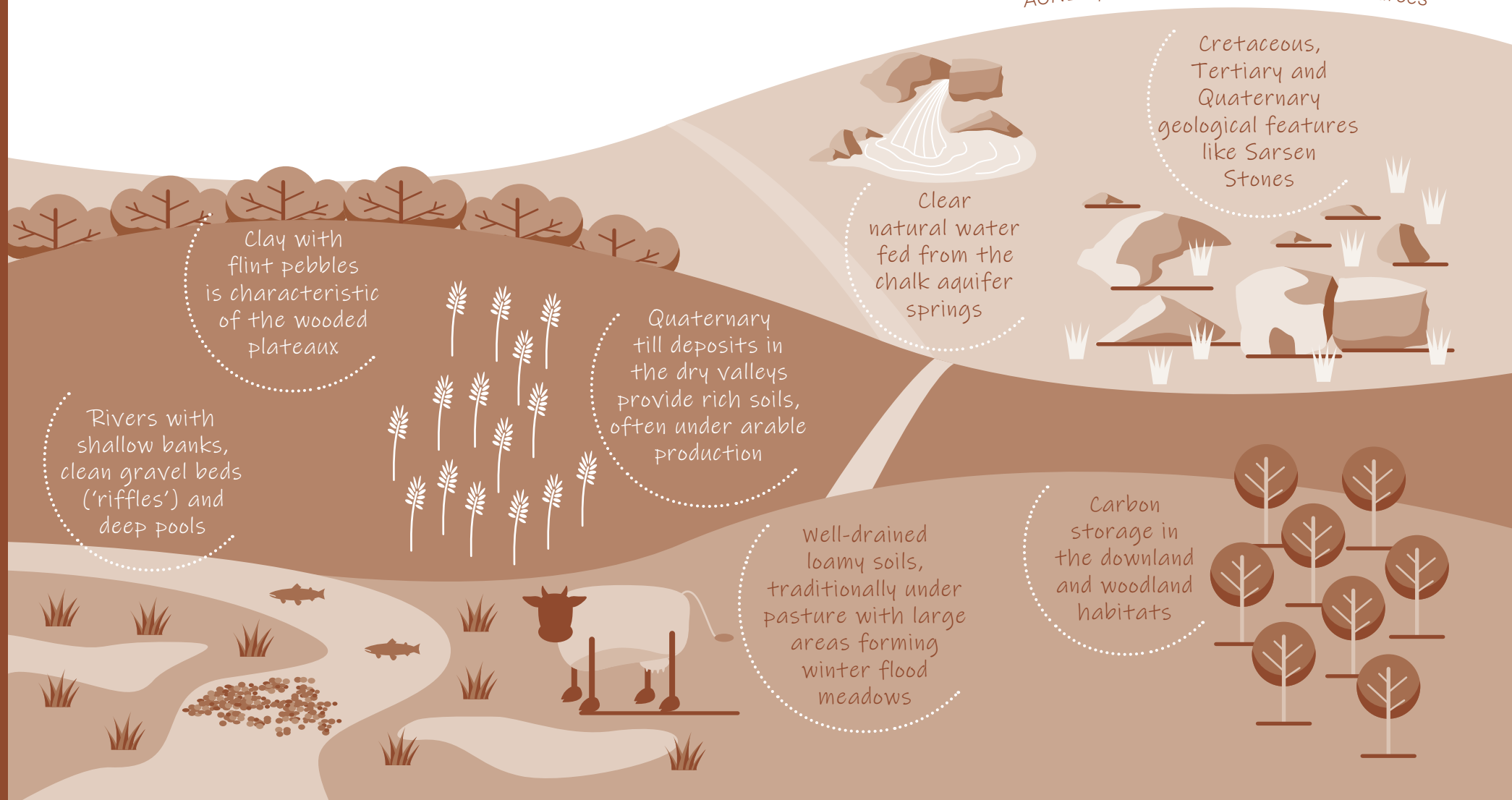


theme 5

Natural Resources

AONB Special Qualities: Natural Resources



Clay with flint pebbles is characteristic of the wooded plateaux

Rivers with shallow banks, clean gravel beds ('riffles') and deep pools


Quaternary till deposits in the dry valleys provide rich soils, often under arable production

Clear natural water fed from the chalk aquifer springs

Well-drained loamy soils, traditionally under pasture with large areas forming winter flood meadows

Carbon storage in the downland and woodland habitats

Cretaceous, Tertiary and Quaternary geological features like Sarsen Stones

A photograph of a dirt path winding through a forest. The path is covered in fallen leaves and leads into the distance. Tall trees with green and yellowing foliage line the path. The atmosphere is misty and serene.

“Our wealth as a nation and our individual wellbeing depend critically upon the environment. It provides us with the food, water and air that are essential for life and with the minerals and raw materials for our industry and consumption. Less obviously, it provides the processes that purify air and water, and which sequester or break down wastes. It is also ... where we find recreation, health and solace, and [where] our culture finds its roots.”

UK National Ecosystem Assessment, 2011

Natural capital is the Earth's stock of natural assets like minerals, air, water and biodiversity

Ecosystem services are the benefits that we receive from natural assets, such as clean water and fuel

Page 59 Savernake Forest in Wiltshire, stocker1970/Shutterstock.com

Page 60 Honey bee feeding on pear blossom, Norman Smith

Page 61 River Dun at Hungerford, Rob Starr, Town and Manor of Hungerford



A Landscape of Opportunity

The components of the natural environment that provide us with benefits to our health and wellbeing are known as 'natural capital'

Accounting for Natural Benefits

6.1 Whether we live in towns or in the countryside, we are dependent on ecological systems (ecosystems) for our health and well-being. The components of the natural environment that provide us with these benefits are known as 'natural capital'. The benefits which society derives from natural capital assets ('ecosystem services') are commonly grouped into four core categories of services:

- ▶ **Supporting services** (for example the processes which form soil, cycle nutrients and the essential photosynthetic process in plants).
- ▶ **Provisioning services** (for example, woodland that provides timber for fuel, construction and manufacturing, or plant communities which sustain populations of insects to pollinate crops).
- ▶ **Regulating services** (for example, soils and aquifers that absorb rainfall reducing flooding, and filtering water to give us healthy rivers and clean drinking water).
- ▶ **Cultural services** (for example, landscapes, wildlife and cultural heritage that give us a sense of identity, support tourism, offer recreational and learning opportunities, assist our physical and mental wellbeing and delight the soul).

6.2 The 2011 UK National Ecosystem Assessment (NEA) identified that inadequate consideration in decision-making of the full range of natural benefits and services that we derive from the natural environment is a significant factor contributing to the degradation of ecosystems. While we pay for some ecosystem

services, like food and fibre, we are often unaware of the importance of others, such as natural purification of water and air, and the attenuation of flood water. The cost of providing these artificially is considerable. In the years after the highly technical UK NEA reports were published, the environmental campaigner and writer Tony Juniper explained ecosystem services in an accessible and readily understandable format using a series of examples from around the world (in 'What has Nature Ever Done for Us?') and more recently from around the UK (in 'What Nature does for Britain'). These illustrate clearly the tendency to under-estimate the value of natural processes and the services and benefits we derive from the natural world. This leads to poorly informed decisions on how to safeguard these functions and utilise natural resources sustainably. The result is pollution, depletion of biodiversity, degraded ecosystems and substantial damage to the processes which are vital to life on Earth. There is a significant financial cost to restore ecosystem functionality or, if it is feasible to do so, to replace such functions with artificial alternatives.

6.3 Just as there are costs to restoring degraded ecosystems, there are benefits and savings from a healthy and naturally functioning environment. Degraded ecosystems present risks to businesses in terms of security of raw materials, waste disposal, insurance rates and brand image. In the North Wessex Downs, there are obvious direct links between ecosystems and the business activities of land-based industries such as farming and forestry (where soil health clearly underpins ecosystem function and the products from the land) and rural tourism. Associations can be less obvious or indirect for other businesses and relate, for example, to supply chains and investment choices.

6.4 In the rural landscape, sustainable agriculture and forestry could deliver widespread positive effects on ecosystems in the area. Grants, subsidies and advice can support and promote sustainable approaches to land use among farmers, foresters and other land managers.

There are benefits and savings from a healthy and naturally functioning environment

Conserving Resources and Maintaining Ecosystem Function

6.5 Protecting natural resources and the natural benefits arising from them by operating in a way that minimises damaging impacts is part of sustainable development. There is a particular need to conserve soil health, manage water and maintain clean air.

Soils

6.6 Soils are cultivated to produce essential items of food, clothing and fuel. Soils also deliver natural benefits, influencing water flows; storing carbon, and supporting wildlife habitats and nutrient cycling. The Government's strategy for soils in the Defra 25 Year Environment Plan sets out a case for improving soil health and protecting peatlands by addressing factors such as erosion, compaction and decline of organic matter. The stated policy objective is that *"By 2030, we want all of England's soils to be managed sustainably, and we will use natural capital thinking to develop appropriate soil metrics and management approaches."*

6.7 Chalk forms the underlying surface geological structure of the North Wessex Downs but the overlying soils influence vegetation cover and land use. Each soil type in the area has its own management requirements.

Sustaining Water Resources

6.8 The main rivers flowing through the downs – the Pang, the Lambourn and the Kennet – drain eastwards to the River Thames. Watercourses flowing off the northern escarpment into the vales also feed the Thames catchment. The separate catchments of the Hampshire Avon and the Test flow south, draining the Vale of Pewsey and Hampshire Downs respectively. The escarpment in the west around Calne falls into the Bristol Avon catchment, flowing west.

6.9 The status and condition of both surface waters and groundwater in terms of quality, availability and flow are important to people and to habitats and species in the AONB. The North Wessex Downs Partnership is committed to supporting the work of Catchment Partnerships, water companies, local planning





Page 62 Kennet and Avon Canal, Peter Orr; Sustainable Drainage System (SuDS) in the AONB and Natural Flood Management (NFM) meeting in the Lambourn Valley, both ARK

authorities and other interested groups to help assess, protect and enhance these important assets.

6.10 One in six residential and commercial properties in England is at risk from flooding. In the North Wessex Downs, there has been localised flooding of villages in the river valleys in the winter. This is often associated with rising groundwater and springs rather than river flooding. Flood risk management may include the provision of sustainable measures to alleviate future flood risk, for example Sustainable Drainage Systems (SuDS) incorporating urban attenuation ponds, and Natural Flood Management (NFM) schemes involving attenuating surface water runoff from agricultural land, river restoration and river floodplain enhancement.

6.11 In summer, some rivers suffer from lack of flows because of water abstraction. This may then lead to a reduction in water quality and ecological diversity caused, for example, by reduced capacity to dilute inflows downstream from sewage treatment works or to transport silt resulting in its deposition. Pressure for abstraction from the chalk aquifers that feed these rivers is directly related to the rising demand for water, including from new development. Drainage structures and other features modify natural flow regimes. Climate change, the deterioration of assets, as well as continuing pressure to build in areas of high risk flood zones, will contribute to increased risk of flooding affecting local communities.

6.12 The waters of the chalk aquifers and rivers are a major source of potable water. Ground waters from within the river catchments are abstracted to meet demands for public water supply and for industry, agriculture and aquaculture (water cress and fish farms). The level of abstraction and effect on river flows varies across the area. The Lambourn has a near natural flow regime with minimal abstraction. In contrast, the River Pang was one of 40 rivers in England identified in the 1980s as suffering from low flows caused by over abstraction (from a groundwater source at Compton). Despite abstraction ceasing in 1997, prompted by increased nitrate levels, the Environment Agency continues to monitor the flow characteristics of the river.

6.13 Groundwater abstraction points in the Kennet Valley are numerous, but the level of abstraction is low, amounting to only

5% of the available water resource. Following detailed studies by Thames Water, overseen by the Environment Agency, the Axford abstraction licence has been amended to safeguard flows in the River Kennet during low flows; in addition, the Ogbourne abstraction licence has been ended. These changes are part of a long-running programme of investigations and licence changes to make groundwater abstractions more sustainable across the AONB, although all licence reductions are still dependent on other sources of supply being available. Modelling indicates that abstraction is having a detrimental impact on river flows, although the proposed construction of a water supply pipeline from Farmoor Reservoir to Swindon is expected to reduce pressures for groundwater abstraction.

6.14 At the same time, the operational requirements of the Kennet and Avon Canal have an effect on the Kennet. Between Bath and the summit close to Crofton Pumping Station, the Canal is fed by the Bristol Avon; between the summit and Kintbury by the River Dun, a tributary of the Kennet; and between Kintbury and Reading by the Kennet. In-flows into the Canal from these river sources can result in less than optimum flows in the rivers, particularly in the summer months and in drier years. When the combined section of canal and river diverge, this can result in high levels of turbidity in the river. There has been significant progress amongst the various parties to minimise the impacts of the canal on the river, including the construction of bypass weirs at canal locks west of Hungerford to prevent canal water spilling over into the River Dun. It is a clear objective of the Canal and River Trust to optimise the use of water resources in the Canal and to use back-pumping to conserve water in the 'artificial' section between Bath and the Canal summit.

6.15 Under the Nitrates Directive, the majority of the North Wessex Downs is designated as a Nitrate Vulnerable Zone (NVZ). Within these zones, farmers are required to limit the application of manures and nitrogen fertilisers, subject to a closed season for the application of certain manures. They are also required to keep records of cropping, stocking and the application of nitrogen fertilisers and manures.

6.16 Further control of diffuse pollution is a requirement of the EU Water Framework Directive. There is an obligation to manage

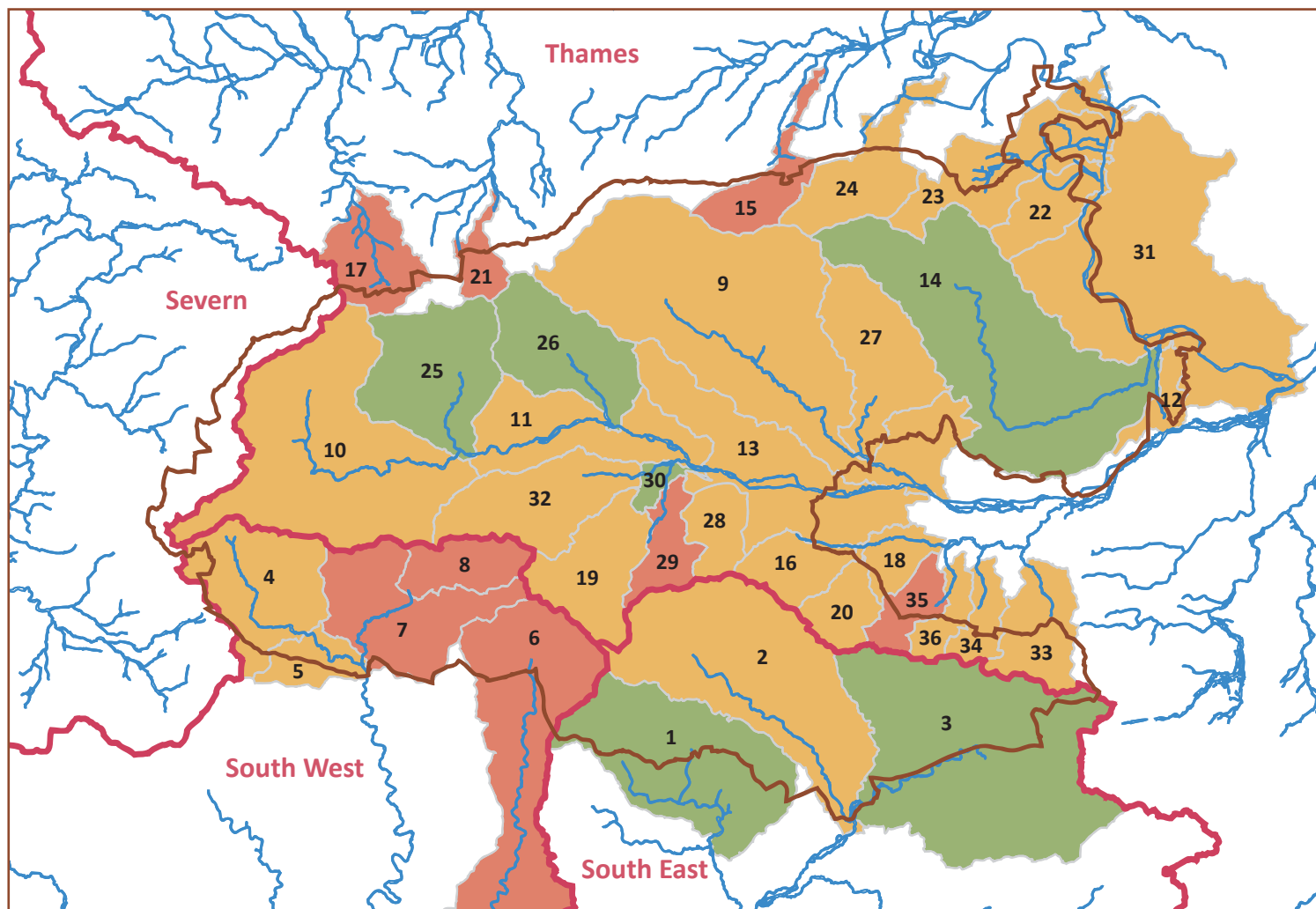


Figure 5. North Wessex Downs AONB surface water quality. Showing main river basins, river catchments and 2016 overall classification of ecological status. Contains OS data © Crown Copyright and database rights 2019. Ordnance Survey 100051200.

Key River Basin Districts

Main Rivers

AONB Boundary

Water Framework Directive Waterbody Catchments with 2016 Overall Ecological Status

Good

Moderate

Poor

No.	Waterbody name	Ecological status
1	Upper Anton	Good
2	Bourne Rivulet	Moderate
3	Upper Test	Good
4	Etchilhampton Water	Moderate
5	Hampshire Avon (West)	Moderate
6	Bourne (Hampshire Avon)	Poor
7	Hampshire Avon (East) and Woodborough Stream	Poor
8	Hampshire Avon (East) and Deane Water	Poor
9	Lambourn (source to Newbury)	Moderate
10	Upper Kennet to Marlborough	Moderate
11	Middle Kennet (Marlborough to Hungerford)	Moderate
12	Sulham Brook	Moderate
13	Middle Kennet (Hungerford to Newbury)	Moderate
14	Pang	Good
15	Letcombe Brook	Poor
16	Enborne (source to downstream A34)	Moderate
17	Ray (Wiltshire; source to Lydiard Brook)	Poor
18	Enborne (downstream A34 to Burghclere Brook)	Moderate
19	Upper Dun	Moderate
20	Penwood Stream	Moderate
21	Liden Brook, Swindon	Poor
22	Cholsey Brook and tributaries	Moderate
23	Mill Brook and Bradfords Brook System, Wallingford	Moderate
24	Ginge Brook and Mill Brook	Moderate
25	Og	Good
26	Aldbourne	Good
27	Winterbourne	Moderate
28	Inkpen Stream (source to Kennet)	Moderate
29	Shalbourne (source to Kennet at Hungerford)	Poor
30	Kennet and Avon Canal and Dun above Hungerford	Good
31	Thames Wallingford to Caversham	Moderate
32	Froxfield Stream	Moderate
33	Baughurst Brook	Moderate
34	Kingsclere Brook (source to Enborne)	Moderate
35	Earlstone Stream and Burghclere Brook (source to Enborne)	Poor
36	Ecchinswell Brook (source to Enborne)	Moderate

60% of nitrates,
25% of phosphorus and 70%
of the sediments in diffuse
pollution are a result of farming

**Agricultural
diseases,** such as
bluetongue, are on the increase,
partly due to climate change

river basins to deliver good environmental outcomes in both surface waters and groundwater. Agriculture is recognised as one of the main sources of diffuse pollution of water courses and groundwater. Defra encourages Catchment Sensitive Farming (CSF) as a key approach to resolving this by managing land in a way that is sensitive to the ecological health of the water environment. While farming is not the sole cause of diffuse pollution, it does contribute approximately 60% of nitrates, 25% of phosphorus and 70% of sediments along with other pollutants which enter our surface waters.

Maintaining Air Quality

6.17 A variety of air pollutants have known or suspected harmful effects on human health and the environment. In most areas of Europe, these pollutants are principally the products of combustion from space heating, power generation or motor vehicle traffic. Pollutants from these sources may not only prove a problem in the immediate vicinity, but can travel long distances, chemically reacting in the atmosphere to produce secondary pollutants such as acid rain or ozone. The nearest monitoring site to the North Wessex Downs is at Harwell. Other sites are in Reading Town Centre, Newbury, Thatcham, Bath and Oxford. Pollution is low, but there may be local issues, such as environmental quality related to traffic pollution.

Climate Change

6.18 There is increasing evidence and acceptance that the global climate is changing, largely as a result of human activity, and that we need both to mitigate the effects of high levels of atmospheric carbon and to adapt to the consequences of climate change. Government policies promote sustainable energy generation and more efficient consumption, and other actions aimed to achieve a low carbon economy. There is a broad consensus on how the climate of Southern England will change over the coming decades. These changes are expected to be progressive but gradual and may not be easily detectable over the

The
Partnership is
keen to refine its
understanding of
the impacts of
climate change

five-year period of this Management Plan. However, strategies are needed now because of the time scale involved to implement effective actions. The main changes are likely to be warmer, drier summers; wetter, milder winters; and increased frequency of extreme weather conditions, such as storms.

6.19 Climate change may result in more rainfall occurring as winter deluges, falling on already saturated ground. This would provide the conditions for increased soil erosion, resulting in damage to historic features and more silt, nutrients and pesticides washing into rivers. These inputs arise predominantly from arable farmland and already have a significant impact on water quality and freshwater biodiversity. Drought and lower summer rainfall are likely to result in a contraction of the chalk stream network. Freshwater species will be lost from some of the winterbournes while some perennial streams will become seasonal





winterbournes. There may be an increase in the popularity of streamside recreation as people seek shade in the hottest months.

6.20 Other significant changes also have the potential to affect the landscapes, wildlife and communities of the AONB. Woodland may become dominated by species that cope better than beech with the likely changes in climate. The range of crops grown by farmers will change and there may be more growing of biofuels. We have already seen increases in agricultural diseases including African horse sickness, bluetongue disease and Schmallenberg virus (SBV) that can be attributed in part to climate change. Water flows in rivers and streams could become more erratic. Species populations and habitats may expand, contract or migrate. These changes may alter the structure and function of ecosystems; new species may migrate into the area, some of which could bring disease or pests that may be detrimental to indigenous species. Tourism pressures could increase as people alter holiday patterns to remain in the UK. All of these factors could affect the plants and animals which inhabit the North Wessex Downs.

6.21 The UK Climate Change Risk Assessment and the National Adaptation Programme are two initiatives that define these impacts. They are based on predictions put forward by the UK Climate Projections (UKCP09). The North Wessex Downs Partnership is keen to refine its understanding of the impacts of climate change and develop strategies for adaption to these effects.

6.22 'Making Space for Nature' outlined four key ways that we can adapt our ecological networks to a changing climate:

- ▶ Ensure that all parts of the network are in the best possible management.
- ▶ Increase the population sizes of vulnerable species.
- ▶ Reduce the risks of local extinction.
- ▶ Provide colonists for new sites.

6.23 To do this we must:

- ▶ allow species to adapt by shifting their distributions naturally to stay within their preferred 'climate envelope' through increasing connectivity (habitat patches and corridors and a network of protected sites to provide a more permeable countryside); and
- ▶ Enhance the opportunities for species to stay within their climate envelope through small-scale local movements (as opposed to being forced into long-distance dispersal) by promoting landscape level-heterogeneity within the AONB.

Page 64 Discovering the value of wetlands at Avington Estate and Denford Fisheries, ARK

Page 65 Cover crop and river restoration work, both ARK



AONB Special Qualities: Natural Resources

- 6.24 Cretaceous, Tertiary and Quaternary **geological history**, with features such as Sarsen Stones.
- 6.25 This geology in turn influences the main **soil types** of the North Wessex Downs:
- ▶ Thin chalk soils of the open downland, now primarily under arable production.
 - ▶ The capping of Quaternary Clay with Flints over the chalk found as pockets of reddish brown clay

Page 66 Vale of Pewsey, Dave Gray
Page 67 River Dun, Tony Bartlett



containing flint pebbles. These areas are particularly characteristic of the Downland with Woodland and Wooded Plateau Landscape Character Types.

- ▶ Quaternary Coombe deposits found where accumulated frost-weathered debris was carried down slope by melt waters at the end of the last glaciation. These have created till deposits in the dry valleys of the downs providing richer pockets of soil, often under arable production.
 - ▶ Deep well-drained loamy soils over Greensand and river alluviums in the Vale of Pewsey, traditionally under pasture with large areas forming winter flood meadows.
 - ▶ A mixed soil mosaic to the east of Newbury with nutrient-poor acidic soils over plateau gravels intermixed with fertile loamy soils overlying the London Clay, characterised by the Medieval landscape of the Lowland Mosaic Landscape Character Type.
- 6.26 Carbon storage in the characteristic habitats of the North Wessex Downs such as chalk grassland and broadleaved woodland.
- 6.27 Rivers with shallow sloping banks, clean shallow ‘washed’ **river gravel beds** (riffles) contrasting with deeper shaded pools.
- 6.28 Often a complex pattern of **river channels** (as on the Kennet downstream of Marlborough) reflecting the past use of the river to supply water to an extensive network of water meadows and mills, most of which are now disused. Upper winterbourne sections and winterbourne tributaries, flowing only during winter and spring when groundwater levels are at their highest.
- 6.29 **Clear natural water** fed from the chalk aquifer by springs which issue in the valleys of the chalk dip slope at the point where the water table comes to the surface. Limited fluctuations in water temperature throughout the year, resulting from the filtration of groundwater as it percolates through the chalk.

Natural Resources: Key Issues, AONB Strategic Objectives and Policies

The North Wessex Downs AONB faces a range of challenges with regard to its natural resources, which this Plan will address through the implementation of key objectives and policies

6.30 Key Issues

Key issues with the potential to have significant influence on the AONB's Natural Resources Special Qualities:

- a) Lack of agreement on the levels of acceptable environmental limits within the AONB.
- b) The need to raise awareness of water quality issues.
- c) Accelerated water run-off and soil erosion, especially on steeper slopes and under 'open' arable crops, such as maize.
- d) Opportunities to encourage no-till or minimum tillage and careful application of agricultural inputs.
- e) Overall air quality is generally good but activities outside the AONB can have a significant effect across the area; impacts of air pollution from road traffic and agriculture on ecosystem health is of concern.
- f) Overabstraction of groundwater and water from the chalk aquifer.
- g) Increasing water demand, especially during the summer months, as a result of climate change and changing lifestyles.
- h) Increasing water demand for crop irrigation as a result of climate change and more erratic weather patterns resulting in prolonged dry periods and intense summer rainfall.
- i) The influence of climate change on groundwater recharge patterns, overall water availability and elevated temperatures in chalk streams.
- j) Increasing water demand as a result of major development in the urban areas in and around the North Wessex Downs, also sometimes leading to export of water out of the AONB catchments.
- k) Loss of river habitats as a result of historical land drainage and channel modifications associated with past flood alleviation works and past industry (although some man-made features, e.g. mill leats, are of considerable historical importance).
- l) Decline in fish stocks and quality of fisheries.
- m) Excessive removal of bankside vegetation (on occasion associated with fisheries management).
- n) Watercourse maintenance to conserve habitat while reducing flood risk where feasible.
- o) Loss of winterbourne channels through agricultural cultivation.
- p) Increasing lock movements on the Kennet and Avon Canal taking water from the River Kennet and its tributaries.
- q) Pollution of rivers from point sources, including public and private domestic sewerage systems (with phosphorus discharges a particular problem), agriculture, commercial watercress beds, and fish farms.
- r) Impacts on the ecology of rivers from diffuse sources of pollution – often individually minor but collectively significant – including run-off from roads, houses and commercial areas, run-off from farmland, and seepage into groundwater from developed landscapes of all kinds, resulting in raised nutrient levels and toxic algal blooms.
- s) Pollution pressure on the River Kennet generated by poor water quality and boat traffic on the Kennet and Avon Canal.

Air pollution from traffic and agriculture impacts on ecosystem health

Over abstraction of groundwaters is of major concern, particularly in light of increased water demands due to climate change





6.31 AONB Strategic Objectives for 2019-2024: Natural Resources

- S.12 Promote and support measures to ensure chalk rivers and streams in the AONB achieve and are maintained at good ecological status including, for example, appropriate riparian planting to mitigate elevated water temperatures predicted as a consequence of climate change.
- S.13 Advocate full recognition in decision-making by relevant bodies of the importance of the AONB's natural capital assets.
- S.14 Ensure that all landscape interventions recognise and address the implications of climate change for the special qualities of the North Wessex Downs and its setting.
- S.15 Encourage efforts to determine the significance of air pollution to maintaining natural capital assets of the AONB and its special qualities, including ecosystem function, cultural heritage and community wellbeing; and responses to address concerns.
- S.16 Advocate the recognition of the importance of the North Wessex Downs landscape for the environmental goods and services it provides to the economy and society as a whole, including heritage, water quality, soils, food production, wildlife, flood management, carbon storage, recreation, health and wellbeing.

6.32 AONB Policies: Natural Resources

NR 01	Support co-ordinated action, guidance and measures on soil health issues.
NR 02	Promote and encourage initiatives for the sustainable management of soil by land managers to minimise soil degradation through erosion, compaction, pollution and impoverishment, particularly in the case of the thin chalk downland soils.
NR 03	Support and provide landscape input to AONB catchment partnerships. Contribute to research, projects and co-operation of partners with an influence on watercourses and catchments.
NR 04	Encourage all partners to take water demand and its consequences for landscape, ecology and fisheries fully into account in decisions regarding planning, changes to land use or cropping patterns within the North Wessex Downs.
NR 05	Support the introduction of demand management measures for water use in those settlements that draw on the aquifers of the North Wessex Downs, and of measures to monitor and reduce water wastage.
NR 06	Support efforts to ensure that no water is abstracted from catchments that are classified as 'no water available', 'over licensed' or 'over abstracted' under the Environment Agency's Catchment Abstraction Management Strategy.
NR 07	Support work to identify and address the sources of diffuse and point pollution within the North Wessex Downs through agencies, local groups and volunteer initiatives.
NR 08	Promote and help co-ordinate remedial action through the Catchment Sensitive Farming Initiative and other partnership schemes to restore and enhance degraded river sections within the North Wessex Downs.
NR 09	Work to ensure that no new abstraction licences are granted within the North Wessex Downs which export water out of the catchments of the AONB. Support measures to reduce abstraction and help businesses adopt new mitigation measures.
NR 10	Promote Sustainable Drainage Systems (SuDS) and natural flood management initiatives to maximise benefits, for example through restoration of traditional water meadow systems or shallow winter flooding in the floodplain to benefit people and wildlife.
NR 11	Promote restoration and continued maintenance of rivers and river corridors to further biodiversity and amenity objectives – re-creating natural river channels and re-linking rivers with their floodplains where this would not damage artificial channels of historic and cultural importance.
NR 12	Seek to develop a better understanding of the likely implications of climate change on the environment and economy of the North Wessex Downs.
NR 13	Support reductions in emissions of greenhouse gases, such as carbon dioxide, nitrous oxide and methane, from all possible sources. Support mitigation measures including better on-farm management of fertiliser and animal waste, biomass heating from local fuel stocks and small-scale renewable energy generation appropriate within the protected landscape.
NR 14	Support and encourage greater domestic and commercial energy efficiency.
NR 15	Engage with opportunities to improve the availability and accessibility of sustainable modes of transport (e.g. bus and rail services, cycling) recognising in particular the health benefits of active modes (walking, cycling, riding, etc.) and promote their use.
NR 16	Encourage greater use of timber in construction from sustainable woodland and in particular short local supply chains to support forestry, woodland and wood products businesses in the AONB.
NR 17	Promote carbon sequestration as an objective and benefit of habitat creation and management of woodland and permanent grassland.
NR 18	Encourage simple greenhouse gas and carbon accounting to monitor the effectiveness of changes.