranquillity is found along parts of the escarpment but the largest area is found in the remote and sparsely settled dip slope in Oxfordshire. Transport corridors, such as the motorways, and aircraft impact negatively on tranquillity in localised areas.

- **Recreation**: A variety of green spaces and an extensive rights of way network offer a range of recreation opportunities suitable for walkers, horse riders and cyclists, as well as for those who enjoy less common pursuits, such as carriage drivers and paragliders. Improvements have also been made to increase accessibility for disabled users. Long-distance trails include the Ridgeway and the Thames Path National Trails, and the Chiltern Way. There are more than 3,500 ha of open access land, around 2.5 per cent of the NCA, including significant tracts of common land close to settlement. There are three National Nature Reserves (NNRs) that provide access to some of the best examples of semi-natural habitats in the country and a particularly large area of accessible woodlands. Green space is well distributed except in the north, where Luton, for example, is noticeably lacking.

- **Biodiversity:** The approximate area of priority habitat amounts to just over 16,000 ha, of which the huge majority is woodland and includes the Chilterns Beechwoods SAC. Fragments of lowland calcareous grassland total more than 700 ha[6] and include Barton Hills and Knocking Hoe NNRs. Chiltern chalk grasslands are distinctive for their large number of rare and scarce vascular plant species such as the Chiltern gentian. At Hartslock Wood SAC and Aston Rowant SAC, there are important examples of the Chilterns' mosaic of chalk grassland, scrub and woodland. Site of Special Scientific Interest (SSSI) designation protects more than 3,600 ha of habitat and Local Wildlife Sites a further 12,647 ha. In addition, there are undesignated chalk streams and parklands. The area is popularly known for its numerous red kites.

- **Geodiversity:** The Chalk outcrop of the Chilterns filters and stores large quantities of high-quality potable water, making it a principal aquifer. The Chalk produces water that is naturally mineral rich, sediment free and of a stable temperature and as such supports specialised chalk stream ecology. In the Thames Valley, large flood plain terraces create a distinct landform and comprise a valuable aggregate resource. Buildings have made use of Chiltern flint; a particular form of hard chalk called 'clunch' or Totternhoe; a conglomeration of flint and pebble called puddingstone; and red brick made from local clays[7]. Of the 14 SSSI designated for their geological interest, many are small-scale historical sites of mineral extraction, including brickworks, sand pits, gravel pits and chalk pits. There are 33 Local Geological Sites.

[6] *Chilterns Area of Outstanding Natural Beauty: Management Plan 2008 - 2013 – A Framework for Action,* Chilterns Conservation Board (undated)
[7] *Chilterns Building Design Guide, Chilterns Area of Outstanding Natural Beauty* (February 2010, second edition)

# Statements of Environmental Opportunity

**SEO 1: Manage the wooded landscape, the woodlands (including internationally important Chilterns beechwoods), hedgerows, commons and parklands with the aims of conserving and enhancing biodiversity and the historic landscape and its significant features; maximising the potential for recreation; and securing sustainable production of biomass and timber.**

**For example, by:**

- Planning for landscape restoration, creation and enhancement activities with reference to the special qualities of the Chilterns Area of Outstanding Natural Beauty (AONB) and North Wessex Downs AONB.
- Building on existing stakeholder groups and strategies involved in woodland conservation including, for example, AONB management plans and county green infrastructure strategies.
- Working across administrative boundaries to develop a resilient ecological network that supports wooded habitat and species.
- Bringing as many wooded features as possible into appropriate management, drawing support from woodland grant schemes and agri-environment schemes. Restore management to those woodlands that have fallen out of management, particularly those with already poor woodland structure, declining timber prospects and deteriorating visitor infrastructure. Secure sustainable management in all cases.
- Seeking to secure woodland and tree health in the long term. Maintain and enhance a heterogeneous woodland resource to ensure that it is resilient to climate change and to pests and diseases such as ash dieback. In existing woodlands and in new plantings, allow for positive species composition changes and maintain woodland on varying terrain, soils and aspect. Conserve the genetic diversity of the woodland resource.
- Co-ordinating deer population management across ownership boundaries. Protect woodlands and trees from deer damage as appropriate. Restore key woodlands and other wooded features that have been severely damaged by deer and squirrels, including important beech woodlands.
- Monitoring impacts of climate change, pests and diseases on native beechwoods, including the Chilterns Beechwoods Special Area of Conservation (SAC), and implementing appropriate adaptation and mitigation strategies. Recognise and conserve all habitats and species of principal importance, including those within SAC, Sites of Special Scientific Interest (SSSI) and Local Wildlife Sites. Restore and conserve all native beechwood types and conserve other semi-natural woodland types that are less extensive than the beechwoods.
- Identifying current and future threats to wooded features in the Chilterns and reviewing ecological, historic and landscape designations to ensure that there is appropriate protection of the range of wooded features. Consider ecological designations for parklands, orchards and hedgerows in particular. Consider Tree Preservation Orders in relation to 'landmark' and veteran trees.

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**SEO 1: Manage the wooded landscape, the woodlands (including internationally important Chilterns beechwoods), hedgerows, commons and parklands with the aims of conserving and enhancing biodiversity and the historic landscape and its significant features; maximising the potential for recreation; and securing sustainable production of biomass and timber.**

**For example, by:**

- Maintaining woodland on ancient woodland sites and conserving ancient hedgerow boundaries. Conserve ancient trees and veteran trees, planting or identifying nearby successors in order to secure the deadwood resource and associated biodiversity in the long term. Continue restoration of Plantations on Ancient Woodland Sites.
- Conserving the diverse arrangements and particular species compositions of wooded features in designed landscapes, incorporating native and exotic species in avenues, groves, belts, shrubberies and so on. Carry out historic landscape character assessments and devise management plans to inform conservation efforts. Ensure that succession planting respects the original plantings and seeks to maintain the historical continuity and sense of place. Target Registered Parks and Gardens, particularly those 'at risk', but also consider parklands of local importance and 'landmark trees'.
- Managing all wooded features to benefit biodiversity, considering the needs of woodland species including woodland butterflies, birds and deadwood invertebrates.
- Conserving and recording archaeology in ancient and secondary woodland. Draw on best practice developed by, for example, the Chilterns AONB and North Wessex Downs AONB.
- Using historic landscape information to engage the public in discussion about change in the landscape, particularly in relation to tree clearance and scrub management on once-open common land and downland.
- Drawing on best practice developed by, for example, the Chiltern Woodlands Project, to ensure appropriate management of woodlands across the Chilterns.
- Drawing on the best practice example of the Chilterns Special Trees and Woods Project to engage the public in recording and celebrating wooded features beyond the Chilterns AONB. Focus such efforts in green spaces and along routes that are publicly accessible. Manage and enhance field boundaries and small woodlands as connections in the woodland network and also as part of a diverse habitat mosaic. Plant hedgerows where there is poor connectivity, particularly where this will also restore historic boundaries. Manage large, species-rich woodlands, such as the Chilterns Beechwoods SAC, as core areas in the ecological network. Focus particularly on conservation of ancient hedged boundaries and ancient woodlands in order to secure their high species richness.
- Conserving historic boundary features, including veteran trees, and creating optimal edge habitat along the woodland or boundary edge.

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**SEO 1: Manage the wooded landscape, the woodlands (including internationally important Chilterns beechwoods), hedgerows, commons and parklands with the aims of conserving and enhancing biodiversity and the historic landscape and its significant features; maximising the potential for recreation; and securing sustainable production of biomass and timber.**

**For example, by:**

- Planning clearance of secondary woodland where it would restore species-rich and fragmented open habitats and restoring key views and historic landscapes. Due to the sensitivities of tree clearance and major landscape change, undertake this work in partnership with local stakeholders. Ensure that historic features are not negatively impacted by clearance. (Open habitats include grassland and heathland in downland, common land, farmland and flood plain settings.)
- Strengthening and developing new local markets for 'local', 'sustainable', 'traditional' woodland products, including wood fuel, which delivers climate regulation benefits.
- Managing the woodland resource to accommodate and drive appropriate woodland-based recreation activities that generate an income to support suitable woodland management. Draw from existing successful examples such as the visitor attractions at Wendover Woods and at Aston Hill Bike Park, the mountain bike course at Halton. Promote and manage demand for recreation to avoid unsustainable visitor numbers, recognising that recreational uses are not appropriate in some woodlands.
- Managing visitor pressure and forestry impacts on the woodland's ecological and historic environment features.
- Strengthening and enhancing multi-user access links between settlements and woodlands, facilitating greater community stewardship of local green spaces. Prioritise access to woodlands near to people's homes and workplaces, creating new woodlands where appropriate.
- Managing small woods associated with farmland as part of the wider ecological network and as a resource that can be managed to provide small-scale products of value to the farmer. Secure buffers in farmland adjacent to woodlands, veteran trees and hedgerow boundaries, particularly where high chemical input and deep ploughing is undertaken.
- Creating new forestry infrastructure that makes sustainable woodland management more viable, such as rides and sawmills.

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**SEO 2: In pockets of historic land use where natural and cultural heritage are both particularly rich, aim to restore and strengthen the historic landscape, ecological resilience and heterogeneity, and to conserve soils. Ensure that species-rich habitats are conserved and extended, including internationally important species-rich Chiltern downland. Secure environmentally and economically sustainable management to ensure conservation in the long term.**

**For example, by:**

- Building on existing stakeholder groups and strategies involved in landscape conservation including, for example, AONB management plans and county green infrastructure strategies.
- Designing any new development to accommodate and sustainably conserve the historic and ecological features and functions of historic land uses and their setting. Avoid negative impacts upon historic setting and the ecological network, working across administrative boundaries within and adjacent to the NCA.
- Using understanding of the area's traditional and historic architecture, and its distinct patterns of settlement, to inform appropriate conservation of historic buildings and settings, and planning for and inspiring any new development so that it makes a positive contribution to local character. Where an existing structure is negatively impacting on a historic setting, consider removal or concealment where it is not possible to improve the structure.
- Identifying and conserving semi-natural habitats that are often associated with historic land uses in the Chilterns, such as chalk grassland, heathland, species-rich scrub, lowland meadow, species-rich hedgerow, traditional orchards, chalk streams and acid grassland. Recognise and conserve all habitats and species of principal importance, including those within SAC, SSSI and Local Wildlife Sites.
- Managing the landscape around pockets of habitat to provide buffers, connections and food for wildlife, for example by locating field margins, field corners and low-input grassland where they will most benefit the ecological network and nearby species populations.
- Identifying where bats, owls and other species are making use of historical structures such as barns, and manage structures and the surrounding ecological network accordingly. Prioritise management of protected species and species of principal importance.
- Confirming the specialist species associated with historic land uses and establishing management that reflects the requirements of specialist species; that is, niche management, or traditional management. Develop management strategies for species with restricted distributions, particularly in light of climate change.
- Restoring historic features associated with chalk streams, such as mills, ponds, watercress beds and watermeadows, particularly where restoration of the historic land use will support traditional management that can sustain valued habitats.

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**SEO 2: In pockets of historic land use where natural and cultural heritage are both particularly rich, aim to restore and strengthen the historic landscape, ecological resilience and heterogeneity, and to conserve soils. Ensure that species-rich habitats are conserved and extended, including internationally important species-rich Chiltern downland. Secure environmentally and economically sustainable management to ensure conservation in the long term.**

**For example, by:**

- Identifying current and future threats to historic land uses and features in the Chilterns and reviewing ecological, historic and landscape designations to ensure that there is appropriate protection. Consider ecological designations for parklands, orchards, chalk streams and hedgerows in particular. Develop a strategy for conserving historic features that are not recognised by Scheduled Monument or Registered Park and Garden designations, such as co-axial fields.
- Establishing resilient core areas from which to expand by targeting conservation in those locations where existing ancient natural and cultural features are particularly numerous and accessible to the public, including the strip parishes along the scarp, parklands, pockets of ancient field systems and areas of open access common and downland.
- Maintaining and enhancing habitat heterogeneity to support specialist and generalist species associated with historic land uses and to provide connections to assist species movement through the landscape. Develop a strategy to address northward and southward migration of species at the northern and southern ends of the Chilterns working across administrative boundaries.
- Restoring historic inter-visibility, long-distance views and viewpoints as appropriate, targeting historic assets that have since become wooded, such as prehistoric monuments on the escarpment.
- Beyond concentrations of habitat, working with neighbouring landowners to restore and create new areas of habitat and establish ecological and access connections, particularly in relation to fragmented chalk grassland and commons that are important to communities.
- Ensuring that planned change in the landscape, such as restoration and creation, is informed by an understanding of the area's historic landscape in order to avoid destruction of historic features and to identify opportunities to restore historic landscapes.
- Planning to strengthen networks or co-operatives of farmers, estates and land managers in order to facilitate landscape-scale approaches, including commercially viable large-scale downland grazing systems and catchment-scale resource protection.
- Ensuring that soil conservation is integrated into management objectives for historic landscapes, particularly where there is a long history of limited or no disturbance and chemical use. In doing so, secure climate regulation, soil quality and water quality benefits.

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**SEO 2: In pockets of historic land use where natural and cultural heritage are both particularly rich, aim to restore and strengthen the historic landscape, ecological resilience and heterogeneity, and to conserve soils. Ensure that species-rich habitats are conserved and extended, including internationally important species-rich Chiltern downland. Secure environmentally and economically sustainable management to ensure conservation in the long term.**

**For example, by:**

- Strengthening and creating new markets that support sustainable grazing and woodland management, including those around 'local'/'sustainable' products and recreation, for example visitor pay-back and charged car parking. Pursue opportunities to bring abandoned or neglected areas into productive management, particularly where losses to biodiversity and historic environment are high, such as on scrub-covered downland. Wood fuel and sheep's wool as insulation material are examples of products recently under demand which could potentially drive commercially viable management on a small or large scale.
- Creating new visions for habitat management and scenery where continuing tradition is not possible as a result of climate change or long-term economics. Explore possibilities such as non-traditional livestock on the downs, commercial recreational activities in woodlands, new species compositions and different vegetation structures in woodlands and grasslands. Planning to engage local communities in helping to conserve their local landscape by recruiting 'volunteer wardens' or 'lookers', attracting sponsors and establishing positive community uses of green spaces and rural buildings. Support and build capacity among existing community groups, for example the Chiltern Society, to conserve their local landscapes.
- Maximising visual and/or physical public access to restored historic landscapes, particularly near to settlements. Provide interpretation and education to enhance visitor experiences and encourage support for conservation activities, particularly near to settlements and at popular destinations.
- Enhancing visitor experience by providing a fit-for-purpose access network that links features across the landscape and appropriate visitor facilities that are sustainable and do not impact negatively on the rural scene.

Brick and flint are common building materials.

**SEO 3: Conserve the Chilterns' groundwater resource, River Thames and chalk streams by working in partnership to tackle inter-related issues at a catchment scale and also across the water supply network area. Seek to secure, now and in the future, sustainable water use and thriving flood plain landscapes that are valued by the public.**

**For example, by:**

- Working in partnership to meet Water Framework Directive objectives for good ecological status (surface water) or good status (groundwater) across the Chilterns. Working at a catchment scale, continue to investigate and implement measures that improve river morphology and river ecology, including measures to tackle low flows.
- Building on existing stakeholder groups and strategies involved in water resource management and conservation including, for example, catchment management plans, AONB management plans and county green infrastructure strategies.
- At the parish and neighbourhood level, providing information that will enable residents to recognise, conserve and enjoy their local chalk streams, ponds and other waterbodies. Strengthen the identity of chalk streams as positive focal points for settlements and communities.
- Drawing on best practice developed by the Chilterns Chalk Streams Project and others to deliver work along the entire length of chalk streams in the Chilterns.
- Reviewing ecological designations for chalk streams and other flood plain habitats in the Chilterns to ensure appropriate protection and conservation management.
- At a catchment scale, strengthening engagement with resident, workplace and farmer communities regarding water usage, pollution, flood risk and low flows in the Chiltern environment. Support consumers in bringing consumption rates down to average or below average levels.
- Through a partnership of water companies operating across the water supply network area, securing sustainable abstraction and consumption across the water supply network area. Recognise and address the links of supply and environmental impact between the Chilterns and other National Character Areas (NCAs), including Berkshire and Marlborough Downs, Inner London and North Downs.
- Building public and consumer support across the water supply network area for the conservation of groundwater and surface water by enhancing access to watercourses. Consider Local Nature Reserve declaration for chalk stream green spaces and hold events and volunteering activities at waterside locations.
- Providing information about chalk stream ecology and the negative impacts on the landscape of unsustainable water use. Enable consumers to recognise the visual/obvious signs of positive and negative impacts of their water use on Chiltern chalk streams.
- Bringing together the various recreational user groups relating to the Thames and Chilterns chalk streams so that they can shape the future of local watercourses as recreational assets and secure sustainable recreational use. Enable them to support conservation activities.

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**SEO 3: Conserve the Chilterns' groundwater resource, River Thames and chalk streams by working in partnership to tackle inter-related issues at a catchment scale and also across the water supply network area. Seek to secure, now and in the future, sustainable water use and thriving flood plain landscapes that are valued by the public.**

**For example, by:**

- Planning to review and build networks of stakeholders across a catchment and/or abstraction area to help conserve the water resource and develop approaches to deliver sustainable development, sustainable land management and sustainable water use. Focus particularly on achieving sustainable water use in areas where rivers and groundwater are considered to be over-abstracted and around growth areas such as Luton. Plan for climate change impacts and future consumer demands.
- Minimising soil compaction and soil sealing in order to facilitate infiltration to the aquifer and minimise the volume and rate of run-off.
- Maximising opportunities arising from waterside development to restore and enhance the adjacent watercourse. In relation to any development, seek planning gain that will restore modified sections and enhance visual and/or physical public access to a watercourse.
- Drawing from best practice and developing innovative solutions that restore watercourses constrained by existing development and that improve poorly engineered channels. Restore urban sections so that watercourses are attractive focal points within the urban environment.
- Expanding the areas of semi-natural habitat in chalk stream flood plains with the aim of improving the ecological network and increasing the extent of habitats of principal importance, such as wet woodland. Conserve and create new ponds. Create habitat so that it also provides recreation, floodwater storage, pollution filtration and biodiversity benefits, as appropriate.
- Designing any work on the ground to contribute positively to the ecological network and natural processes that operate across the landscape, both within and beyond the catchment and within both urban and rural settings. Where possible, restore natural channels to allow natural river processes to take place and create areas of floodwater storage in the flood plain. Seek to extend and connect fragments of semi-natural habitat in the flood plain and nearby.
- Planning any developments to minimise demands and impacts on the water resource, including incorporating features such as sustainable urban drainage systems (SUDS). Seek opportunities to address negative impacts of existing development, including tackling pollution pathways from industry.
- Supporting farmers and other land managers in preventing pollution, conserving soils, using water efficiently and managing and creating flood plain habitats. Draw on best practice, for example catchment sensitive farming techniques.
- Ensuring that there is adequate understanding of future water resource challenges among all key stakeholders, particularly in relation to resources and habitats that are already under stress, such as the Colne catchment.

**SEO 4: Enhance local distinctiveness and create or enhance green infrastructure within existing settlements and through new development, particularly in relation to the urban fringe and growth areas such as Luton. Ensure that communities can enjoy good access to the countryside.**

**For example, by:**

- Building on existing stakeholder groups and strategies that influence development, including, for example, AONB management plans and county green infrastructure strategies.
- Designing and locating development to maintain landscape character and enhance green infrastructure provision across the NCA, drawing on best practice as undertaken by, for example, the Chilterns AONB and North Wessex Downs AONB. Adapt or remove existing development where to do so would significantly strengthen landscape character, enhance views and address barriers to natural processes and public access to the countryside.
- Seeking to conserve the setting of the two AONB landscapes outside of their boundaries when undertaking development and land management, working across planning authority boundaries as necessary.
- Maximising the benefits of planning gain by strategically allocating gain across the NCA and across planning authority boundaries. Ensure that planning gain supports an ecosystems approach. Prioritise such efforts where there are development pressures, for example in growth areas.
- Ensuring that there is an accurate and up-to-date understanding of green infrastructure needs, particularly in relation to growth areas such as Luton.
- Responding to recreation demands and visitor pressures strategically. Manage green spaces and routes across the landscape as a connected network that can dissipate or concentrate visitor pressure.
- Addressing deficits in greenspace and access links, integrating the public transport and cycle network and creating new or improved multi-user routes and green spaces working across administrative boundaries as necessary.
- Supporting farmers in providing public access routes and areas and hosting school visits, particularly where this fills gaps in provision and secures access near settlements. Target farmers around Watford, Hemel Hempstead and Amersham.
- Maximising the appeal of existing and new green spaces and sustainable transport routes close to people's homes and workplaces, including in the urban fringe where it could also strengthen landscape character.
- Considering declaration of additional Local Nature Reserves and new country parks, particularly near to settlements. Ensure that visitor needs are well met at Local Nature Reserves and country parks.
- Establishing improved and new green infrastructure that supports natural processes through securing resilient ecological networks and functioning flood plains. Identify major barriers to significant ecological processes and seek to restore better ecological function working across administrative boundaries as necessary.
- Enhancing the rural and urban scene by promoting the use of traditional local building materials and vernacular styles and utilising appropriate infrastructure. Draw on best practice as developed by, for example, the Chilterns AONB.

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**SEO 4: Enhance local distinctiveness and create or enhance green infrastructure within existing settlements and through new development, particularly in relation to the urban fringe and growth areas such as Luton. Ensure that communities can enjoy good access to the countryside.**

**For example, by:**

- Addressing negative impacts on tranquillity associated with traffic and large visitor numbers across the NCA. Promote alternative routes and destinations at a strategic scale to disperse impacts where appropriate. Design new and existing green spaces, routes and visitor facilities to better manage noise, high visitor numbers and multiple user groups or activities. Identify those locations where improved tranquillity will significantly enhance people's experience of key places and routes across the landscape.
- Designing all development and transport infrastructure to support sustainable soil and water use, flood management and pollution prevention, incorporating features such as SUDS. Focus particularly on areas where pollution, flooding and/or low flows have a negative impact. Co-ordinate activity on a catchment scale. Consider opportunities to combine with green space, to realise biodiversity and access benefits.
- Adapting traditional building designs and materials as appropriate to ensure resilience to climate change.
- Supporting suppliers and contractors who can help to conserve the traditional built environment and incorporate traditional materials into new constructions.
- Identifying key viewpoints where the appearance of the landscape is particularly valued. Monitor and conserve these viewpoints as a priority and promote them as visitor destinations as appropriate.

# Supporting document 1: Key facts and data

**Area of Chilterns National Character Area (NCA): 164,093 ha**

## 1. Landscape and nature conservation designations

Fifty per cent of the NCA (82,627 ha) lies within the Chilterns Area of Outstanding Natural Beauty (AONB) and 2 per cent (2,649 ha) within the North Wessex Downs AONB.

- Management plans for the protected landscapes can be found at:
  www.chilternsaonb.org/
  www.northwessexdowns.org.uk/

**Source: Natural England (2011)**

### 1.1 Designated nature conservation sites

The NCA includes the following statutory nature conservation designations:

| Tier | Designation | Name | Area (ha) | % of NCA |
|---|---|---|---|---|
| International | n/a | n/a | 0 | 0 |
| European | Special Protection Area (SPA) | n/a | 0 | 0 |
| | Special Area of Conservation (SAC) | Chilterns Beechwoods SAC; Aston Rowant SAC; Hartslock Wood SAC | 1,442 | 1 |
| National | National Nature Reserve (NNR) | Aston Rowant NNR; Barton Hills NNR; Knocking Hoe NNR | 169 | <1 |
| | Site of Special Scientific Interest (SSSI) | A total of 87 sites wholly or partly within the NCA | 3,656 | 2 |

**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.*

Land covered by international and European nature conservation designations totals 1,442 ha or 1 per cent of the total land area; national designations cover 3,656 ha or 2 per cent. The SAC are also SSSI. Both Barton Hills and Knocking Hoe NNRs are within the SSSI designated area but Aston Rowant NNR is only partially SSSI designated.

There are 1,062 local sites in the Chilterns covering 12,647 ha which is 8 per cent of the NCA.

**Source: Natural England (2011)**

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

### 1.1.1 Condition of designated sites

| SSSI Condition Category | Area (ha) | Percentage of NCA SSSI Resource |
|---|---|---|
| Unfavourable declining | 41 | 1 |
| Favourable | 2,336 | 64 |
| Unfavourable no change | 53 | 2 |
| Unfavourable recovering | 1,226 | 34 |

**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 18 m on the River Thames flood plain to a maximum of 267 m near Wendover on the chalk ridge. Mean elevation is 126 m.

**Source: Natural England (2010); Chilterns AONB Management Plan 2008-13**

### 2.2 Landform and process

Landform is dictated by chalk strata which have been tilted upward to create a north-east to south-west escarpment. The scarp faces north-west across low-lying vales. The dip slope descends down into the London Basin and appears as a plateau behind the crest of the scarp.

Numerous valleys incise the dip slope creating a ridge and valley topography. The landform is generally rounded and rolling.

Valleys without watercourses, known as dry valleys or 'coombes', are periglacial landforms created during the Quaternary (the last ice age) when frozen ground prevented water percolating into the chalk.

Some stretches of watercourses, known as 'bournes', only flow when the water table is high. Spring line watercourses rise at the foot of the escarpment to flow out across the clay vales to the north. The River Thames cuts a narrow valley through the chalk escarpment at Goring. Natural river processes are restricted where watercourses are heavily modified and artificial.

**Source: Chilterns AONB Management Plan 2008-13; Chilterns Buildings Design Guide; Thames River Basin Management Plan**

### 2.3 Bedrock geology

The Chilterns escarpment is composed of chalk and is part of a larger mass that extends from East Anglia through the Chilterns to the Wessex Downs and underlies the London Basin. It is a type of limestone created under unique conditions in warm, shallow seas 70 to 95 million years ago. Marl and flint nodules are often associated and some chalk layers yield important fossils such as sea urchins and ammonites. Lower Chalk forms the base of the escarpment, Middle Chalk forms the main slope of the scarp and Upper Chalk forms the top of the scarp and bulk of the dip slope. The Lower Chalk is marly (has more clay) and contains harder bands of rock including the Tottenhoe Stone. The Middle Chalk is banded top and bottom by harder chalk rock and Melbourn rock, with the latter forming the base of the main valleys in the Chilterns.

In addition the NCA contains more recent Tertiary sediments of 65 to 2 million years ago. Being on the rim of the London Basin, there are small outcrops of Lambeth Group deposits on the dip slope. Tertiary sediments are also found as loose blocks of silica-cemented sand or pebble conglomerates on valley slopes and bottoms. These rocks are called 'sarsen stones'.

**Source: Chilterns Natural Area Profile; Chilterns AONB Management Plan 2008-13; Natural England county geology profiles**

### 2.4 Superficial deposits

During the Quaternary, the chalk bedrock was subject to erosion by freezing and thawing, creating extensive 'clay with flint' deposits which cap the ridges between the valleys up to a depth of 4 m. Tundra conditions also deposited wind-blown material called loess.

Gravels lie at the foot of the dip slope including along the Thames valley. Archaeological artefacts have been found in gravels.

**Source: Chilterns Natural Area Profile**

### 2.5 Designated geological sites

| Tier | Designation | Number |
|---|---|---|
| National | Geological Site of Special Scientific Interest (SSSI) | 14 |
| National | Mixed Interest SSSIs | 0 |
| Local | Local Geological Sites | 33 |

**Source: Natural England (2011)**

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

### 2.6 Soils and Agricultural Land Classification

A mixture of acidic and calcareous soils, derived from the variable geology of chalk, clay and gravels, permits mixed farming. Thin rendzina soils are found on the chalk. Heavy clay soils containing flints are found across the plateau and often support woodland.

**Source: Chilterns AONB Management Plan**

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

| Grade | Area (ha) | % of NCA |
|---|---|---|
| Grade 1 | 196 | <1 |
| Grade 2 | 18,049 | 11 |
| Grade 3 | 109,004 | 66 |
| Grade 4 | 5,942 | 3 |
| Grade 5 | 55 | <1 |
| Non-agricultural | 13,726 | 8 |
| Urban | 17,122 | 10 |

**Source: Natural England (2010)**

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

## 3. Key water bodies and catchments

### 3.1 Major rivers/canals

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

- River Thames 52 km
- River Lea or Lee 19 km
- River Misbourne 16 km
- Grand Union Canal 13 km
- River Chess 7 km
- River Ver 6 km
- River Hiz 6 km
- River Wye n/a
- River Gade n/a
- River Bulbourne n/a

**Source: Natural England (2010)**

Watercourses originate on the dip slope, at the foot of the scarp and from outside the NCA.

Chalk watercourses flow south-east off the dip slope and are tributaries of the Thames catchment, many with a long history of management and modification. There are numerous small streams and springs emerging onto the clay vales at the foot of the escarpment which are tributaries of the Thame (Thames) and Great Ouse (East Anglian) catchments.

The Thames flows from the clay vales to the north and cuts through the chalk ridge at Goring in the south.

The Grand Union Canal links London to the Midlands and has associated reservoirs and arms to Aylesbury and Wendover. It interacts with the Rivers Bulbourne, Gade and Colne.

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

**Source: Thames River Basin Management Plan;**

### 3.2 Water quality

The total area of Nitrate Vulnerable Zone (NVZ) is 154,097 ha, or 94 per cent of the NCA.

**Source: Natural England (2010)**

### 3.3 Water Framework Directive

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

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

## 4. Trees and woodlands

### 4.1 Total woodland cover

The NCA contains 27,153 ha of woodland or 17 per cent of the total area, of which 12,113 ha or 7 per cent is ancient woodland. Within the NCA, the Chilterns AONB is one of the most wooded landscapes in England with 21 per cent woodland cover, of which 56 per cent is ancient. Watling Chase Community Forest covers 323 ha, less than one cent of the area.

**Source: Natural England (2010), Forestry Commission (2011), Chilterns AONB Management Plan**

### 4.2 Distribution and size of woodland and trees in the landscape

Woodland is widespread, being found on the plateau and as 'hanger' woods in the valleys and on scarp slopes. Woodland blocks are scattered densely across the NCA as a mosaic with other semi-natural habitats and farmed land, except in the northern third where woodlands are present as smaller, more isolated fragments. In the AONB, woodland cover is highest in the south-west – in Oxfordshire – at 30 per cent.

Broadleaved trees dominate. Varied geology supports a range of species including oak, birch, holly and hazel on the plateau and ash, wych elm, field maple and cherry on the chalk escarpment. Ancient beechwoods are a distinctive feature of the AONB and are particularly associated with the 18th and 19th century local furniture industry. Many woods have a history of being planted, replanted or selectively managed to create beech high forest, although records suggest beech is also the naturally dominant woodland type. As well as beech high forest, ancient coppice woodlands are also present. Cherry orchards can be found in the central Chilterns and very rare natural box woods are present on the scarp.

Tree clumps and field trees associated with parklands, wood pasture and large gardens also contribute to the resource. Ancient and veteran trees are also associated with former wood pasture on common land.

**Source: Chilterns AONB Management Plan 2008-13; Natural Area profile; Ancient beechwoods in the Chilterns**

### 4.3 Woodland types

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

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

| Woodland type | Area (ha) | % of NCA |
|---|---|---|
| Broadleaved | 21,517 | 13 |
| Coniferous | 3,807 | 2 |
| Mixed | 794 | <1 |
| Other | 1,035 | 1 |

**Source: Forestry Commission (2011)**

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

| Type | Area (ha) | % of NCA |
|---|---|---|
| Ancient semi-natural woodland | 7,125 | 4 |
| Planted Ancient Woodland (PAWS) | 4,988 | 3 |

**Source: Natural England (2004)**

## 5. Boundary features and patterns

### 5.1 Boundary features

Hedgerows are the main boundary type, many of them ancient.

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

### 5.2 Field patterns

Field patterns are variable although small fields are typical and especially common on steeper ground. Boundaries generally date back to medieval times. Between High Wycombe and Hemel Hempstead, fields are considerably smaller and are either rectilinear or small squares. In the south-west and north-east, fields are medium to large with generally irregular, gently curving boundaries. Subdivision of fields into horse paddocks is significant in the AONB where approximately 5 per cent of land is under equestrian use.

**Source: Chilterns AONB Management Plan 2008-13; Countryside Character Area description; Countryside Quality Counts (2003); Chilterns Land Use Change Survey 2010 Report**

## 6. Agriculture

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

### 6.1 Farm type

In 2009, holdings were predominantly cereals, 372 holdings or 32 per cent, grazing livestock accounted for 246 holdings or 21 per cent, 32 per cent of holdings were recorded as 'other types'. Far fewer holdings were mixed, 62 holdings or 5 per cent; horticulture, 50 holdings or 4 per cent; and dairy, 21 holdings or 2 per cent. In the AONB, diversity of livestock now includes alpacas, deer and emu. Between 2000 and 2009 cereal holdings reduced by 43 or 10 per cent and the most notable decrease was the halving of diary holdings from 42 to 21.

**Source: Agricultural Census, DEFRA (2010); Chilterns AONB Management Plan 2008-13**

### 6.2 Farm size

There were 1,168 recognised holdings covering 93,392 ha of the NCA in 2009. Farms of the largest size bracket were predominant; covering 68,999 ha or 74 per cent of the farmed area spread across 270 holdings. Farms of between 5 ha to 20 ha were more numerous in number at 387 holdings, but only accounted for 4,216 ha or 5 per cent of the farmed area. In the AONB, there are numerous large estates.

In the Chilterns AONB, there has been an increase in the number of small farms associated with hobby farming, in other words non-commercial holdings. In 2009, there were 112 farms of less than 5 ha recognised as commercial holdings in the NCA.

**Source: Agricultural Census, DEFRA (2010); Chilterns AONB Management Plan 2008-13**

### 6.3 Farm ownership

In 2009 owned land accounted for 60 per cent or 56,090 ha of the total farmed area, while the remainder was tenanted.

**Source: Agricultural Census, DEFRA (2010)**

### 6.4 Land use

Cereals have the highest land use cover in hectares, 37,115 ha or 40 per cent of farmed area, followed by grass and uncropped land at 34,211 ha or 37 per cent. Oilseeds at 6,497 ha or 7 per cent and 'other arable crops' 6,557 ha or 7 per cent made up the majority of the remaining area.

Between 2000 and 2009, cereals reduced by 5,718 ha or 13 per cent. Significant changes related to 'other arable crops' which increased by 40 per cent or 1,879 ha and vegetables which reduced to just 98 ha from 286 ha.

In the Chilterns AONB, small holdings associated with hobby farming exhibit mixed land uses.

**Source: Agricultural Census, DEFRA (2010); Chilterns AONB Management Plan 2008-13**

### 6.5 Livestock numbers

In 2009, sheep were the most numerous livestock (54,000 animals), followed by cattle (28,000 animals) and pigs (21,000 animals). All livestock numbers fell between 2000 and 2009; pig numbers most significantly, by over half from 50,000 to 21,000. Over the same period sheep numbers dropped by 10,000 or 16 per cent and cattle by 4,000 or 12 per cent.

**Source: Agricultural Census, DEFRA (2010)**

### 6.6 Farm labour

In 2009 there were 2,515 farm workers on commercial holdings, of which principal farmers accounted for 59 per cent. Only 120 salaried managers were employed, with 379 full time and 308 part time workers. Casual labour made up 8 per cent of labour.

Between 2000 and 2009, labour reduced by 167 in total, including losses among principal farmers (61) and full time workers (113). Part time workers increased by 75 and salaried managers by 5.

In the Chilterns AONB, there are a notable number of hobby farmers. In addition, the farmer demographic is ageing and the number of new entrants is declining.

**Source: Agricultural Census, DEFRA (2010); Chilterns AONB Management Plan 2008-2013**

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

## 7. Key habitats and species

### 7.1 Habitat distribution/coverage

Semi-natural habitats are scattered across the area in a mosaic with farmed land. There are noticeably smaller and fewer areas in the northern third of the NCA. Woodland makes up the vast majority of the resource, while the remaining areas represent a variety of scattered, fragmented habitats including acid, neutral and calcareous grassland, chalk streams, heathland, wood pasture and parkland, reedbed and fen. The variety of habitat reflects the varied geology and history of land management. Ashridge Commons and Woods, near Hemel Hempstead represent the largest contiguous complex of varied habitats and cover an area of 627 ha. On a much smaller scale commons across the area, and notably within the AONB, contain remnants of chalk grassland, heathland, acid grassland, ponds and wood pasture as can be seen at Moorend Common on the Dunstable Downs.

The Chilterns have the most extensive native beech woodland in England, located on the plateau and as beech 'hangers' on steeper slopes. All the native beech wood types are present from the dry woods on acid soils, oak-beech woods on heavy clay to the most diverse on thin chalky redzina soils, plus the extreme yew and box wood types. The beech woods on the chalk scarp are the most interesting, supporting rare fungi and orchids such as the ghost orchid. Those on acid soils have poor ground flora interest, limited to species such as coralroot bittercress. A few woodlands are not dominated by beech and contain ancient coppice, for example Hodgemoor Woods, Hog and Hollow Woods. Much of the secondary woodland, including that on commons, has enhanced interest due to its history as former chalk grassland or wood pasture.

Remnants of chalk downland are found on the scarp face and steeper valley slopes. In the AONB a 2008 audit identified at least 700 ha of chalk grassland. Some of the chalk grassland will not be high quality and scrub encroachment reduces the area. Downland supports unique and rich plant communities including small scabious, rockrose, candytuft and others, and invertebrates such as silver spotted skipper and Duke of Burgundy fritillary. In addition, the Chiltern grasslands support species which are uncommon elsewhere on the chalk grasslands of southern England, for example, early gentian, monkey orchid and pasque flower. The Chilterns is a national stronghold for a short, very species rich type of chalk grassland characterised by sheep's fescue, mouse-ear hawkweed and basil thyme. It supports a range of specialised insects, mosses, liverworts, molluscs and invertebrates. Associated rare habitats are chalk heath found at Shirburn and Coombe Hills and juniper scrub at Aston Rowant.

Chalk rivers and streams are characterised by water crowfoots and support a high diversity of plants, insects, birds and fish, including some of the UK's most endangered species including reed bunting, water vole and brown trout. River margins are of interest as well as winterbourne sections which support a unique assemblage of plants and animals. The River Thames also has limited interest, including wet meadow and fen between Henley and Marlow and species including Loddon lily and Daubenton's bat. Other small wetland habitats in the Chilterns include rare calcareous fen, as at Pitstone and Bledlow, and wet woodland.

The farmed landscape supports nationally important assemblages of declining farmland birds including nationally important populations of corn bunting and linnet. The Chilterns are a national stronghold for arable weeds, including pheasant's eye and ground pine. In addition, the estimated length of hedgerow in the AONB part of the area is 4,045 km (2,528 miles), with much of this being species rich, including field maple, hornbeam, hazel and way faring tree among others. Hedgerows often contain ancient and veteran trees. Old trackways and ponds are also a feature of farmland that can support wildlife interest.

**Source: Chilterns AONB Management Plan, Chilterns Natural Area Profile**

### 7.2 Biodiversity Action Plan (BAP) priority habitats

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

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

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

| Habitat | Area (ha) | % of NCA |
|---|---|---|
| Broadleaved mixed and yew woodland (Broad habitat) | 14,732 | 9 |
| Lowland calcareous grassland | 1,192 | 1 |
| Coastal and flood plain grazing marsh | 341 | <1 |
| Lowland meadows | 161 | <1 |
| Lowland dry acid grassland | 53 | <1 |
| Fens | 52 | <1 |
| Reedbeds | 16 | <1 |
| Lowland heathland | 14 | <1 |
| Purple moor grass and rush pasture | 4 | <1 |

**Source: Natural England (2011)**

- Maps showing locations of UK BAP priority habitats are available at: http://magic.defra.gov.uk/website/magic/ select 'Habitat Inventories'

### 7.3 Key species and assemblages of species

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

## 8. Settlement and development patterns

### 8.1 Settlement pattern

Neolithic clearance of woodland for agriculture and the development of an important Roman communications network established a settlement pattern still evident today. The oldest settlements are nucleated settlements located in valleys and at the foot of the escarpment, established due to reliable water supply. Many have Norman churches, village greens and ponds. Settlement on the higher ground was restricted to dispersed hamlets and farms until the mid-19th century, when scattered linear villages developed, usually around common land and along droving routes. Commons on the dip slope are very characteristic and are often associated with nearby towns and villages.

There are many parklands and designed landscapes along the River Thames and on sloping valley sides, including the Prime Minister's rural retreat at Chequers.

The proximity of the area to London meant that many of the towns along major road and rail corridors expanded greatly in the 19th and 20th centuries, including Luton and Hemel Hempstead in the north, Amersham in the centre on the Metropolitan London Underground line, and Thames-side, Marlow and Henley in the south. Major transport corridors follow the valleys and do not run along the escarpment.

Leisure land uses are prominent on the outskirts of towns and villages, including golf courses and horse paddocks.

**Source: Chilterns AONB Management Plan, Chilterns Countryside Character Area description; Countryside Quality Counts (2003)**

### 8.2 Main settlements

The main settlements within the NCA are: Luton/Dunstable; High Wycombe; Hemel Hempstead; Amersham/Chesham; Harpenden; Berkhamsted; Marlow and Henley-on-Thames. The total estimated population for this NCA (derived from ONS 2001 census data) is: 946,859.

**Source: Chilterns Countryside Character Area description; Countryside Quality Counts (2003), Natural England (2012)**

### 8.3 Local vernacular and building materials

Timber-frame was the traditional material for most buildings until the 18th century when brick began to be widely used. Brick was often made locally, giving rise to variations of colour and quality. Flint was also widely used in combination with brick and is particularly common in the central plateau areas. Clay tiles became the general roofing material from 16th century, but Welsh slate is also found and in Oxfordshire, thatch. Rarely, local Tottenhoe Stone and clunch are used. The consistent range of building materials used in different combinations throughout the AONB is distinctive.

Dating back to the 1920s and 30s, buildings of the 'Metroland' style are found along the Metropolitan London Underground line.

**Source: Chilterns AONB Management Plan, Chilterns Countryside Character Area description; Countryside Quality Counts (2003)**

## 9. Key historic sites and features

### 9.1 Origin of historic features

The Chilterns is a long-settled area with features dating back to prehistory. Many features survive in the AONB because the land has not been intensively cultivated or developed.

The earliest evidence of human activity is found at flint working sites in Caddington, dating back to the early Palaeolithic (125,000 – 70,000 BC). Subsequent periods of prehistory are evidenced by more visible earthworks, the majority being on the escarpment and in the Thames Valley. Neolithic barrows are found at Whiteleaf and around Dunstable. Barrows from the Bronze Age are more common, for example, Edlesborough and Wendover. Hill forts and dykes from the Iron Age are found along the scarp, connected by the Ridgeway or Icknield Way, which has been in use since the Neolithic, and along the Thames Valley. Grim's Ditch is one of several Iron Age linear dykes – evidence of extensive land divisions – stretching from Great Hampden to Dunstable. Pre-Roman 'co-axial' patterns of parallel trackways and fields exist.

The Ridgeway is reputedly the oldest road in the country dating back to prehistoric times when it linked Wessex to East Anglia. In the wider landscape, there are extensive ancient routes and sunken lanes or 'hollow ways'. The Roman roads of Watling Street (A5) and Akeman Street (A41) run through the Chilterns. The Anglo-Saxon boundary known as the Black Hedge and the old Hundreds boundaries are also of interest.

Medieval buildings survive, such as flint churches and timber-framed barns. Former parks are now evident as commons, for example at Ashridge, Hampden. Brick kilns, windmills, Brunel bridges, canals and designed landscapes are more recent historical features. Parklands include examples of 18th century designs by Bridgeman, Repton and Brown, for example Tring Park and Ashridge, and often contain or are surrounded by distinctive estate architecture.

**Source: Draft Historic Profile, Countryside Character Area description**

### 9.2 Designated historic assets

This NCA has the following historic designations:

- 40 Registered Parks and Gardens covering
- 4,696 ha (15 in the AONB)
- 0 Registered Battlefields
- 202 Scheduled Monuments (122 in the AONB)
- 6,851 Listed Buildings

**Source: Natural England (2010); Chilterns AONB Management Plan 2008-13**

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

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

## 10. Recreation and access

### 10.1 Public access

- Six per cent of the NCA or 10,642 ha, is classified as being publically accessible and includes significant areas of downland on the ridge.
- There are 3,563 km of public rights of way at a density of 2.2 km per km2.
- There are 2 National Trails within the NCA. The Thames Path extends over 54 km and The Ridgeway over 67 km, predominantly along the ridge of the escarpment.

**Sources: Natural England (2010)**

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

| Access designation | Area (ha) | % of NCA |
|---|---|---|
| National Trust (Accessible all year) | 1,745 | 1 |
| Common Land | 2,719 | 2 |
| Country Parks | 251 | <1 |
| CROW Access Land (Section 4 and 16) | 4,829 | 3 |
| CROW Section 15 | 2,751 | 2 |
| Village Greens | 127 | <1 |
| Doorstep Greens | 3 | <1 |
| Forestry Commission Walkers Welcome Grants | 4,316 | 3 |
| Local Nature Reserves (LNRs) | 649 | <1 |
| Millennium Greens | 6 | <1 |
| Accessible National Nature Reserves (NNRs) | 211 | <1 |
| Agri-environment Scheme Access | 146 | <1 |
| Woods for People | 6,301 | 4 |

**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

Lowest scores for tranquillity are associated with the urban areas of Luton/ Dunstable, Hemel Hempstead and High Wycombe, and the concentration of development along the south-east boundary. The most tranquil areas are the scarp slopes of the north-west boundary and areas of the plateau, particularly to the south of Aylesbury.

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

| Category of tranquillity | Score |
|---|---|
| Highest value within NCA | 30 |
| Lowest value within NCA | -108 |
| Mean value within NCA | -21 |

**Sources: CPRE (2006)**

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

### 11.2 Intrusion

The 2007 Intrusion Map (CPRE) shows the extent to which rural landscapes are 'intruded on' from urban development, noise (primarily traffic noise), and other sources of visual and auditory intrusion. A breakdown of intrusion values for this NCA is detailed in the table below.

| Category of intrusion | 1960s (%) | 1990s (%) | 2007 (%) | % change (1960s-2007) |
|---|---|---|---|---|
| Disturbed | 41 | 59 | 67 | 26 |
| Undisturbed | 51 | 33 | 20 | -31 |
| Urban | 8 | 8 | 13 | 5 |

**Sources: CPRE (2007)**

Notable trends from the 1960s to 2007 are significant loss of undisturbed land, just over 30 per cent, and an increase in the area of disturbed land of about 25 per cent.

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

## 12. Data sources

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

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

# Supporting document 2: Landscape change

## Recent changes

### Trees and woodlands

- There has been an increase in the amount of woodland being managed under agreements with the Forestry Commission; increased from 27 per cent to 34 per cent of the eligible woodlands identified in the National Inventory of Woodland and Trees.
- Agreements have funded very limited woodland creation between 1999 and 2003.
- Of the NCA designated as the Chilterns AONB, 20 per cent of woodlands were in a Forestry Commission woodland grant scheme in 2009. By 2011, this had risen to 36 per cent, a total of 6,504 ha.
- Of the NCA designated as the Chilterns AONB, felling licences applied to 1,912 ha of woodlands in 2011.

### Boundary features

- Between 1999 and 2003, only 3 per cent of the NCA's field boundaries received payments for management, restoration or creation under agri-environment agreements. 105 km of hedge was planted and restored and 55 km of hedge was managed.

### Agriculture

- Between 1999 and 2003, the rate of grassland loss slowed and reversed so that there is currently a balance between cereals and pasture.
- Agri-environment scheme uptake in the NCA has been above the national average, with a focus on semi-natural grassland conservation. Almost half the NCA has been within a target area for Higher Level Stewardship, focusing support for management, restoration and creation of landscape features in the Chilterns AONB and North Wessex Downs AONB.
- Of the NCA designated as the Chilterns AONB, the total area in agri-environment schemes, Environmental Stewardship and Countryside Stewardship, was 67 per cent of farmland in 2011, well distributed across the Chilterns AONB. Higher Level Stewardship agreement coverage in 2011 was above the national average at 11 per cent (HLS) and 2.3 per cent (Organic HLS), totalling nearly 7000 ha.
- New linear features have been created in the NCA under agri-environment schemes. In 2003, this included permanent grass margins greater than 6 m (269 km), 2 m arable margins (103 km), creation of 2 m grass margins or beetle banks (31 km), and buffer strips (2 km).
- Cattle and sheep numbers declined by 12 per cent (3,921) and 16 per cent (10,538) respectively between 2000 and 2009.

### Settlement and development

- There has been recent expansion around Dunstable, Harpenden, Hemel Hempstead and High Wycombe, with upgrading in 2003 of the A41 and a by-pass around Aston Clinton.
- Growth areas identified in the NCA include Milton Keynes-South Midlands and Cambridge-Stansted-Peterborough.
- Recent developments on the edge of scarp foot in and around historic market towns have altered the historic settlement pattern.
- Recreational land uses, including horse paddocks, golf courses and 'hobby' farms, are replacing commercial agricultural land uses.
- New road construction and road 'improvements' have affected the small scale road network, particularly on the dip slope and in the valleys.

### Semi-natural habitat

- In 2003, land managers in the NCA were being supported through agri-environment schemes in managing 757 ha chalk grassland, 568 ha of lowland pasture on neutral/acid soils 430 ha of grassland restoration and 327 ha lowland hay meadow.
- Of the NCA designated as the Chilterns AONB, the area of species rich grassland being maintained or restored under Higher Level Stewardship has increased between 2009 and 2011 from 198 ha to 1,012 ha. Since 2009, agreements have funded 226 ha of species rich grassland creation.
- In 2011, 40 of the 187 commons were managed under woodland or agri-environment scheme agreements. In 2011, a Chilterns Common Project was launched to support management outside scheme agreements on 10 to 15 commons over 4 years.
- Of the commons which are SSSI, there were positive trends in condition with 97 per cent in favourable or unfavourable recovering condition.
- 30 per cent of all SSSI in the NCA are recovering from unfavourable condition whilst 1.5 per cent are declining in condition.
- Of the NCA designated as the Chilterns AONB, 99 per cent of the total SSSI area was in favourable or unfavourable recovering condition in 2011, compared to 94 per cent in 2009. The number of Local Sites in positive conservation management has risen from 29 per cent in 2009 to 39 per cent in 2011.
- Of the NCA designated as the Chilterns AONB, 86 per cent of SSSI where chalk grassland is the main habitat were in favourable or unfavourable recovering condition in 2009. This increased to 98 per cent in 2011.
- Since 2010, the Chilterns Chalk Grassland Project has cleared scrub and improved conservation grazing infrastructure across twelve sites owned by the Wildlife Trusts.
- A Plantlife project 'Saving England's Lowland Juniper' successfully propagated and planted young juniper at several sites in 2010 and 2011, improving the chances of population survival.

### Historic features

- The rate of conversion of listed barns on a unit area basis is high, with over 200 conversions since 1999. About 67 per cent of listed historic farm buildings remained unconverted in 2003 and approximately 94 per cent were intact structurally.
- Parkland conservation has been supported by an Historic Parkland Grant for around 25 per cent of parkland and by agri-environment schemes for another 13 per cent.
- Scheduled monuments on the At Risk register in 2012 which were in a declining condition amounted to 15 sites, including two associated with Roman settlement near St Albans and Totternhoe Castle. No scheduled monuments or Registered Parks and Gardens were considered to be of improving condition in 2012.
- 90 ha of historic landscape have been managed under agri-environment schemes between 1999 and 2003.

### Rivers

- Low flow alleviation schemes have been in place for several years on the Misbourne and Ver. The majority of chalk streams suffer low flows - Gade, Bulbourne, Chess, Wye, Hughenden, Ver and Misbourne.
- In 2012, a project to provide advice to farmers and land managers in the Colne catchment will tackle pollution affecting surface and ground waters.

### Minerals

- Gravel working in the Thames Valley continues north of Maidenhead only.
- Active large chalk quarries are now limited to one in Bedfordshire. Totternhoe Stone (clunch) is quarried.
- Excavation for brick-making materials continues at two locations in Buckinghamshire; small scale brick making was once widespread.

**An historic, hedged routeway leads to woodlands on Chinnor Hill.**

## Drivers of change

### Climate change

- Aquifer recharge will be reduced. Hotter, drier summers will offer less rainfall and increased evaporation rates. Rainfall events in the winter may be increasingly concentrated in major downpours, much of which could be lost to surface run-off. Pollution incidents may also increase as a result of failed drains and rapid run-off during storms.

- Water-dependent chalk streams and springs and wetland habitats are vulnerable to low groundwater levels and their resilience is already reduced by historical low flows along many streams. Unpredictable and frequent periods of drought and flood will give rise to erratic flows and difficulties in managing flows. There may be downstream migration of stream heads and winterbourne sections. Water quality may also deteriorate as a result of high temperatures, lower oxygen levels and polluted run-off during storm events.

- Thermal stress will also impact on a range of species, especially those near or at the southern limit of their range. This is exacerbated where connectivity to upstream habitats or other catchments is inhibited.

- Livestock may be kept off the open downs to prevent exposure to extreme weather conditions; leading to under-grazing.

- Climate change favouring a longer growing season will exacerbate the problem of scrub and woodland encroachment onto valued open features such as downland and common land. Viewpoints, landmarks and historic features such as burial mounds and boundaries will become more rapidly obscured.

- More frequent drought increases the risk of fire in semi-natural habitats and will tend to depress agricultural productivity. With increasing warmth, new crops and varieties and cropping patterns and livestock systems may emerge.

- Trees in exposed positions, particularly within parkland, orchards, hedgerows and small woodlands, will be vulnerable to sun scorch, crown/root die back and windthrow. Associated lichen, fungi and invertebrate interest will also be affected. Loss of landmark trees will be particularly significant.

- Native beech woodlands will be affected. Survival rates of beech will vary depending upon underlying soils, with trees on the free-draining soils of northern facing slopes/coombes likely to fare better than some of the stands on the thinner soils of the south facing slopes. Where beech fails, there will be a change in species composition as more drought tolerant species prevail naturally or are planted. Beech dependent species, including fungi and invertebrates, will be disproportionately affected.

- High temperatures and summer drought are expected to reduce the species diversity of chalk grassland. Younger calcareous grasslands composed of fast-growing or short-lived species are likely to be more vulnerable than older calcareous grasslands (Grimes et al 2000). South-facing habitats will suffer greatest exposure to increased solar radiation.

- The fragmented and small size of some habitats in the Chilterns, including chalk grassland and common land habitats reduces their resilience to threats. The wider heterogeneity of the landscape offers a variety of aspects, such as hedgerows, as 'movement corridors' that will assist more mobile species in finding more favourable conditions.

- Climate change adaptations to building design will give rise to new features in the built environment, particularly where encouraged by schemes such as the Chilterns Buildings Design Award.

- Mild winters may lead to greater visitor numbers in the winter. Surfaces of access routes will be damaged by increased pressure following waterlogging and result in rapid run-off.

## Other key drivers

- Growth areas affecting the NCA include Milton Keynes-South Midlands and Cambridge-Stansted-Peterborough. Further development and infrastructure elsewhere is also possible, such as along major railways and at Luton airport. Development will alter the appearance of the landscape and may reduce the sense of tranquillity. There will be associated demands on a variety of ecosystems in the area, including water availability and accessible green space.

- Agricultural and forestry economics will continue to shape the character of the rural landscape. Scrub and woodland encroachment upon open areas including downland may continue as livestock numbers decline and viability of sheep and cattle farming remains limited. In contrast, demand for wood fuel may bring unmanaged woodlands into production and galvanise efforts to manage deer. Demand for arable products will remain and may increase, encouraging deer management and demanding limited hedgerow management. Agri-environment schemes will continue to support sustainable agriculture.

- Smallholders and non-farmers own a significant proportion of land and may potentially convert agricultural land to non-productive land uses, for example horse paddocks and gardens.

- Land purchases driven by perceived development opportunities will give rise to land falling into disuse or temporary uses whilst awaiting development. This will be particularly acute in the urban fringe and especially in growth areas.

**People are attracted to chalk streams such as the Hughenden Stream as they pass through settlements and greenspaces.**

- Demand for recreation opportunities and associated visitor facilities will see changes to infrastructure in the countryside and possible deterioration of access routes, infrastructure and landscape features at the most popular locations. High visitor numbers may detract from visitors' experiences.

**Easy access routes are established in the Chilterns.**

- Visitors to the countryside may be unfamiliar with the countryside and may behave inappropriately. Visitors will require visitor information and signage to assist them. In addition, some visitors will be deterred by livestock in the countryside and others may worry livestock. As such, visitors present a particular challenge to grazing management of publicly accessible land.

- Interest groups will challenge the management of features in the landscape that they value, with tree clearance, fencing and new development being sensitive issues. Management of common land, for example, will require consultation and negotiation with the public. Demand for water at a local and regional level will impact the Chilterns groundwater resource and its management. Related impacts upon chalk streams will arise.

- Pests and diseases will influence woodland and cropping choices, giving rise to new woodland species compositions and new crops. The impact of disease upon ash trees may be significant in the Chilterns since ash is the second most common species after beech.

- Farming will increasingly incorporate measures that are resource efficient and prevent pollution. This will introduce new features, potentially at a catchment scale, including buffer strips and water storage reservoirs.

# 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.

**Community groups conserve and celebrate the area.**

| Statement of Environmental Opportunity | Ecosystem Service | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Food provision | Timber provision | Water availability | Genetic diversity | Biomass provision | Climate regulation | Regulating water quality | Regulating water flow | Regulating soil quality | Regulating soil erosion | Pollination | Pest regulation | Regulating coastal erosion | Sense of place/inspiration | Sense of history | Tranquility | Recreation | Biodiversity | Geodiversity |
| **SEO 1:** Manage the wooded landscape, the woodlands (including internationally important Chilterns beechwoods), hedgerows, commons and parklands with the aims of conserving and enhancing biodiversity and the historic landscape and its significant features; maximising the potential for recreation; and securing sustainable production of biomass and timber. | ↔ *** | ↗ ** | ↗ * | n/a | ↑ ** | ↑ ** | ↔ * | ↗ ** | ↑ ** | ↑ ** | ↗ ** | n/a | n/a | ↑ *** | ↗ *** | ↘ * | ↗ ** | ↗ ** | ↔ *** |
| **SEO 2:** In pockets of historic land use where natural and cultural heritage are both particularly rich, aim to restore and strengthen the historic landscape, ecological resilience and heterogeneity, and to conserve soils. Ensure that species-rich habitats are conserved and extended, including internationally important species-rich Chiltern downland. Secure environmentally and economically sustainable management to ensure conservation in the long term. | ↔ * | ↔ ** | ↗ ** | n/a | ↔ ** | ↔ ** | ↗ ** | ↗ ** | ↑ ** | ↑ ** | ↗ *** | n/a | n/a | ↑ *** | ↑ *** | ↔ ** | ↑ ** | ↑ *** | ↗ *** |

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

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

| Statement of Environmental Opportunity | Ecosystem Service | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Food provision | Timber provision | Water availability | Genetic diversity | Biomass provision | Climate regulation | Regulating water quality | Regulating water flow | Regulating soil quality | Regulating soil erosion | Pollination | Pest regulation | Regulating coastal erosion | Sense of place/inspiration | Sense of history | Tranquility | Recreation | Biodiversity | Geodiversity |
| **SEO 3:** Conserve the Chilterns' groundwater resource, River Thames and chalk streams by working in partnership to tackle inter-related issues at a catchment scale and also across the water supply network area. Seek to secure, now and in the future, sustainable water use and thriving flood plain landscapes that are valued by the public. | ↘ * | ↔ *** | ↑ ** | n/a | ↔ ** | ↗ * | ↑ *** | ↑ *** | ↑ *** | ↑ *** | ↔ ** | n/a | n/a | ↑ *** | ↔ *** | ↔ *** | ↑ *** | ↑ *** | ↔ *** |
| **SEO 4:** Enhance local distinctiveness and create or enhance green infrastructure within existing settlements and through new development, particularly in relation to the urban fringe and growth areas such as Luton. Ensure that communities can enjoy good access to the countryside. | ↔ ** | ↔ ** | ↗ * | n/a | o | ↗ * | ↗ ** | ↗ * | ↔ ** | ↗ ** | ↗ ** | n/a | n/a | ↑ *** | ↗ * | ↘ ** | ↑ *** | ↗ * | ↗ * |

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

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

| Landscape attribute | Justification for selection |
|---|---|
| Chalk and periglacial landforms and features, including a prominent escarpment and dry valleys. | ■ Adjacent to the clay vales, the Chalk escarpment is an abrupt change in elevation, 300 m above the Vale of Aylesbury. It stands as a distinctive relief feature visible from miles around. Extensive views are provided by the ridge, particularly from open downland.<br>■ The views and experiences across this landscape are variable, as a result, in part, of landform. The enclosed nature of small valleys contrasts with the extensive views and open landscape on parts of the scarp and ridges.<br>■ The crest line of the escarpment becomes progressively lower towards Hertfordshire, in the north-east, where it was overridden by ice sheets during the Anglian glaciation.<br>■ Exposed Chalk is infrequent and woodland cover is extensive; however, the underlying bedrock is made prominent by the few local landmark carved figures, for example Whiteleaf Cross. The few Chalk exposures provide access to key Cretaceous sequences and yields important fossils.<br>■ The numerous valleys across the dip slope create topography of alternating ridges and valleys, steep slopes and narrow valley floors. Some of these valleys are dry, while others are coursed by chalk streams with intermittent headwaters.<br>■ Sarsen stones (post-glacial sandstone blocks of Tertiary age) are known only at a few locations, for example Bradenham.<br>■ The Chilterns is part of a larger Chalk mass which functions as an aquifer. Unconfined areas of Chalk in the Chilterns represent key areas for re-charge (and pollution) of the aquifer. In addition to supplying local demand, the aquifer provides for London and the Thames. |
| River Thames valley and associated settlements including the important landforms of the Goring Gap and gravel river terraces. | ■ The River Thames is culturally significant nationally and links the Chilterns to other NCAs within its catchment. Locally, it is an important recreational resource, a focus for settlement, an area of wetland interest and a major landscape feature.<br>■ The Goring Gap is a well-known landform created by the River Thames carving a passage through the Chalk ridge.<br>■ Quaternary deposits here are famous type localities for Thames' river terraces, aiding our understanding of the evolution of the Thames' course through geological time.<br>■ Being an important communication route and cultural attraction, historic features along the Thames are significant. There is a concentration of prehistoric monuments in the Thames Valley and internationally important prehistoric artefacts have been found in gravel terraces; for example, at Cannoncourt Farm Pit SSSI.<br>■ The Thames was also a focal point for some of the region's finest houses and associated parkland and designed landscapes. Distinctive river frontages and 'summer homes' from the 19th century are a feature of Thames-side towns such as Marlow. |

| Landscape attribute | Justification for selection |
|---|---|
| A diversity of semi-natural habitats and species special to the Chilterns. | ■ A variety of soils which broaden the range of habitats beyond those typical of the Chalk. The extensive clay-with-flint deposits support acid heathland, grassland and woodland.<br>■ The Chiltern soilscape makes it possible for all native beechwood types to be present and also for small examples of rare chalk heath which comprise both acid-loving and calcareous plants. There are the dry beechwoods on acid soils; the oak-beech woods on heavy clays; and the beechwoods on thin, chalky rendzina soils.<br>■ Nationally important extremes of the beechwood series, the yew woods and box woods, are also present. Important wet habitats which contrast with the dry habitats on chalk; watercourses, springs and limited areas of fen and meadow are found in some valleys and along the foot of the scarp.<br>■ A few small areas of calcareous fen exist at Pitstone and Bledlow and, in the Thames Valley, there are SSSI wet meadows and fens between Henley and Cookham. Ponds form on impermeable clay-with-flint deposits and there are also man-made features including the Grand Union canal, mineral extraction pits and reservoirs such as Tring Reservoirs SSSI. The Thames and its valley represent the largest wetland feature and the Chess is the most significant of the chalk streams..<br>■ Downland, common land, meadow, parkland and woodland have created diversity of habitat at a local scale. Common land often exhibits features resulting from different land management practices, including wood pasture, heathland/grassland and secondary woodland; for example, Naphill Common SSSI and Frithsden Beeches SSSI.<br>■ The red kite and deer are numerous in this area and, as a consequence, have become strongly associated with the Chilterns.<br>■ There are several rare or scarce species associated with the Chilterns. Grassland plant species include Chiltern gentian, fringed gentian, early gentian, wild candytuft, monkey orchid, and military orchid. Woodland species include firecrest, a number of scarce deadwood beetles and flies and also fungi such as Devil's or Satan's bolete, old man of the woods, and Inocybe patonillardii. Box woodlands support a number of rare lichens and liverworts. Chalk stream species include the water vole and cowbane. |

| Landscape attribute | Justification for selection |
|---|---|
| One of the most wooded lowland landscapes in the country, distinguishing the Chilterns from other more open chalk landscapes. | ■ The Chilterns is one of the most wooded lowland landscapes in the country with over 23,000 ha of woodland covering 14 per cent of the NCA. The majority of woodland is broadleaved and much is native beechwood.<br>■ Over half the woodland resource is ancient. Extensive areas of woodlands have remained uncleared for centuries, particularly on steep slopes and over clay-with-flint deposits.<br>■ A variety of elements create this wooded landscape – farm woodlands, productive forestry, wooded commons, parklands (including designed woodlands, groves and tree avenues), orchards, hedgerow trees, field trees, hedgerows, gardens and roadside trees.<br>■ The Chilterns has the greatest extent of native beechwoods in the country. Chilterns Beechwoods SAC represents a major resource at over 12,000 ha. There are 'hanging' beechwoods on the upper slopes of the valley sides and on the scarp. Plantation beechwoods are renowned for their 'cathedral like' qualities.<br>■ Woodlands and hedgerows contribute to the seasonal variations in colour and are widespread enclosure elements creating a sense of intimacy and secrecy. There is a wealth of species in the typical Chiltern hedgerow including many typical of ancient woodland - hazel, field maple, holly, ash, elm, rose, dogwood, blackthorn, spindle, whitebeam and wild clematis.<br>■ The beechwoods have inspired artists and writers; for example, Paul Nash's painting 'Wood on the Downs'.<br>■ A strong association with the history of the country's furniture industry, particularly chairs, including the 'Windsor Chair', which relied upon local woodland products.<br>■ The dense shade cast by some beechwood types supports a unique ground flora community including saprophytic orchids.<br>■ Secondary woodland, for example on commons, has greater biological interest than would normally be expected because of its origin from natural succession of chalk downland or old wood pasture with scattered pollards; for example, Naphill Common SSSI and Ashridge Commons and Woods SSSI. |

| Landscape attribute | Justification for selection |
|---|---|
| An ancient landscape of commons, downland, woodland and field boundaries, fragments of preserved ancient land use patterns, historic monuments, settlements and routeways dating from prehistory to the more recent past. | ■ The historic environment includes bronze-age barrows and field systems; iron-age forts and dykes; pre-Roman 'co-axial' patterns of parallel trackways and fields; Roman roads and villa sites; medieval churches, field patterns, strip lynchets and deer enclosures; ancient coppice woodlands; 18th century sawyer pits and parklands; and 20th century military trenches and 'Metroland'.<br>■ Prehistoric monuments are concentrated along two nationally significant historic communication routes passing through the Chilterns – the Ridgeway and the Thames.<br>■ Some ancient features are widespread and can be accessed and enjoyed by the public – ancient woodland, ancient boundaries, historic routeways including 'holloways', historic field and settlement patterns, manorial wastes and commons. In the half of the NCA designated the Chilterns AONB, 45 per cent of the landscape is of pre-18th century origin and 42 per cent of fields are pre-18th century.<br>■ Nucleated settlements with historic cores are associated with watercourses and springs. Despite significant 20th-century development, some settlements appear little changed, for example the historic village of Turville. Medieval flint churches are numerous.<br>■ Common land accounts for 2,179 ha, or 2 per cent of the area, and ancient woodland 12,113 ha or 7 per cent of the NCA. Historic downland is almost exclusively found along the scarp and accounts for 2 per cent of the area of the Chilterns AONB. As well as preserving historic land use patterns, such areas of ancient downland, common land and woodland are also rich with historic features, including scheduled monuments.<br>■ Ancient woodlands contain features associated with the industry, including the local furniture industry that was at its peak in the 19th century. Secondary woodland also preserves features pre-dating woodland cover; for example, Boddington hill fort.<br>■ Many places have a long history of management. On commons, for example, there can be remnants of previous land uses within secondary woodland, including wood pasture, heathland glades and ponds. Chiltern commons have historically been managed for all their naturally occurring resources including as wood pasture, woodland, deer park, pannage and for mineral extraction.<br>■ Around 40 per cent of hedged field patterns in the Chilterns are thought to have pre-18th century origins, with distinctive Saxon parish boundaries surviving along the scarp. The Black Hedge near Great Hampden and the Hundreds boundaries are significant Anglo-Saxon features.<br>■ There are 4,696 ha of Registered Parks and Gardens over 40 sites, many being visually prominent in the landscape and accessible to the public. Parkland can contain both biodiversity interests, including woodland, veteran trees, grassland and heathland, and historic features surviving from pre-existing landscapes. |

| Landscape attribute | Justification for selection |
|---|---|
| Fragmented species-rich chalk grassland on steep slopes, supporting rare plants and scrub communities including juniper, box and numerous orchids. | ■ The resource is less extensive and more fragmented than other areas known for chalk grassland. This is the consequence of the unique combination of complicated topography, distribution of other habitats and pattern of land use over the centuries.<br>■ Chiltern grasslands are distinctive where they have a very short, highly diverse turf. A large number of rare and scarce vascular plant species have been recorded that are uncommon across other south England chalk grasslands. Several plant species are strongly associated with the Chilterns: Chiltern gentian, early gentian, fringed gentian, greater pignut. Many rare orchid species have been found and there are strong populations of some rare species such as the pasque flower at Barton Hills National Nature Reserve.<br>■ There are rich communities of invertebrates, liverworts and mosses including specialists of box and juniper scrub. Duke of Burgundy, small blue and chalkhill blue are butterflies of restricted distribution in the Chilterns.<br>■ Rare scrub communities include very important UK examples of lowland juniper scrub at Aston Rowant SSSI and Roughdown Common SSSI, and one of three sites in the country for native box scrub at Ellesborough and Kimble Warren SSSI. |
| Red brick and flint buildings are distinctive. | ■ Settlement pattern and local vernacular building styles contribute greatly to the landscape character and a sense of history. Traditional building materials of brick and flint were historically used in all settings, from the farmstead to the village and town, and include churches, boundary walls and railway stations. Brick and flint continue to be used in some modern constructions.<br>■ Variations in the use of brick and flint create interest. Brick was often made locally, giving rise to variations of red colour, texture and quality. Bricks of varying colours and glazes were used to create ornamental details. Some buildings, including churches, may be constructed entirely from flint. The proportion of brick to flint is variable, as is the style.<br>■ Areas of 20th century development have introduced other styles and materials that can be dominant over the traditional character. |

| Landscape attribute | Justification for selection |
|---|---|
| Localised and occasionally modified chalk streams. | ■ Chalk streams and associated wetland habitats occur in an otherwise dry landscape and support a high diversity of plants and animals. Further importance is attached to them as globally scarce habitats confined mainly to England and north-west Europe. There are unique assemblages of plants associated with winterbourne sections.<br>■ In the half of the NCA designated the Chilterns AONB, important biodiversity is recognised by two SSSI and 30 Local Wildlife Sites which incorporate sections of chalk river.<br>■ Chalk streams only occur where groundwater reaches the surface in the chalk valleys and along the foot of the scarp. Chalk streams in the valleys tend to be minor landscape features except in the case of the Chess. Some watercourses are intermittent at their headwaters, for example the River Misbourne, or along entire stretches, such as Hamble Brook.<br>■ Numerous springs and watercourses arising at the foot of the scarp.<br>■ The River Lee passes through Luton and the River Wye through High Wycombe. Rivers are often near to major roads following the valley floors and consequently have a long history of modification and pollution to the extent that no Chiltern chalk stream can be considered to be 'natural'.<br>■ Water meadows are found alongside the River Chess.<br>■ A localised feature, chalk streams are significant for their local biodiversity, history and community interest. There are six local community groups dedicated to the conservation of Chiltern chalk streams. Riverside urban green spaces and Barton Springs, for example, draw visitors.<br>■ Historic features include water cress beds along the Alderbourne and Chess, ornamental lakes as at Shardeloes, and mill remains. |

| Landscape attribute | Justification for selection |
|---|---|
| An agricultural landscape of cereals and livestock intimately mixed with woodland and defined by ancient hedgerow boundaries. | ■ A patchwork land use pattern of woodland and farmland. At the farm scale, there is often a mix of woodland and farmland, with woodlands having historically been a useful resource for the farm itself.<br>■ Much of the patchwork land use pattern is intricate because it has the ancient characteristics of being small-scale, irregular and defined by ancient boundaries and routeways. Today, the farmed landscape dominates land use, combined with very high woodland cover. Grade 3 land accounts for 66 per cent of the NCA and dictates a mix of arable and livestock farming.<br>■ Livestock numbers have been in decline but livestock farming continues and helps conserve remaining areas of downland and meadow. There are no rare/traditional breeds particularly associated with the Chilterns.<br>■ Orchards and watercress beds remain as relicts of once significant local industries.<br>■ Despite a dramatic decline in the last 50 years, the Chilterns still stands out as a national stronghold for arable weeds including pheasant's eye, ground pine, broad-leaved cudweed and rough mallow. Areas of less intensive agricultural land, for example field margins, host these species.<br>■ A 2002 survey in the Chilterns AONB found that there are nationally important populations of farmland birds including corn bunting and linnet. Above average populations of skylark and yellowhammer were also found. However, species such as stone curlew are no longer present.<br>■ Species-rich grassland is present in the farmed landscape on limited areas of downland and meadow. In the part of the NCA designated the Chilterns AONB, a survey in 2006 and 2007 identified that there were many veterans amongst the hedgerow trees and 38 per cent of hedgerows surveyed were in good condition. |

| Landscape attribute | Justification for selection |
|---|---|
| Features linked to recreation are widespread, including an extensive rights of way network, open access land, horse paddocks and golf courses. | ■ Areas of downland and the numerous scattered commons are designated as open access land. The extensive woodland resource also contributes to the area of open access. Open country includes key locations along the scarp, providing access to magnificent views, species-rich grassland and scheduled ancient monuments.<br>■ Commons are key green spaces within the villages, towns and larger urban areas and are scattered across the NCA. They are particularly important in more developed areas such as the Thames Valley, for example Cookham commons, and on the edge of London at places such as Chorleywood and Harpenden.<br>■ Popular visitor sites include Ashridge, Coombe Hill, College Lake, Tring Reservoirs, Wendover Woods, Dunstable Downs, Pegsdon Hills and Barton Hills. Recreation infrastructure including car parks, visitor centres and signage are associated with some popular green spaces, such as Dunstable Downs. Areas of tranquillity are significant in a landscape that is near to London, cut through by major transport routes and subject to development pressures. The scarp plateau, especially in the south, is the most tranquil area.<br>■ Accessibility by road has not been upgraded from single track lanes in some places and such areas feel 'secret' and tranquil; for example, Bix Bottom near Henley and Radnage Valley near High Wycombe. It is also possible to 'escape' where there are significant enclosure features such as narrow valleys, woodland, holloways and hedgerows.<br>■ The rights of way network is considered good. There are promoted routes incorporating all the key landscape attributes of the Chilterns, including 'Access for All' routes in the Chilterns AONB. Promoted routes include two National Trails – the Thames Path and the Ridgeway - towpaths along the Grand Union Canal and National Cycle Network routes.<br>■ Water-based recreation is possible along the Thames and Grand Union Canal, including fishing, boating, canoeing and birdwatching. Limited access is provided to the chalk streams, for example, Barton Springs is on open access land.<br>■ With over 10 million people living within an hour's drive or train journey, many people can benefit from the tranquillity and recreation opportunities of this area.<br>■ Areas of recreational use comprise over 2 per cent of the Chilterns AONB and consist of golf courses, playing fields, theme parks and zoos. The largest of these categories is golf courses. Some Registered Parks and Gardens are accessible to the public at cost, including National Trust properties such as Hughenden Manor and Greys Court.<br>■ In the half of the NCA designated the Chilterns AONB, a survey suggests that 5 per cent of the AONB is used for equestrian purposes and there are promoted horse riding routes. Subdivision of fields into paddocks is particularly evident near settlements. |

| Landscape attribute | Justification for selection |
|---|---|
| A settled landscape with 20th century development associated with major transport routes, but with small-scale, dispersed settlement and single track country lanes found off main routes. | ■ Settlement is dispersed and there are major transport routes passing through the area. The built environment is therefore very much part of the Chiltern landscape, although the level of development varies across the NCA.<br>■ Good lines of communication with nearby London have been critical to the development of the area and also essential to a wider transport network which links London to the Midlands and the North. Beginning with the turnpike trust improvements to the main routes during the 18th and 19th centuries, links have been strengthened and include London's transport network of the Grand Union Canal, railway lines and several motorways.<br>■ Some settlements have been a particular focus for 20th century development due to their proximity to London and major transport routes. 'Metroland', which incorporates Amersham for example, was specifically developed and promoted in the early 20th century as a residential area for London commuters on the Metropolitan line. One of the first 'new towns' in the NCA, Hemel Hempstead, was designated in 1947.<br>■ Very limited 20th century expansion is found where the road network is small-scale. The plateau and valleys south of the M40 is a large area characterised by single track lanes and scattered farmsteads, hamlets and small villages.<br>■ In 2003, approximately 41 per cent of the NCA was included in the London Metropolitan Green Belt. |
| Frequent grand country houses and designed landscapes occupy prominent positions. | ■ The proximity to London and Windsor attracted the landed elite in the 18th and 19th centuries. Grand country houses and parks reached their peak at 600 in 1820. Today 3 per cent of the NCA is included in the Register of Historic Parks and Gardens.<br>■ Designed landscapes of the 18th century, for example Tring Park and Ashridge, are best known and include works by Bridgeman, Repton and Brown. Some are associated with high profile figures including Chequers, the Prime Minister's rural home, and Hughenden, a home of Victorian Prime Minister Disraeli.<br>■ Public access is possible to many country houses and landscapes, including properties owned by the National Trust and others. |

## Landscape opportunities

- Protect the character and integrity of the rural landscape, by conserving the combination and balance of key assets; boundary features, semi-natural habitats, tranquillity and historic buildings.
- Identify and conserve views to and from key and popular viewpoints and landmarks by careful design and vegetation management, minimising the impact and effects of development, woodland planting and scrub encroachment.
- Conserve the patchwork land use pattern, valued farmland species and productivity of the landscape by securing sustainable forestry and mixed agricultural activity. This includes conservation of small farm woodlands, historic hedgerows, farmland birds, woodland birds and arable weeds.
- Plan and manage private and public spaces for recreation, such as golf courses and hobby farms, so that their design and their features positively contribute to landscape character. Seek the conservation, restoration and creation of natural and cultural features in these landscapes.
- Secure sustainable development which also reflects traditional local building styles and materials both within and outside the AONBs of the Chilterns and North Wessex Downs. Where landscape character and features are degraded by development, identify opportunities to re-develop areas and infrastructure, for example; re-modelling canalised sections of river and restoring key views.
- Conserve the range and mosaic of habitats found in the landscape by protecting traditionally managed or relict features such as chalk grassland, coppice woodland, orchards, laid hedgerows, veteran and ancient trees and commons.
- Support marginal and localised land management practices and develop 'products' attractive to modern consumers, including leisure products, local brands and wood fuel.
- Seek to reduce threats to natural and historic features by conserving or restoring their setting, addressing the problem of fragmentation particularly associated with chalk grassland and common land. Work at a landscape scale which reflects the ecosystem approach, ecological network approach and historic landscape character areas.
- Conserve, enhance and create new public access infrastructure, access links and accessible natural and cultural features, particularly near to settlements, in order to enhance the transitional areas between town and countryside and conserve tranquillity. Undertake appropriate visitor management to ensure sustainable visitor pressure at all sites but particularly focus upon 'honey pot' sites and those sites near to new development. Identify and promote alternative green spaces and entry points to reduce visitor pressure.

## Landscape opportunities continued

- Conserve the extensive woodland cover and diversity of wooded features, particularly the ancient woodlands, native beech woodlands and wooded features in designed landscapes, in order to conserve the sense of place, biodiversity and historic landscape. Restore plantations on ancient woodland sites. Plan to improve the understanding of the extent and management requirements of the rare yew and box woods. Plan to build the resilience of woodlands to climate change impacts, particularly the valued beech woodlands which are vulnerable. Consider new species compositions and secure woodland across a variety of aspects.

- Engage landowners and managers of parklands in the management of trees and woodlands, particularly those outside grant schemes and those that are 'At Risk'. Conserve the best examples and variety of Chiltern parklands, maintaining their legibility and contents and ensuring management brings about positive outcomes for access and interpretation, biodiversity and the historic record. Manage veteran and ancient trees, woodlands and grasslands in parklands to strengthen biodiversity value.

- Conserve ancient routeways and existing hedgerow boundaries across the landscape to conserve boundary patterns and biodiversity. Create new hedgerow boundaries to fields and routeways to restore historic field patterns and benefit biodiversity, Carry out targeted surveys and possible Local Wildlife Site designation to conserve species-rich hedgerows and identify hedgerow trees of significant landscape and biodiversity value.

- Protect chalk streams and wetlands through securing sustainable levels of water abstraction and through pollution prevention measures in both their rural and urban settings. Harness catchment-scale approaches, recognising the entire length of chalk streams and groundwater resources. Pursue Local Wildlife Site designation to secure protection as appropriate.

- Manage the flood plain of chalk streams, including historic features such as watercress beds and channels, in order to conserve and create wetland habitat, filter runoff; and store water. In the urban environment, seek to restore degraded channels and extend the area of green space surrounding rivers for biodiversity, flood alleviation and public access benefits.

- Manage recent change in the landscape by establishing a dialogue with growing stakeholder groups, particularly hobby farmers, horse-owners and non-farmers owning significant areas of land and valued features. Develop best practice management guidance to disseminate to these growing audiences.

- Build on existing community interest and activity around chalk streams and common land to secure further improvements.

- Create urban fringe areas that deliver a variety of functions and contribute positively to sense of place. Create strong visions which help to manage land that is 'awaiting development'.

## Ecosystem service analysis

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

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

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
|---|---|---|---|---|---|---|
| **Food provision** | Soils, particularly Grade 1 and 2 land<br><br>Arable farming<br><br>Livestock production<br><br>Aquifer<br><br>Grassland | Approximately two thirds of the area is described as having Grade 3 land. There are significant areas of Grade 1 and 2 land on valley floors and along the foot of the scarp.<br><br>Cereal production accounted for 40 per cent of farmed area, almost the equivalent area, 37 per cent, was grass or uncropped land[8]. Farming is less mixed in Hertfordshire where arable dominates[9]. In the Chilterns AONB, a 2008 survey found wheat growing on 50 per cent of cropped land; barley on 20 per cent and oilseed rape on 11 per cent[10]. | National | Soils on Grade 3 agricultural land are suited to both cereals and livestock farming, hence the mixed farmed landscape. However, ongoing declines in sheep numbers reduce the capacity for local farming systems to sustain the traditional grazed downlands.<br><br>The steep slopes of the scarp and valleys (often Grade 4 land) are difficult to cultivate. However, cultivated sloping land with shallow chalk soils are at risk of erosion.. Steep slopes under permanent pasture reap benefits for regulating soil erosion, for biodiversity and sense of place.<br><br>Grade 1 and 2 land accounts for about 10 per cent of the NCA and is the most highly versatile, often growing high value arable crops.<br><br>**Continued on next page...** | With approximately 10 million people living within an hour's travelling time of the Chilterns (including London), there are opportunities to build consumer markets around locality foods and rare livestock breeds linked to farming systems that conserve the Chilterns landscape.<br><br>Improving the economics of sustainable livestock farming could bring important benefits to biodiversity and sense of place, if associated with targeting graziers to biodiverse grasslands. | **Food provision**<br><br>**Sense of place**<br><br>**Biodiversity**<br><br>**Regulating soil quality**<br><br>**Regulating soil erosion**<br><br>**Regulating water quality**<br><br>**Water availability** |

[8] *Agricultural Census,* Department for Environment, Food and Rural Affairs (2010) [9] *Land Cover Map,* Centre for Ecology and Hydrology (2000)
[10] *Chilterns AONB Land Use Survey 2008,* Chilterns Conservation Board (2008)

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
|---|---|---|---|---|---|---|
| **Food provision** | | There are several vineyards and micro-breweries in the area. In 2009, livestock numbers had dropped since 2000 with just below 54,500 sheep, just over 28,000 cattle and approximately 21,500 pigs. | | **... continued from previous page**<br><br>Despite the history of sheep grazing on the downlands, the Chilterns is not associated with any traditional rare breeds and there are also no locality foods recognised at a regional or national level[11].<br><br>Orchards are an important feature in the landscape, but are largely relict.<br><br>Arable and vegetable production occasionally requires abstractions from groundwater and surface waters, sometimes to provide for spray irrigation.<br><br>Climate change may encourage the expansion of vineyards in the Chilterns. | Resource-efficient farming should be encouraged and risks identified and managed to reduce negative impacts upon water resources, for example, arable reversion should be targeted to areas of high soil erosion risk and fertiliser use minimised where infiltration into the aquifer is rapid.<br><br>Opportunities should be sought to bring relict orchards back into management for food, sense of place and biodiversity benefits. | |

[11] *Exploration of the Relationship between Locality Foods and Landscape Character,* C. Trewin and L. Mason (2006; Land Use Consultants)

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
|---|---|---|---|---|---|---|
| **Timber provision** | Beech and conifer woodland<br><br>Coppice | Woodland is found across 14 per cent of the NCA[12] (or 21 per cent of the Chilterns AONB[13]), making this one of the most wooded lowland areas in England and with a potential annual production of 60,000 tonnes [14].<br><br>There is approximately 7,000 ha of conifer plantation and 14,000 ha of broadleaved woodland.<br><br>1,560 ha of woodland in the public forest estate is managed outside of woodland grant schemes for timber and other ecosystem services. | Local | During the 18th and 19th centuries, Chiltern woodlands provided a steady supply of beech wood to a significant local furniture industry. Today, timber production is largely limited to conifer woodlands.<br><br>The more extensive broadleaved woodlands as well as hedgerow trees, parkland trees and field trees are not commonly managed for timber production. The woodland resource is undermanaged, with problems of over-stood coppice, a lack of thinning and over-mature beech.<br><br>Various factors make forestry commercially unviable but particular issues in the Chilterns are the prevalence of beech which has a limited market and costs associated with pests, principally deer and grey squirrel[15]. Infrastructure, such as local sawmills, and the local skilled workforce once associated with this area has been in decline. | Opportunities are linked to developing local, small-scale markets and added value products, for example fencing, sustainable and local branded products,[16] with associated infrastructure and skills training needs being met. However, wood fuel opportunities may be greater.<br><br>Woodlands managed for timber can also be managed to provide public amenity opportunities, conserve heritage and produce biomass. | **Timber provision**<br><br>**Sense of place**<br><br>**Sense of history**<br><br>**Biodiversity**<br><br>**Regulating soil quality**<br><br>**Biomass energy** |

[12] Natural England (2010) [13] *Chilterns Area of Outstanding Natural Beauty: Management Plan 2008 - 2013 – A Framework for Action,* Chilterns Conservation Board (undated)
[14] *LEADER Local Action Group Local Development Strategy,* Chilterns LAG (2008) [15] Ibid [16] Ibid; *Seeing the Wood for the Trees,* Forestry Commission (2004)

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
|---|---|---|---|---|---|---|
| **Water availability** | Aquifer<br><br>Watercourses | Almost the entire NCA comprises a principal aquifer containing large quantities of high-quality potable water, corresponding with outcropping chalk[17]. It is the largest principal aquifer in the London Basin and the most significant in southern England. Abstraction volumes and development for abstraction is therefore significant[18].<br><br>The majority of volume abstracted in the Chilterns is from groundwater. This contrasts with nearby London or the Upper Thames Clay Vales where surface water abstractions dominate.<br><br>In the northern half of the Chilterns, all the rivers and groundwater[19] units in the entire Colne catchment and in the Lee and Mimram management unit are 'over abstracted'. | National | South east England is a highly populated area with relatively low annual rainfall. It is also a region with higher than average consumption rates[20] and agricultural uses in the Chilterns include 'high loss' uses such as spray irrigation[21]. Some parts of the south-east have less useable water per person than some arid countries[22] and more homes are expected to be built.<br><br>Public water supply needs, including those of London, have historically caused a greatly depressed water table and low flows in Chiltern chalk streams. Reliance upon groundwater resources will be particularly acute during periods of drought which may also coincide with increased demand by people.<br><br>**Continued on next page...** | Opportunities to improve water availability are only effective when implemented on a large scale, with the exception being winter storage reservoirs.<br><br>Work in partnership with water companies across the water supply network area to secure sustainable abstraction and consumption, including engaging water consumers about the negative impacts of unsustainable abstraction upon Chiltern chalk streams. | **Water availability**<br><br>**Biodiversity**<br><br>**Regulating water quality**<br><br>**Regulating water flow** |

[17] *Baseline Report Series 6: Chalk of the Colne and Lee River Catchments,* Environment Agency and British Geological Survey (2003) [18] *Catchment Abstraction Management Strategy for Colne,* Environment Agency (December 2007) [19] There are four Catchment Abstraction Management Strategies (CAMS) applicable to the Chilterns NCA – Upper and Bedford Ouse; Upper Lee; Colne; and Thame and South Chilterns. The CAMS area boundaries and the NCA boundary do not match and so CAMS information is approximated to fit the NCA. Two-thirds of the Chilterns NCA falls into the Colne and Thame and South Chilterns CAMs areas. [20] *Thame and South Chiltern Catchment Abstraction Management Strategy,* Environment Agency (2007) [21] *Catchment Abstraction Management Strategy for the Upper Lee,* Environment Agency (June 2006) [22] *Underground, Under Threat – The state of groundwater in England and Wales,* Environment Agency (undated).

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
|---|---|---|---|---|---|---|
| **Water availability cont...** | | In the south, all the groundwater units are 'over licensed' except the most southern groundwater unit in Oxfordshire which has 'no water available'. No rivers or groundwater units in the Chilterns are considered suitable for further extraction at low flows.<br><br>Water is also imported into the Chilterns. The areas around Wycombe and Aylesbury are net importers from Thames-side sources [23].<br><br>Streams become more numerous towards the north. A large area of dip slope in Oxfordshire is without any watercourses and the two southernmost streams can be dry along their entire lengths (Hughenden Stream and Hamble Brook).<br><br>A quarter of London's water supplies is drawn from its underlying confined aquifer which is supported by groundwater flows from the Chilterns and North Downs[24]. Groundwater flows in the south of the Chilterns aquifer also supply the nearby River Thames, supporting abstractions downstream including significant volumes for London[25]. | | Future demand associated with residential development threatens the sustainability of abstraction[26]. Water companies, in partnership with the Environment Agency, are carrying out work to address low flows and secure sustainable abstraction, including closing pumping stations and installing pipelines to transfer water.<br><br>In the four Environment Agency catchments falling within this NCA, current abstraction at low flows is causing or has the potential to cause, unacceptable environmental damage, with the exception of the dip slope in Oxfordshire and the River Thames reach which are appropriately licensed[27].<br><br>**Continued on next page...** | Where recharge potential is greatest across the aquifer, work with land owners and managers to improve soils, vegetation cover and artificial surfaces to enhance infiltration and avoid contamination from, for example, nitrates. Resolve pollution issues at source where there is rapid infiltration.<br><br>Support sustainable water consumption and pollution prevention in the design of new developments. Ensure the water supply network can meet demand from new development in a sustainable way.<br><br>At a catchment scale, encourage take-up of land management measures that are water efficient and minimise pollution including winter storage reservoirs, best practice irrigation and contour ploughing. | |

[23] Thames Water Utilities Ltd, personal commentary [24] *State of the Environment Report for London,* Greater London Authority, Environment Agency, Natural England and Forestry Commission (June 2011) [25] *Thames Corridor Abstraction Management Strategy, Environment Agency (2004). The Thames Corridor CAMS covers the freshwater River Thames, from Cricklade to Teddington, and the Thames Tideway as far down as Erith.* [26] *Catchment Abstraction Management Strategy for Thame and South Chilterns,* Environment Agency (March 2007)*; Catchment Abstraction Management Strategy for Colne,* Environment Agency (December 2007)*; Catchment Abstraction Management Strategy for the Upper Lee,* Environment Agency (June 2006) [27] Catchment Abstraction Management Strategy for Thame and South Chilterns, Environment Agency (March 2007); Catchment Abstraction Management Strategy for Colne, Environment Agency (December 2007); Catchment Abstraction Management Strategy for the Upper Lee, Environment Agency (June 2006); Catchment Abstraction Management Strategy for Upper and Bedford Ouse, Environment Agency (March 2005); Catchment Abstraction Management Strategy for the Thames Corridor, Environment Agency (June 2004)

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
|---|---|---|---|---|---|---|
| **Water availability cont...** | | In the 'Thame and South Chilterns' and 'Colne' catchments[28], 40 per cent of total abstracted volume relates to uses other than public water supply such as agriculture, industry and recreation[29].<br><br>Secondary aquifers are associated with Quaternary gravel deposits along the Thames. There is hydraulic connectivity between the aquifer/ groundwater and watercourses. Tring Reservoirs supply water to the Grand Union Canal. | | The northern catchments which are 'over abstracted' in the Chilterns are among only 15 per cent in England and Wales considered to be in this worst state and the availability of water for surface waters are at the highest risk from abstraction[30].<br><br>This poor picture of water availability is despite the Chilterns annual rainfall being higher than the average for the region. In the southern half of the NCA, the escarpment receives 708 mm average annual rainfall, although only 287 mm reaches watercourses and the aquifer[31].<br><br>Aquifer recharge is greatest high on the escarpment, in the valleys, not on the interfluves, and at the boundary between chalk and clay-with-flint deposits[32]. Groundwater abstraction is concentrated in the valleys, including the River Thames. Due to hydrological continuity between the watercourses and the aquifer, abstraction from the aquifer draws water from the rivers into the chalk.<br><br>**Continued on next page...** | | |

[28] The Colne CAMS area and the Thame and South Chilterns CAMS area accounts for approximately two-thirds of the Chilterns NCA but the CAMS areas include additional areas outside the NCA.
[29] *Thame and South Chiltern Catchment Abstraction Management Strategy,* Environment Agency (2007). [30] *Land Use and Environmental Services,* Environment Agency (October 2009; Science Report SC080014/SR1) [31] *Catchment Abstraction Management Strategy for Thame and South Chilterns,* Environment Agency (March 2007) [32] *Baseline Report Series 6: Chalk of the Colne and Lee River Catchments*, Environment Agency and British Geological Survey (2003)

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
|---|---|---|---|---|---|---|
| **Water availability cont...** | | | | Abstraction risks upon the Thames are not considered significant due to its large flows but there are risks to the smaller chalk streams[33]. Infiltration does not take place where there are overlying impermeable deposits, for example clay-with-flint, and where fissures in the chalk are poorly developed across the high ground of Oxfordshire in the south-west[34].<br><br>Abstraction pressures contributing to low flows are currently a concern for the rivers Ver, Misbourne, Mimram and Lee. Drying and variable river levels impact upon the ecology of rivers and water-dependent habitats such as meadows and wet woodland. Downstream impacts must also be considered, particularly since Chiltern watercourses contribute water to two key river systems – the River Thames and the rivers feeding into the Ouse Washes and The Wash.<br><br>The Thames applies a large draw on groundwater in the south, contributing to a pattern of watercourses across the dip slope that sees an absence of watercourses at the southernmost end in Oxfordshire and increasing density of watercourses northwards. | | |
| **Genetic diversity** | Orchards | Orchards in the central part of the NCA are small remnants of a historically significant local fruit industry. | Local | Predominantly out of production, these orchards may be in decline, however, they preserve a number of local and unusual varieties. | Engage owners in managing their orchards to conserve the genetic diversity they contain along with their biodiversity and cultural heritage. | **Genetic diversity**<br><br>**Biodiversity**<br><br>**Sense of place**<br><br>**Sense of history** |

[33] *Groundwater Quality Review – SW Chilterns and Twyford Brook*, Environment Agency (February 2005) [34] Ibid

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
|---|---|---|---|---|---|---|
| **Biomass energy** | Woodland<br><br>Short rotation coppice (SRC) | The Energy Crops Scheme 2000-2006 did not fund any miscanthus or short rotation coppice crops in the Chilterns.<br><br>In this heavily wooded landscape, potential yields of biomass from trees are significant from thinnings, logs, chippings and other sources. | Local | The firewood market is thriving locally, with sale of logs for firewood being more of a driver for woodland management than timber.<br><br>The potential yield from miscanthus is limited, while potential for SRC yields are mainly medium. SRC (willow, poplar) is inappropriate in the Chilterns where it reduces infiltration to groundwater, particularly in areas already under water stress.<br><br>Suitable locations for biomass production are limited by the presence of vulnerable landscape features and views and also steep terrain, although the heavily wooded landscape offers some opportunities to assimilate SRC. Miscanthus will cause least landscape change if sited where intensive arable already exists, such as on the scarp foothills and Thames Valley.<br><br>With approximately 10 million people living within an hour's drive (including London), there is a large potential market for wood fuel both from the domestic and commercial sector, including large and numerous premises with wood fuel systems, such as Heathrow Terminal 2 and Slough Heat and Power. | Seek growth in the market for woody biomass which secures additional benefits to biodiversity, timber production and conservation of woodland as an important landscape feature[35].<br><br>Establish appropriate management of native beech woodlands which realises their biomass potential and also ensures the conservation of their special biodiversity.<br><br>Work with local educational institutions and land owners to develop a skilled workforce to manage woodlands across the NCA. | **Biomass energy**<br><br>**Timber provision**<br><br>**Biodiversity**<br><br>**Sense of place** |

[35] *Chilterns AONB State of the Environment Report,* Chilterns Conservation Board (2010)

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
|---|---|---|---|---|---|---|
| **Climate regulation** | Woodland<br><br>Permanent pasture<br><br>Wetland habitats<br><br>Historic land uses such as downland and parkland | Although containing relatively low carbon concentrations, topsoils will contribute to carbon storage capacity.<br><br>There are considerable areas of undisturbed soils supporting woodland and permanent pasture, including semi-natural chalk grassland, which are less likely to release their carbon stores and store more carbon than regularly cultivated ground. Permanent grasslands account for approximately 1,500 ha.<br><br>Woodland cover is high across the NCA at 14 per cent, representing carbon stores in both soils and tree biomass. Wetland habitats in the valleys which may contain undisturbed peaty and/or deep soils with higher carbon storage capacity account for approximately 400 ha. | Regional | Soil carbon stores are limited in this NCA due to the predominance of mineral soils. However, carbon storage potential is maximised where there are undisturbed soils which have a considerable longevity of storage such as in historic downland, woodland, common land and parkland.<br><br>The contribution that woodland makes to carbon sequestration is very limited compared to the UK's soil carbon stores and declines with increasing tree maturity. Woodland makes a greater contribution to climate regulation through reducing emissions as a provider of alternative fuels to fossil fuels. | The greatest contribution to be made to climate regulation will be through generating biomass fuels.<br><br>Soil carbon stores should be conserved and well managed to maximise storage across the NCA. Incorporate organic matter, use cover crops and adopt reduced tillage techniques to improve soil structure so that there are benefits for carbon regulation, soil quality and soil erosion.<br><br>When managing historic landscapes such as downland and parkland, avoid disturbance of soils to benefit long-established carbon stores as well as to preserve above-ground and below-ground archaeology.<br><br>Conserve and manage ancient woodlands and their soils to maximise carbon storage while also delivering biodiversity and wood fuel benefits. Forestry activities, including planting and harvesting, should seek to minimise soil disturbance.<br><br>Manage existing wetlands and seek to extend wetlands in order to secure the peat resource, benefit biodiversity and manage water resources. | **Climate regulation**<br><br>**Regulating soil quality**<br><br>**Biomass energy**<br><br>**Sense of history**<br><br>**Biodiversity** |

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
|---|---|---|---|---|---|---|
| **Regulating water quality** | Chalk<br><br>Watercourse<br><br>Vegetated slopes<br><br>Cross-field hedgerows (in arable) | Natural process of water percolating through the Chalk.<br><br>Woodland, areas of permanent pasture, cross-field boundary hedgerows and vegetated slopes found throughout the area reduce cross-ground water flow rates thereby increasing infiltration and the processes of natural filtration.<br><br>94 per cent of the NCA falls into a nitrate vulnerable zone (NVZ) providing groundwater and surface water protection, and the area around Luton falls into a catchment sensitive farming priority catchment. | Regional | The NVZ and catchment sensitive farming designations reflect the importance of the area to national water quality interests and to the location of polluting activities. Due to the hydraulic connectivity between groundwater/aquifer and watercourses, pollutants can cross-contaminate.<br><br>Groundwater in the aquifer is generally high quality but pollution is present from urban point sources, such as industry in High Wycombe, St Albans, Luton, Dunstable, and from diffuse sources, such as nitrate concentrations from farming; a particular problem in the south of the area.<br><br>River water quality is generally good in all but one of the four catchments in the NCA, the Colne, but pollutants are present. Groundwater and surface water protection in this NCA demands filtration of pollutants in both the rural and urban setting, with particular solutions required for the Colne in relation to interactions with the canal network.<br><br>Settlement pattern means that urban centres are adjacent to watercourses, where there is limited green space to filter pollutants from runoff. Pollutants in runoff from arable land may be intercepted by the surrounding mosaic of hedgerows, woodlands, scrub and grasslands<br><br>Existence of very rapid flow paths within the Chalk means that groundwater is susceptible to pollution incidents from a wide range of activities and there is potential to cause widespread and long-lasting pollution of the aquifer. | Target the development of sustainable drainage systems / green space within and downstream of urban centres to filter pollutants.<br><br>Work with farmers and other land managers at a whole farm and at a catchment scale to maximise and strategically locate land cover which slows and filters run-off and improves water entering the aquifer, for example through arable reversion, hedgerows restoration and planting, permanent arable field margins and strips and reedbeds.<br><br>Work with farmers and other land managers to maintain or enhance existing field drainage to improve infiltration and slow down runoff. Avoid new drainage of existing wetlands.<br><br>Reduce compaction and erosion in all soils, and poaching in grassland, including remedial loosening. Encourage sustainable grazing regimes on permanent pasture and rough land. | **Regulating water quality**<br><br>**Food provision**<br><br>**Regulating soil erosion**<br><br>**Regulation soil quality**<br><br>**Regulating water flow**<br><br>**Biodiversity** |

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
|---|---|---|---|---|---|---|
| **Regulating water flow** | Watercourses<br><br>Wooded valley sides<br><br>Vegetated steep slopes<br><br>Water storage features, in-stream and in the wider flood plain such as wet meadows and watercress beds<br><br>Permanent pasture | The middle reaches of the River Thames lie near the southern boundary of the NCA, flowing from the adjacent NCA Upper Thames Tributaries and on to London. The Thames flows across a wide flood plain offering flood storage capacity.<br><br>The Thames Valley has a fairly high risk of flooding, with riverside settlements including Reading, Henley and Marlow susceptible. The Thames Valley also offers potential floodwater storage areas.<br><br>Smaller scale flooding may also affect those settlements adjacent to chalk streams in the dip slope valleys but, historically low flows have been a more significant issue.<br><br>Some watercourses are prone to drying in their upper reaches and the permeability of the Chalk means that infiltration can reduce overland flows. Five of the nine chalk streams are classified as 'heavily modified waterbodies'. | Local | Groundwater provides a relatively consistent flow volume to chalk streams. However, abstraction can give rise to artificial and low flow regimes which impact the ecology of rivers and water-dependent habitats such as meadows and wet woodland.<br><br>Abstraction pressures contributing to low flows are currently a concern for the rivers Ver, Misbourne, Mimram and Lee. Treated discharges from sewage treatment works modify flows of rivers such as the Lee and Hiz.<br><br>Low flow alleviation schemes have been implemented along several chalk streams including the Misbourne, Bulbourne and Wye[36]. Pumping stations along chalk streams have been closed and investigations continue along rivers such as the Wye. Chalk streams within the Chilterns AONB also benefit from the conservation activities of the Chiltern Chalk Streams Project which has been running for several years.<br><br>Downstream impacts must also be considered, particularly since Chiltern watercourses contribute water to two key river systems – the River Thames and the rivers feeding into the Ouse Washes and The Wash.<br><br>**Continued on next page...** | Target the development of sustainable drainage systems and green space within and downstream of urban centres to store floodwaters and filter pollutants.<br><br>Work with farmers and other land managers at a whole catchment scale to improve soil management to aid water infiltration and to maximise and strategically locate land cover which slows and filters run-off, for example through arable reversion, hedgerows restoration and planting, permanent arable field margins, wooded slopes and reedbeds.<br><br>Restore historic and natural features in flood plains to increase capacity for water storage, including wet meadows, watercress beds and reedbed. | **Regulating water flow**<br><br>**Regulating water quality**<br><br>**Water availability**<br><br>**Biodiversity** |

[36] Thames Water Utilities Ltd, personal commentary

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
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| **Regulating water flow cont...** | | There are landscape features which assist infiltration and slow overland flows, including extensive broadleaved woodland and a locally dense network of hedgerows. | | **... continued from previous page**<br><br>Across the Chalk, infiltration can reduce overland flows after rainfall events and so alleviate localised flooding. However, flooding can affect the many urban centres adjacent to chalk streams where there is significant run-off and limited flood storage space (with associated water pollution threats). The Thames can bring floodwaters into the NCA and on into London.<br><br>Narrow valleys on the dip slope restrict flood storage capacity while the wide Thames flood plain offers some opportunity for storage. The dominance of heavily modified watercourses amongst the chalk streams means natural river processes are restricted at times of high water flows.<br><br>Establish land cover which slows runoff in the urban and rural environments. The role that water flow management in the Upper Thames Tributaries can play in attenuating Thames floodwater will also benefit this NCA and London. | | |

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| **Regulating soil quality** | Permanent pasture<br><br>Calcareous soils<br><br>Grade 1, 2 and 3a land<br><br>Soils under woodland | Prime agricultural land of Grades 1 and 2 is associated with the lower scarp and Thames flood plain and covers about 10 per cent of the NCA area or about 18,000 ha.<br><br>There are soil types of a calcareous nature which are naturally resilient to drought if well managed. These are shallow lime-rich soils over chalk or limestone covering around 15 per cent of the NCA and also freely draining lime-rich loamy soils which account for just over 10 per cent of the NCA area.<br><br>Soils across approximately half the NCA are vulnerable to compaction. These include the slightly acid loamy and clayey soils associated with the dip slope ridges (covering just over 40 per cent) and the freely draining slightly acid but base-rich soils (covering just over 10 per cent).<br><br>There are considerable areas of uncultivated soils under woodland and grassland, some of which have been undisturbed for centuries such as ancient woodland, downland and fen. Permanent grasslands account for approximately 1,500 ha and fen 52 ha. Woodland cover is high at around 23,000 ha, of which 12,000 ha is ancient. | Regional | The best and most versatile agricultural land (Grade 1, 2 and 3a) is a priority for protection from loss by development. Almost half the NCA, including much of the plateau, is vulnerable to poaching and compaction and this threatens soil structure, versatility and productivity.<br><br>The national importance of the chalk aquifer makes overlying soil structure and soil contaminants significant in terms of water filtration.<br><br>There are significant potential pollutant sources including urban centres, roads and intensive agriculture. | Conserve and maximise the resource, aiming particularly to avoid deterioration of soils with high Agricultural Land Classification grades. Ensure there is good soil management in woodlands as well as across farmland.<br><br>Across all soils, reduce soil compaction and erosion. Avoid land management practices which can lead to compaction such as over-stocking and working machinery on wet ground. Carry out remedial work such as loosening where necessary.<br><br>Reducing intensity of tillage and encouraging use of additional sources of organic matter on intensively managed soils, such as cover/catch crops and manures, should help increase soil carbon and improve soil structure. This, with careful use of fertilisers, should help reduce nitrous oxide emissions.<br><br>Good soil management will also benefit food production in the long term, aid infiltration to the aquifer and reduce pollutants entering surface and ground waters. | **Regulating soil quality**<br><br>**Regulating soil erosion**<br><br>**Food provision**<br><br>**Regulating water quality**<br><br>**Regulating water flow**<br><br>**Water availability**<br><br>**Climate regulation**<br><br>**Biodiversity** |

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| **Regulating soil erosion** | Soils<br><br>Permanent pasture<br><br>Woodland | Steep slopes across the Chilterns make soils vulnerable to erosion under certain land uses. Some Chiltern soils types are also intrinsically vulnerable to erosion.<br><br>The extensive woodland cover protects a large proportion of Chiltern soils.<br><br>Soils under permanent vegetation – grassland and scrub – are less prone to wind or water erosion. | Local | Soil management is critical as many of the Chiltern soil types are vulnerable to damage and hence erosion. Erosion of thin chalk soils can lead to total loss of soil to expose bare rock. Soils under woodland will be conserved but are not accessible for food production.<br><br>With the NCA falling into a Nitrate Vulnerable Zone overlying a regionally/nationally important aquifer, soil erosion is a concern in relation to water quality because water can transfer sediments and contaminants into groundwater and surface water.<br><br>The predominant loamy and clayey soils with impeded drainage, covering almost half the NCA, are easily compacted by machinery or livestock if accessed when wet, increasing the risks of soil erosion by surface water run-off. The majority of these soils are also prone to capping/slaking, as are some of the freely draining lightly acid but base-rich soils (around 10 per cent of the NCA), leading to increased risk of erosion.<br><br>The shallower lime-rich soils (around 15 per cent of the NCA) are at risk of erosion on sloping cultivated ground or where bare soil is exposed, as are the freely draining lightly acid loamy soils (covering about 20 per cent of the NCA), where there is also the potential for wind erosion on some coarse textured cultivated variants. The remaining loamy/ clayey soils (flood plain or seasonally wet soil types covering less than 5 per cent of the NCA) are at low risk of erosion. | Encourage farmers and land managers to manage land on steep slopes as pasture, especially where there are thin chalk soils and where biodiversity benefits are significant.<br><br>Incorporate organic matter, adopt reduced tillage and avoid compaction in order to minimise runoff and soil erosion.<br><br>Incorporate features such as hedgerows and grassland buffers which can intercept runoff and so reduce widespread erosion, filter contaminants and enhance the landscape.<br><br>Encourage longer growing periods between grazing and increase sward diversity in leys to increase root penetration and increased soil stability. | **Regulating soil erosion**<br><br>**Regulating soil quality**<br><br>**Regulating water quality**<br><br>**Food provision** |

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| **Pollination** | Species-rich grassland<br><br>Hedgerows<br><br>Woodland edge | Habitats supporting pollinating insects are provided by the Chilterns' hedgerows, species-rich grasslands, wetlands and exposed rock. | Local | In the Chilterns AONB, a 2008 survey found wheat growing on 50 per cent of cropped land; 20 per cent barley and 11 per cent oilseed rape[37]. Graminae species, such as maize and cereals, dominate Chilterns' crops and are wind pollinated so do not require pollinators. However, crops that are insect pollinated and are grown here now and may be in the future include soft and top fruit, linseed, oil seed rape, and a variety of beans. | Maintain pollinator habitat and, where possible, create new pollinator habitat.<br><br>Where crops are grown that require insect pollination, create new pollinator habitats including chalk grassland. | **Pollination**<br><br>**Food provision**<br><br>**Biodiversity** |
| **Pest regulation** | Habitat mosaic | The high degree of heterogeneity in the landscape, as opposed to a monoculture landscape, provides resilience against widespread pest and disease damage. | Local | There is recognised pest damage affecting timber production/trees in the Chilterns: mammals including grey squirrels, fat dormouse), muntjac and fallow deer, and insects, including oak processionary moth at Pangbourne and west London, and horse chestnut leaf miner. Sudden oak death, ash dieback and red band needle blight are also affecting trees in the Chilterns[38].<br><br>Non-native species such as signal crayfish are also threatening native aquatic biodiversity. The mosaic of woodlands, hedgerows and watercourses may facilitate disease and pest dispersal. However, the mosaic of habitats will potentially support natural predators. | Maintain and build resilience against pests and diseases by supporting diversity within species populations and in terms of habitats and crop types. Focus upon managing impacts upon food and timber provision and biodiversity.<br><br>Establish pest and disease management strategies for the Chilterns woodlands and watercourses in particular. | **Pest regulation**<br><br>**Timber production**<br><br>**Biodiversity** |

[37] *Chilterns AONB Land Use Survey 2008,* Chilterns Conservation Board (2008)
[38] *Chilterns AONB State of the Environment Report,* Chilterns Conservation Board (2010)

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
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| **A sense of place/ inspiration** | Panoramic views<br><br>Beechwoods<br><br>Historic environment<br><br>Watercourses<br><br>Escarpment<br><br>River Thames<br><br>Traditional built environment<br><br>Downland<br><br>Open access land and rights of way<br><br>Farms hosting school visits | As a result of the special qualities of much of this landscape 52 per cent is designated AONB – the majority being the Chilterns AONB and a small area to the south of the Thames being the North Wessex Downs AONB.<br><br>There is public access to locations and viewpoints with diverse and ancient natural and cultural heritage, including barrows and hill forts, and rare and unique features, such as the Chiltern gentian and Whiteleaf Cross, a carved chalk figure. Wide views and feelings of space and height are also gained from high points overlooking the clay vales or valley flood plains.<br><br>A dense hedgerow network, holloways, woodland and branching steep valleys create an intimate landscape in places.<br><br>The Thames is a dominant feature in the south.<br><br>**Continued on next page...** | National | Some modern development is reinforcing traditional building styles, particularly in the AONB. The AONB designation of the majority of this NCA reflects a strong scenic and landscape character and provides resources for conserving and enhancing the natural beauty of the area. Natural and cultural heritage is accessible and celebrated in local museums, parklands, urban spaces, countryside sites and on commons.<br><br>Local communities are active in engaging both local people and visitors in local heritage through town centre trails, museums, promoted countryside routes and events. Several farms host school visits to engage children in their local working countryside, but there are few near to London. | Work with the AONB to conserve and enhance the landscape and the special qualities of the AONB and consider applications of best practice beyond the AONB boundary.<br><br>Further develop strong locality products where this supports the management of the landscape, for example woodland and sheep farming products and local building materials.<br><br>Further engage active communities in conserving and enhancing the landscape, and the distinctive physical and cultural character of the area.<br><br>Engage farms near to London in hosting school visits. | **Sense of place/ inspiration**<br><br>**Sense of history**<br><br>**Food provision**<br><br>**Biodiversity**<br><br>**Geodiversity** |

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| **A sense of place/ inspiration cont...** | | Consistent use of traditional building materials provides consistency and connection with local geology. Attractive villages and dispersed farmsteads give a sense of rural tranquillity and affluence while large urban centres and major roads are busy.<br><br>Designed landscapes provide a sense of grandeur.<br><br>Local museums celebrate local, personalities, artistic endeavour and heritage, for example the Roald Dahl Museum and Henley River and Rowing Museum.<br><br>Nineteen farms in the NCA host school visits under agri-environment schemes[39]. | | There is an absence of strong local brands associated with food, wood or other products, suggesting that the identity of the working landscape is not as strong as it could be. In the past, orchard produce was associated strongly with this area; a characteristic now widely lost. The Chilterns AONB considers that the conservation of the built environment is largely dependent upon outside sources for materials and skills[40].<br><br>The area continues to provide stimulation for many writers, artists, poets and painters. | | |

[39] Based on analysis of agri-environment scheme data held by Natural England, 2012

[40] *Chilterns Area of Outstanding Natural Beauty: Management Plan 2008 - 2013 – A Framework for Action,* Chilterns Conservation Board (undated)

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| **Sense of history** | Scheduled Monuments and other, unscheduled heritage assets<br><br>Registered Parks and Gardens<br><br>Listed buildings<br><br>Traditional built environment, both urban and rural<br><br>Ancient natural features<br><br>Ancient woodlands and their traditional management and production | There are 202 Scheduled Monuments, including parts of the well known prehistoric routeway called the Ridgeway.<br><br>Around 15 of these monuments are declining in condition and on the At Risk Register. Additional monuments are at risk and of an unknown or stable condition.<br><br>Bronze-age barrows and iron-age hill forts and dykes found along the scarp connected by the Icknield Way which has been in use since the Neolithic period<br><br>Iron-age hillforts and dykes found along the Thames Valley to the south.<br><br>Roman influence is still evident through the communications network and settlement pattern, and medieval influence is reflected in settlement and field patterns.<br><br>Chalk streams reveal unique features associated with watercress growing and numerous mill sites. | Regional | The history of the landscape is evident in numerous historic features from various ages dating back to prehistory. Some historic features are widespread, including ancient boundaries, holloways, commons, ancient woodlands, churches, and buildings in the vernacular style.<br><br>Public access is provided to some key heritage assets and landscapes including parklands, monuments along the Ridgeway and commons, increasing the opportunity to understand and interpret the historic environment.<br><br>Woodland archaeology reveals changes in woodland management and climate including coppice stools linked to medieval activities and saw pits and other features associated with the furniture industry of the 18th and 19th centuries.<br><br>**Continued on next page...** | Engage communities and owners of historic features in celebrating and conserving the historic environment, including developing skills and industry around historic environment conservation and traditional building materials and construction.<br><br>Improve public access and visitor facilities to key historic features.<br><br>Enhance the setting of historic features as part of landscape-scale projects which integrate multiple landscape objectives.<br><br>Establish positive management of woodlands which conserves their archaeology and draws on traditional techniques while also benefitting biodiversity, wood fuel production and carbon storage. | **Sense of history**<br><br>**Sense of place/ inspiration**<br><br>**Timber provision**<br><br>**Biodiversity**<br><br>**Geodiversity**<br><br>**Recreation** |

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| **Sense of history cont...** | | More recent heritage assets include the Grand Union Canal.<br><br>There are 6,851 Listed Buildings. Traditional materials in the built environment include flint, brick, tiles and in places weatherboard and thatch, plus old farm buildings characterised by large timber-framed barns clad with black weatherboard. The use of Totternhoe Stone (clunch) as a building material is a characteristic of this area.<br><br>Forty registered historic parks and gardens in the NCA, many the works of key 18th century designers such as Bridgeman, Repton and Brown<br><br>Ancient woodlands are extensive and contain a variety of archaeology, veteran trees and ancient coppice stools. | | Some settings of historic features could be improved, as could their management, for example through the reduction in arable cultivation currently affecting monuments. There is also concern about visitor pressure negatively impacting historic features, including historic routeways and popular landmarks.<br><br>The value of such an ancient landscape is heightened by the fact that it lies adjacent to modern development including the London edge and several motorways. Local museums, historic character mapping projects and historic sites celebrate and engage people in the historic environment. There are local community groups working to conserve and engage people in the historic environment.<br><br>The collected expression of taste and wealth seen in the many grand houses and parks and gardens, reflects the proximity of the area to London and the past and ongoing popularity of this highly scenic landscape. | | |

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| **Tranquillity** | Secluded valleys<br><br>Scarp<br><br>Woodlands | The largest area of high to medium tranquillity is in the south-west, including around Henley-on-Thames.<br><br>Elsewhere, parts of the escarpment and a few valleys without major roads and settlements are highly tranquil and there are also very small pockets of medium to high tranquillity near to the London edge, for example between Amersham and Hemel Hempstead.<br><br>Only 20 per cent of the NCA is assessed as 'undisturbed'. | Regional | The Chilterns is a transitional area in which levels and areas of tranquillity increase with distance away from London, except in the north where Luton and Stevenage influence tranquillity.<br><br>Low tranquillity scores are dispersed across the NCA reflecting settlements and major transport corridors.<br><br>Experiences of tranquillity in those pockets of high to medium tranquillity near to the London edge and in the Thames Valley will be particularly significant and valued.<br><br>Luton and Stevenage are a focus for further development and so the surrounding areas of high to medium tranquil spaces may be detrimentally affected.<br><br>Traffic, a key contributor to disturbance, affects popular countryside visitor destinations as well as more traditional rural settlements. Traffic calming measures and support for non-car transport has reduced traffic issues at Ashridge. | Distinctive elements of the Chilterns landscape, woodlands, flowing water and the 'rural' scene, should be conserved and managed to improve perceptions of tranquillity, particularly near to settlements.<br><br>Traffic calming measures and support for non-car travel at popular countryside destinations should be encouraged and supported and will improve tranquillity and recreation experiences generally.<br><br>Further erosion of tranquillity should be avoided or minimised by ensuring development in areas of high to medium tranquillity is appropriate to the setting and incorporates measures, such as tree planting and green 'buffers'. | **Sense of tranquillity**<br><br>**Sense of place/ inspiration**<br><br>**Sense of history**<br><br>**Recreation** |

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| **Recreation** | Ridgeway National Trail<br><br>Thames Path National Trail<br><br>Open access land<br><br>Public rights of way<br><br>National cycle routes and regional trails<br><br>Grand Union Canal<br><br>Public forest estate<br><br>Historic parks and gardens<br><br>River Thames<br><br>The scarp slope | More publicly accessible routes and green spaces are needed for the populations of Luton, Hemel Hempstead and High Wycombe but other settlements have good access provision per head of population[41].<br><br>There are 3,563 km (equivalent to 2.17 km per km$^2$) of rights of way, and over 3,500 ha of open access land (around 2.5 per cent of the NCA), including significant tracts of common land.<br><br>There are three National Nature Reserves. 1,560 ha of woodland in the public forest estate is managed outside woodland grant schemes for timber and other ecosystem services. | Regional | In 2007, it was estimated that there were just over 55 million leisure visits made to the Chilterns AONB[42]. A survey at 11 sites in the AONB established that 74 per cent of visits were made by local residents and 83 per cent were made by groups; family and/or friends[43].<br><br>The Chilterns represents an important local recreational resource for approximately 1.38 million residents in the 11 district council areas in which the AONB falls[43]. In addition, the area is easily accessible from London and other major urban centres, such as Milton Keynes, and offers relative tranquillity[44].<br><br>Some locations are recognised 'honey pot' sites, for example, Wendover Woods and Ashridge Estate[45] and the resilience of these sites' features to visitor pressure is a concern. Traffic on rural routes also affects enjoyment.<br><br>**Continued on next page...** | Improve the bridleway network as a multi-user network and also to meet the demands of the considerable resident population of horse owners.<br><br>Manage visitor pressure upon fragile locations by promoting alternative, more robust and equally attractive destinations and increase the resilience of vulnerable sites.<br><br>Maximise the contribution that volunteers and local communities can make to the maintenance of landscape features which are recreational assets.<br><br>Support, create and improve links between recreational assets and settlements.<br><br>Address gaps in the provision of routes and green spaces, targeting efforts around Luton, Hemel Hempstead and High Wycombe. | **Recreation**<br><br>**Biodiversity**<br><br>**Sense of place/ inspiration**<br><br>**Sense of history** |

[41] Based on visual analysis of countryside access data held by Natural England, 2012 [42] *Chilterns AONB Visitor Survey 2007,* Tourism South East (2008) [43] Ibid [44] *Chilterns Area of Outstanding Natural Beauty: Management Plan 2008 - 2013 – A Framework for Action,* Chilterns Conservation Board (undated) [45] *Chilterns AONB Visitor Survey 2007,* Tourism South East (2008)

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| **Recreation cont...** | | Two National Trails run through the area; the Ridgeway follows the crest of the scarp and the Thames Path follows the course of the river. There are a number of National Cycle Network routes and regional routes, the Icknield Way and the Chiltern Way. The Ridgeway, Grand Union Canal and National Cycle routes are multi-user routes along much of their length.<br><br>Water-based activities are provided along the Thames and Grand Union Canal.<br><br>There are a wide range of activities offered by this area, for example walking, cycling, horse riding, gliding, canoeing, mountain biking, canal boating and bird watching[46]. A large number of organisations provide events for the public[47]. The Chiltern Society volunteer groups assist in the maintenance of the rights of way network. | | A survey of 11 sites in the Chilterns AONB also suggested the majority of visits involve passive activities, such as walking or enjoying the view, rather than active pursuits such as off-roading or paragliding[47].<br><br>There is demand for more multi-user routes, particularly along the Thames Path.<br><br>Common land, lying in close proximity to homes, workplaces and schools, is particularly well used. Large areas are open to the public by the National Trust, Forestry Commission, wildlife trusts and local authorities, with a particular assemblage along the ridge providing some of the best views in the area[46].<br><br>The percentage of open access land and accessible natural green space[48] in the AONB is relatively high and well spread. Locally promoted routes equally serve different users, including 'easy access' circular trails.<br><br>**Continued on next page...** | | |

[46] *Chilterns Area of Outstanding Natural Beauty: Management Plan 2008 - 2013 – A Framework for Action,* Chilterns Conservation Board (undated) [47] Ibid [48] Accessible natural green spaces are areas of countryside that provide both public access and a potential wildlife habitat – woodlands, grasslands, wetlands, rivers, canals and country parks.

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
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| **Recreation cont...** | | Visitor experiences at some sites may be negatively impacted by congestion and noise. | | Approximately three-quarters of accessible natural green space is woodland, with around a third of open access woodlands being provided by the Forestry Commission. Key landscape features are accessible and offer a broad appeal, including picturesque villages, waterways, biodiverse habitats and historic places[49].<br><br>Boat traffic has reduced along the Thames in recent years[50]. | | |

[49] *Chilterns Area of Outstanding Natural Beauty: Management Plan 2008 - 2013 – A Framework for Action,* Chilterns Conservation Board (undated) [50] Ibid

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| **Biodiversity** | Species- rich chalk grassland<br><br>Ancient woodland<br><br>Ancient hedgerows<br><br>Sustainably managed farmland<br><br>Chalk streams<br><br>Common land habitats<br><br>Parkland<br><br>Farmland birds<br><br>Arable weeds<br><br>Local Nature Reserves | Recognised at an international level, the beechwood SACs cover just less than 1 per cent of the NCA.<br><br>There are 3,670 ha of land designated SSSI, dominated by chalk grassland and broadleaved woodland. 98 per cent of SSSI are in 'favourable' or 'unfavourable recovering' condition.<br><br>There are 1,062 Local Wildlife Sites. The provision of Local Nature Reserves does not meet the recommended 1 ha per 1000 population in any district.<br><br>Biodiversity of parklands, chalk streams and orchards is under-represented amongst all designated sites.<br><br>Semi-natural habitats are restricted in extent, except woodland. Chalk grassland and common land habitats exist as scattered fragments, although the extensive hedgerow network provides potential linkages. | National | Important areas and types of semi-natural habitat are designated, although stretches of chalk stream, ancient hedgerow, parkland and farmland biodiversity are under-represented.<br><br>Larger areas of woodland, common and grassland represent core areas of habitat. Chalk streams and ancient hedgerows can function as corridors.<br><br>Declining livestock numbers have made conservation of open habitats difficult, giving rise to significant losses to scrub and woodland. Open habitats are largely conserved only where agri-environment schemes support management.<br><br>Conservation of woodland biodiversity relies upon grant schemes, although a growing wood fuel market is reviving management in some woods. Many woods have long been unmanaged, leading to declines in woodland birds and butterflies. Orchards are largely unmanaged.<br><br>**Continued on next page...** | Establish a resilient ecological network. Identify and address gaps and build core areas, particularly in relation to chalk grassland and flood plain habitats. Incorporate access improvements to provide for public engagement with nature<br><br>Realise greater recognition of the biodiversity interest of parkland, chalk streams and orchards by seeking designations as appropriate and by integrating biodiversity conservation into management of associated historic assets.<br><br>Conserve important species populations in semi natural and farmland settings through supporting sustainable farming. Where possible, management to conserve biodiversity should also seek to assist water and soil conservation, focusing upon areas where risks are highest and the value of the asset greatest, for example, chalk grassland on steep slopes or wet meadows alongside a chalk stream. | **Biodiversity**<br><br>**Recreation**<br><br>**Sense of place**<br><br>**Sense of history**<br><br>**Regulating soil quality** |

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| **Biodiversity cont...** | | Chalk streams support characteristic species and also strengthening populations of water vole. However, the ecological status of the rivers Gade and Ver is considered 'bad' and less than five waterbodies are considered 'good'.<br><br>Arable weeds are localised but there are strong populations of shepherd's needle, for example. Farmland birds include corn bunting, grey partridge and yellowhammer.<br><br>The red kite draws visitors to the Chilterns, as do rare plants such as the pasque flower at Barton Hills NNR. | | Farmland birds benefit from the mosaic of habitats and from sustainable farming practices supported by agri-environment schemes.<br><br>Chalk stream ecology is negatively affected by low flows, engineered channels and pollution. Low flow alleviation schemes, resource protection measures across farmland and improvements delivered by community groups are improving condition in some places.<br><br>Chalk streams within the Chilterns AONB have benefitted from a dedicated long-running Chalk Streams Project which promotes best practice conservation and development and supports conservation activities. Project work has secured improvements to stream and flood plain habitats along several rivers including restoration of water meadows and improved fish passage along the Chess[51]. | Engage local communities and landowners in conserving their local biodiverse spaces as part of a wider, co-ordinated ecological network, particularly those near settlements and popular with visitors such as Barton Hills NNR.<br><br>Restore chalk streams, flood plain habitats and flood plain function. Innovative solutions will be required along significant stretches of watercourse due to the constraints of existing development and settlement.<br><br>Review the Local Nature Reserve resource and identify and address any gaps, particularly where new development is taking place.<br><br>Secure biodiverse green infrastructure as part of development.<br><br>Manage visitor pressure upon fragile locations by promoting alternative, more robust and attractive destinations and increasing the resilience of vulnerable sites. | |

[51] *Annual Report 2011-12,* Chilterns Chalk Streams Project (undated)

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
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| **Biodiversity cont...** | | | | Commons and riversides are significant as biodiverse spaces near to settlements. Access to urban-edge grasslands and woodlands may also be significant for local people to experience 'common' or 'urban' wildlife.<br><br>Local Nature Reserves are relatively few considering the population size. With many key areas of habitat, including downland, being subject to public access, there can be issues around visitor pressure and conflict between visitors and management activities.<br><br>Local authorities, private farms, the National Trust, Wildlife Trusts and Forestry Commission provide public access to biodiverse sites. Promoted routes and interpretation boards in the countryside celebrate the natural interest of the Chilterns.<br><br>Landowners deliver nature conservation management under agri-environment schemes while numerous community groups and organisations also carry out nature conservation work. | | |

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| **Geodiversity** | Chalk<br><br>River terrace gravels<br><br>Fluvial geomorphology | There are 14 geological SSSI and 33 Local Geological Sites. The form of the Chilterns Chalk outcrop is prominent and a distinctive landform that is visible and accessible for interpretation.<br><br>Some periglacial landforms, such as dry valleys, chalk carved figures and disused quarries, some of which are designated, are accessible by the public, for example. Whiteleaf Cross, College Lake, Totternhoe Quarry.<br><br>Landforms of the Thames Valley, including the Goring Gap and gravel pits, can be accessed and enjoyed by the public from the Thames Path and from locally popular vantage points such as Winter Hill, near Cookham.<br><br>**Continued on next page...** | Local | The geology and processes that underpin the area have generated much of the areas agriculture, land use and now cultural heritage. Despite being almost entirely underlain by the Chalk, a diversity of soils have developed through the interplay of climate, topography, vegetation and human influence, which in turn support the characteristic habitats and land uses across the Chilterns.<br><br>Of the few green spaces with very good visitor facilities such as car parks and visitor centres, many have geodiversity interest that can be promoted to the public.<br><br>Historic buildings built with local materials and historic excavation sites on commons also represent an important resource near to settlement. Public access to exposures of chalk is rare and new excavations are not taking place. | Work with existing and new groups, including landowners of green spaces, to build capacity to carry out geoconservation activities and education.<br><br>Secure benefits to geodiversity through landscape scale projects which integrate multiple landscape objectives.<br><br>Engage communities and property owners in celebrating and continuing use of local building materials, including developing skills and industry around traditional building materials.<br><br>The relationship between geodiversity in this area and the underlying aquifer, water quality and availability, and soils presents an opportunity to engage a wide audience in better understanding natural processes that limit available resources. | **Geodiversity**<br><br>**Sense of place/ inspiration**<br><br>**Sense of history**<br><br>**Recreation** |

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| **Geodiversity cont...** | | Traditional building materials also celebrate local geology. Local museums and promoted routes contribute to the interpretation of local geodiversity. There are local community groups carrying out geoconservation and public engagement activities.<br><br>Pitstone Quarry SSSI is famous for an organic deposit (around 180,000 years BP) which is evidence of a previously unknown British interglacial. | | Those groups which are seeking to engage the public and study geodiversity have restricted resources, relying largely on volunteers, consequently public engagement in geodiversity is small-scale. | | |

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