

## Appendix 2 – Cotswolds AONB Ecosystem Services

Ecosystem service	Key natural capital assets	Description, quantity, quality and trends	Issues and opportunities	Providers and beneficiaries
<b>Crops</b>	Soils Fresh water Climate Farmland	<p>Crops and bare fallow account for 86,438ha (49% of all agricultural land); this is the single biggest land use in the AONB. Crops and fallows have increased from 41% in 2007 due to the removal of the set-aside requirement<sup>1</sup>.</p> <p>Cereals, general cropping and horticulture farms account for 37% of all commercial farms, but a larger area of land use.</p> <p>The main crops grown in the AONB are winter wheat, oilseed rape and spring barley. There has been a reduction in wheat and winter barley since 2007, and an increase in spring barley and oil seed rape, as well as oats, linseed and maize.</p> <p>Estimated tonnages for key crops in 2013:</p> <ul style="list-style-type: none"> <li>• Winter wheat – 165,000 tonnes</li> <li>• Spring wheat – 22,000 tonnes</li> <li>• Winter barley – 26,000 tonnes</li> <li>• Spring barley – 114,000 tonnes</li> <li>• Oats – 25,000 tonnes</li> <li>• Oil seed rape – 56,000 tonnes</li> </ul> <p>Total arable (crops and straw) farmgate value in 2013 = £69.7 million (62% of total farmgate</p>	<p>Issues:</p> <ul style="list-style-type: none"> <li>• Large (&gt;100ha) commercial holdings account for most crop production and more is grown under contract farming agreements, with larger kit and less labour. Hence relatively few key decision-makers in terms of land use, and less farm labour for environmental management</li> <li>• Prevalence of blackgrass affecting crop growing ground; there is a range of blackgrass control approaches including spring crops and fallow.</li> <li>• Cropped area is likely to increase with reduction in participation in agri-environment schemes, with end of Environmental Stewardship and fewer applications to Countryside Stewardship.</li> <li>• Cost pressures will drive further uptake of precision farming, minimum tillage etc. resulting in lower use of inorganic fertilisers and pesticides, improved soil management etc.</li> <li>• Brexit means uncertainty in terms of trade and support; there will be impacts in terms</li> </ul>	<p><u>Providers:</u> Farmers and growers</p> <p><u>Beneficiaries:</u> Processors, packers, wholesalers, retailers and consumers</p>

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		value in the Cotswolds AONB).	<p>of crop selection, management practices and systems etc.</p> <p>Opportunities:</p> <ul style="list-style-type: none"> <li>• Design a new policy and programmes that steward natural capital assets and rewards the provision of public goods</li> </ul>	
<b>Livestock and fodder</b>	Soils Fresh water Climate Farmland Semi-natural habitats	<p>Permanent grass, temporary grass and rough grazing – which underpin grazing livestock enterprises (alongside forage crops such as maize and cereals/crops grown for animal feed) - account for 76,566ha (43% of all agricultural land in the AONB). Temporary grassland has increased slightly since 2007, and permanent grass and rough grazing has decreased<sup>1</sup>.</p> <p>Dairy (4% - 63 farms), grazing livestock (45%) and mixed (10%) farms account for 59% of all commercial farms in the AONB.</p> <p>Livestock numbers in 2013 include:</p> <ul style="list-style-type: none"> <li>• Dairy cows – 8,812</li> <li>• Beef cows – 10,128</li> <li>• Total cattle – 63,217</li> <li>• Breeding ewes – 109,454</li> <li>• Total sheep – 237,088</li> </ul>	<p>Issues:</p> <ul style="list-style-type: none"> <li>• Continued polarisation between commercial producers and smaller scale farmers.</li> <li>• Livestock numbers are expected to continue to reduce, in general.</li> <li>• Potential increase in livestock (sheep) on cereal farms to improve productivity and resilience.</li> <li>• Cost pressures will drive better nutrient management resulting in better use of manures, lower use of inorganic fertilisers and pesticides, improved soil management etc.</li> <li>• Reduced participation in agri-environment schemes is expected with limited Countryside Stewardship budget.</li> <li>• Brexit means uncertainty in terms of trade and support; there will be impacts in terms</li> </ul>	<p><u>Providers:</u> Farmers and producers</p> <p><u>Beneficiaries:</u> Dairy and other processors, retailers and consumers</p>

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		<ul style="list-style-type: none"> <li>• Total pigs – 16,361</li> <li>• Total poultry – 791,695</li> <li>• Total horses – 44,33</li> </ul> <p>There has been a decrease in most types of livestock since 2007, especially dairy cows and pigs, with an increase in poultry. Estimated production for livestock enterprises in 2013:</p> <ul style="list-style-type: none"> <li>• Milk – 56 million litres</li> <li>• Beef (prime beef and cull cows) – 7.9 million kg</li> <li>• Sheep meat (lamb and cull ewes) – 3.1 m kg</li> <li>• Pig meat – 1.1 m kg</li> </ul> <p>Total livestock farmgate value in 2013 = £41.6 million (38% of total farmgate value in the Cotswolds AONB).</p>	<p>of livestock numbers, management practices and systems etc.</p> <p>Opportunities:</p> <ul style="list-style-type: none"> <li>• Design a new policy and programmes that steward natural capital assets and rewards the provision of public goods</li> </ul>	
<b>Fish</b>	Fresh water	<p>There is a thriving fishery resource in the AONB. All of the Cotswolds rivers except the Upper Thames are designated Salmonid Fisheries under the Freshwater Fish Directive and Native brown trout water under the Environment Agency National Trout and Grayling Strategy.<sup>2</sup></p>		<p><u>Providers:</u></p> <p>Aquaculture businesses, recreational anglers</p>

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		Detailed survey data is available for analysis from the Environment Agency. A sample data extraction for Brown Trout (taken at selected stations on the Rivers Evenlode, Windrush and Churn in 2005 and 2012) indicates a relatively stable population for that species over that period in those locations.		<u>Beneficiaries:</u> Processors, wholesalers, retail, catering, consumers
<b>Wild foods</b>	Farmland Woodland Semi-natural habitats Plants and animals	<p>There is a range of wild food in the AONB including deer, rabbits, berries, mushrooms etc.</p> <p>There are four species of wild deer in the AONB (fallow, muntjac, roe and sika). Fallow are already present in high densities throughout the AONB, muntjac and roe are present at low to medium densities in many parts of the AONB but are increasing in numbers and expanding their ranges, whilst sika are present only in small numbers in a restricted area around Wychwood.</p> <p>The extension in geographic range of deer and the increase in deer densities have been encouraged by changes in land use. In addition, warmer winters means more food year round and higher rates of breeding success and survival.</p>	<p>Issues:</p> <ul style="list-style-type: none"> <li>Increasing deer numbers resulting in damage to woodland</li> </ul> <p>Opportunities:</p> <ul style="list-style-type: none"> <li>Develop wild venison production, for sale within and outside the AONB.</li> </ul>	<u>Providers:</u> Landowners, foresters, stalkers  <u>Beneficiaries:</u> Processors, retailers and consumers

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		<p>Currently, the majority of deer carcasses resulting from deer culling in the Cotswolds are sold direct to game processors outside the AONB. Recent changes to Meat Hygiene Regulations have relaxed some of the constraints on producing small amounts of wild game meat, including venison, for local sale direct to the final consumer and this could open up a number of opportunities for establishing local venison production<sup>3</sup>.</p> <p>No data on the volume and value of wild venison or other wild foods produced in the AONB is presently available.</p>		
<b>Timber and other fibre</b>	Soil Fresh water Mixed woodland Hedges	<p>There is an estimated 26,370ha of woodland in the AONB (13% of all land in the AONB).</p> <p>Broadleaved woodland predominates, accounting for 19,558ha or 74% of all woodland. Conifers account for 2,969 or 11%, with the balance being mixed woodland, young trees etc.</p> <p>Ash and beech are the predominant broadleaved species, accounting for around 60% of broadleaved species.</p> <p>Total estimated potential yield of woodland in the AONB, based on Forestry Commission</p>	<p>Issues:</p> <ul style="list-style-type: none"> <li>• Timber prices are expected to remain firm, and longer term prospects look reasonable. This should underpin future management.</li> <li>• Smaller woodlands, particularly those with poor/difficult access still generally remain uneconomic to manage.</li> <li>• There is likely to be limited tree planting /woodland creation over the next five years or so due to future uncertainties re future agricultural prospects and future</li> </ul>	<p><u>Providers:</u></p> <p>Landowners, farmers and foresters</p> <p><u>Beneficiaries:</u></p> <p>Processors, retailers and consumers</p>

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		<p>2015 data, is 117,365m<sup>3</sup> per year. This includes 11,243m<sup>3</sup> of conifer sawlogs and 5,797m<sup>3</sup> of broadleaved sawlogs. The total also includes 61,126m<sup>3</sup> of wood fuel. This has an estimated energy value of 130,895MWhr/year, the equivalent of 13.09 million litres of heating oil<sup>4</sup>.</p> <p>Timber prices have increased over the last five years. Delivered prices for softwood timber offered by both the sawlog and wood processing sectors are reported to have increased by 30-40% since 2009. The hardwood market has also improved, in particular, firewood prices.</p> <p>Improved timber and firewood prices have stimulated management activity in woodlands, in terms of felling, thinning etc. <sup>1</sup></p>	<p>agricultural policy, the grant system which is perceived to be complex, and continued pressure from and costs associated with deer.</p> <ul style="list-style-type: none"> <li>• Pests and diseases are expected to have an adverse impact on woodlands and timber production/quality. <i>Chalara fraxinea</i> poses a particular threat to the Cotswolds AONB due to a high percentage of ash trees in the area.</li> <li>• Climate change can be expected to influence woodlands in terms of wind/storm damage, risks associated with warmer/drier summers and a range of pests and diseases.</li> </ul> <p>Opportunities:</p> <ul style="list-style-type: none"> <li>• Design a new policy and programmes that steward natural capital assets and rewards the provision of public goods</li> </ul>	
<b>Water supply</b>	Geology Soils Fresh water Climate Habitats	<p>The Cotswolds AONB is of great importance for the supply of water locally and for the South East region. This water comes via abstraction from both groundwater, in the Cotswolds aquifer, and surface water, including the River Thames which has its source in the AONB. The water abstracted goes to the public water</p>	<p>Issues:</p> <ul style="list-style-type: none"> <li>• Increasing population leading to growing demand for water</li> <li>• Potentially reduced water availability with climate change</li> <li>• Rapid and significant impact of abstraction</li> </ul>	<p><u>Providers:</u>            Water companies;            private landowners</p>

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		<p>supply and to a lesser extent industry and agriculture.</p> <p>There is a large amount of licensed abstraction taking place in the Cotswolds. The Fully Licenced quantity of water granted for abstraction from the Cotswold AONB area is 136,120 Megalitres (Ml) per year<sup>5</sup>. The breakdown is shown in Table 1.</p> <p><b>Table 1: Breakdown of licenced abstraction of water in Cotswolds AONB</b></p> <table border="1" data-bbox="551 770 1153 1185"> <thead> <tr> <th data-bbox="551 770 736 903">Purpose</th> <th data-bbox="736 770 945 903">% of total abstracted</th> <th data-bbox="945 770 1153 903">% of total abstracted (excluding power production)*</th> </tr> </thead> <tbody> <tr> <td data-bbox="551 903 736 946">Agriculture</td> <td data-bbox="736 903 945 946">5</td> <td data-bbox="945 903 1153 946">30</td> </tr> <tr> <td data-bbox="551 946 736 989">Environmental</td> <td data-bbox="736 946 945 989">2</td> <td data-bbox="945 946 1153 989">15</td> </tr> <tr> <td data-bbox="551 989 736 1032">Industry</td> <td data-bbox="736 989 945 1032">0</td> <td data-bbox="945 989 1153 1032">1</td> </tr> <tr> <td data-bbox="551 1032 736 1075">Amenity</td> <td data-bbox="736 1032 945 1075">1</td> <td data-bbox="945 1032 1153 1075">4</td> </tr> <tr> <td data-bbox="551 1075 736 1142">Power production</td> <td data-bbox="736 1075 945 1142">85</td> <td data-bbox="945 1075 1153 1142"></td> </tr> <tr> <td data-bbox="551 1142 736 1185">Water Supply**</td> <td data-bbox="736 1142 945 1185">8</td> <td data-bbox="945 1142 1153 1185">50</td> </tr> </tbody> </table> <p>*Power production is a very large quantity in the Cotswold AONB, but 100% of the water abstracted is returned locally, and not all schemes licenced are operational. To give a</p>	Purpose	% of total abstracted	% of total abstracted (excluding power production)*	Agriculture	5	30	Environmental	2	15	Industry	0	1	Amenity	1	4	Power production	85		Water Supply**	8	50	<p>on streams, especially during periods of summer low flows.</p> <ul style="list-style-type: none"> <li>Leaching of nitrate and pesticides to groundwater</li> </ul> <p>Opportunities:</p> <ul style="list-style-type: none"> <li>Improvements in water retention/storage with habitat creation and management</li> <li>Addressing water quality issues through improvements in land management and related measures.</li> </ul>	<p><u>Beneficiaries:</u></p> <p>Domestic, business and agricultural consumers</p>
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		<p>more representative breakdown of abstractions, power production purposes have been removed from the last column in the table above.</p> <p>**The breakdown of water supply in the area: 99% is abstracted for Public Water Supply and Public Water Supply related purposes, &lt;1% for private water supply uses.</p> <p>41.5% of water abstracted is from groundwater, 58.5% from surface water. Excluding production of power purposes, this changes to 63.5% sourced from groundwater, 36.5% from surface water<sup>5 6</sup>.</p> <p>It is important to note that:</p> <ul style="list-style-type: none"> <li>• The figures above refer to the total amount licenced, not the amount used. It is therefore likely to be an over estimation of the quantity being abstracted from the area.</li> <li>• The figures above do not account for the consumptiveness of the licence purposes. Some licences may return all the water abstracted to the surface or groundwater</li> </ul>		

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		<p>source e.g. power, fish farming, minerals</p> <ul style="list-style-type: none"> <li>• The percentages above are slightly skewed as some licences have multiple purposes. It is assumed each purpose can take the full licence amount.</li> </ul> <p>Trend data for the actual volume of water abstracted from the Cotswolds AONB based on licences in the Thames area is shown in Figure 1 at the end of this Appendix.</p> <p>There is potential surface water capacity available for abstraction in the River Evenlode, the River Leach, and the Thames headwaters and groundwater currently available from the Upper Windrush unconfined limestone and the Upper Coln unconfined limestone aquifers. However, most of the area is classed as having 'no further water available' for abstraction from both surface water and groundwater while the central part of the aquifer is already 'over licensed'.<sup>2</sup></p> <p>Four different water companies cover the Cotswolds AONB, with Thames Water being by far the largest (the others are Severn Trent, Bristol Water, and Wessex Water).</p>		

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<b>Genetic resources</b>	Fresh water Habitats Plants and animals	<p>Wild and cultivated species in the Cotswolds AONB provide valuable genetic resources.</p> <p>Wild species include a number of priority species, which are subject to long term monitoring (see 'Plants and Animals' in Appendix 1).</p> <p>Cultivated species include crops and livestock, the most famous example of which is the Cotswold Sheep, known as the Cotswold Lion, a native rare breed. Culturally the Cotswold Lion is an asset as an emblem of the area and its cultural identity. Numbers are recovering after a long period of unpopularity.<sup>2</sup></p>	<p>Issues:</p> <ul style="list-style-type: none"> <li>Lack of data on wild and cultivated species genetic resources in the AONB</li> </ul> <p>Opportunities:</p> <ul style="list-style-type: none"> <li>Collating data on unique genetic resources in the AONB</li> <li>Seek to maintain viable flocks of Cotswold Lion sheep and the genetic basis of the breed and seek expansion in numbers to secure its future in the Cotswolds.</li> <li>Develop the brand for meat and wool from the Cotswold Lion; develop quality products and a local market.</li> <li>Promote its use as a grazing animal in local grazing schemes and in particular for conservation grazing.<sup>2</sup></li> </ul>	<p><u>Providers:</u> Government, NGOs, landowners, farmers</p> <p><u>Beneficiaries:</u> Other farmers, processors, retailers, consumers, public</p>
<b>Climate regulation</b>	Climate Soils Woodland Other semi-natural habitats	<p>Mineral soils in the AONB generally have low carbon content, typically 0 to 5%, especially where under continuous arable cultivation, such as on the high wold and dip slope.</p> <p>Areas under permanent pasture, limestone grassland and the organic soils under woodland cover are likely to retain higher volumes of carbon.<sup>2</sup></p>	<p>Issues:</p> <ul style="list-style-type: none"> <li>Limited soil carbon content, especially in mineral soils across the high wold and dip slope</li> </ul> <p>Opportunities:</p> <ul style="list-style-type: none"> <li>Improve carbon content (and natural fertility and soil structure) in agricultural soils by building organic matter through</li> </ul>	<p><u>Providers:</u> Landowners, farmers and foresters.</p> <p><u>Beneficiaries:</u> All</p>

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		<p>Woodlands play an important role in sequestering atmospheric carbon and in storing it in living plant material, as do grasslands, reedbeds etc.</p> <p>It is estimated that 47,529 tonnes of carbon are sequestered per year, with an estimated value of over £3million (see Summary Report)</p>	<p>mixing of manures, incorporating organic matter and reducing cropping and the number of tillage operations.</p> <ul style="list-style-type: none"> <li>• Expand the area of permanent pasture, wet meadow and limestone grassland to further the ability of the habitats and the underlying soils to sequester carbon</li> <li>• Expand the area of woodland to increase carbon sequestration and storage, while contributing to biodiversity, water quality and reducing soil erosion.</li> <li>• Improve the condition of woodland and other semi-natural habitats, through active management, to enhance carbon storage.</li> </ul>	
<b>Air quality regulation</b>	Woodland Other semi-natural habitats	Air quality in the Cotswolds AONB is generally good, with the exception of pockets of poorer air quality in certain locations due to emissions from road traffic. There is however limited opportunity for the natural environment to mitigate this (see 'Air' in Appendix 1).	<p>Issues:</p> <ul style="list-style-type: none"> <li>• Localised poorer air quality due to road traffic</li> </ul> <p>Opportunities:</p> <ul style="list-style-type: none"> <li>• None, other than control of amount/type of traffic etc.</li> </ul>	<p><u>Providers:</u> Government, property owners</p> <p><u>Beneficiaries:</u> Residents, businesses, visitors, especially in urban areas</p>

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<b>Soil erosion regulation</b>	Soils Woodland Farmland Cross-field hedgerows	There is a risk of soil erosion across the dominant soils in the AONB, namely, the lighter textured (less clayey) soils and shallow variants found particularly on the scarp and high wold. These are sometimes unstable and prone to loss through erosion. <sup>2</sup>  The lime-rich loamy and clayey soils have a low risk of soil erosion.	Issues: <ul style="list-style-type: none"> <li>• Risk of soil erosion with shallow lime-rich soils in certain localities</li> </ul> Opportunities: <ul style="list-style-type: none"> <li>• Introduce/maintain permanent grassland and woodland and restore field boundaries (hedges) along scarp edge and valley sides in areas particularly prone to soil erosion.</li> <li>• Manage arable land in ways that build up organic matter and avoid compaction, and introduce good soil husbandry and management.</li> </ul>	<u>Providers:</u> Landowners, farmers, growers  <u>Beneficiaries:</u> Landowners, farmers, growers, government, water companies, public
<b>Soil quality regulation</b>	Soils Farmland	The shallow lime-rich soils over limestone found on the high wold and dip slope are typically drought prone but their calcareous nature affords a degree of natural resilience to loss of quality. It is important to retain their high porosity when considering aquifer recharge. This requires the maintenance of good structural conditions to aid water infiltration and good nutrient management and soil husbandry to prevent pollution of the underlying aquifer.	Issues: <ul style="list-style-type: none"> <li>• Need to maintain good soil quality for the benefit of farming and water supply</li> </ul> Opportunities: <ul style="list-style-type: none"> <li>• In shallow lime-rich soils, improve soil structure and quality by increasing organic matter content through management interventions such as using break crops, changing crop rotation patterns and by</li> </ul>	<u>Providers:</u> Landowners, farmers, growers  <u>Beneficiaries:</u> Landowners, farmers, growers,

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		<p>The lime-rich loamy and clayey soils with impeded drainage found in valley bottoms are calcareous soils with some natural resilience and enhanced workability. These soils are at risk of topsoil compaction and poaching. <sup>2</sup></p>	<p>increasing areas under grassland cover.</p> <ul style="list-style-type: none"> <li>On lime rich loamy soils exercise careful management of weak topsoils to help maintain a good soil structure.</li> </ul>	<p>government, water companies, public</p>
<p><b>Water quality regulation</b></p>	<p>Geology Rivers Soils Farmland Woodland Other semi-natural habitats</p>	<p>Around half of the area's groundwater is classed as being of poor quality, particularly within the north and western parts of the AONB, with predominantly good groundwater quality in the southern half.</p> <p>All of the rivers within the character area are classed as good in terms of their chemical quality and most rivers are classed as having good ecological quality other than the upper Evenlode and the mid Windrush which have moderate ecological quality and the River Coln and some small tributaries of the Thames in the south-west of the catchment which have 'poor ecological quality. <sup>2</sup></p>	<p>Issues:</p> <ul style="list-style-type: none"> <li>Ecological status failures within the water bodies are, in the majority, for phosphate and fish.</li> <li>Nitrate and pesticide pollution, from agricultural inputs are of particular concern for groundwater in the north and western parts of the area and some surface waters.</li> <li>Phosphate concentrations are a concern on the rivers Evenlode, Glyme and Ampney Brook.</li> </ul> <p>Opportunities:</p> <ul style="list-style-type: none"> <li>Support catchment sensitive farming initiatives which give tailored farm advice about agricultural inputs and soil and water management to help address water quality issues within the area, and grant aid appropriate works.</li> </ul>	<p><u>Providers:</u> Landowners, farmers</p> <p><u>Beneficiaries:</u> Water companies, consumers, public, farmers and growers</p>

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			<ul style="list-style-type: none"> <li>Support targeted habitat restoration, creation and management to help improve water quality</li> </ul>	
<b>Hazard regulation (flooding)</b>	Climate Rivers, streams Woodland Other semi-natural habitats	<p>Flooding is generally not an issue within the AONB, although localised flooding does occur, such as in Moreton-in-Marsh during the heavy rains in July 2007.</p> <p>Environment Agency data suggests that, within the AONB, there are 1033 properties in Flood Zone 2 (0.01% risk from fluvial flooding in any given year) and 471 properties in Flood Zone 3 (0.1% risk from fluvial flooding in any given year).</p> <p>The main areas at risk are: Moreton-in-Marsh, Bourton-on-the-Water, Ascot-under-Wychwood, Shipton-under-Wychwood, Milton –under-Wychwood, Andoversford and Northleach.<sup>7</sup></p> <p>The area forming the headwaters of the Thames contributes to flooding of the Thames further downstream and outside of the AONB; this occurred in July 2007.</p> <p>The Environment Agency Thames Catchment Flood Management Plan (2009) identifies this area as at low risk of flooding due in part to</p>	<p>Issues:</p> <ul style="list-style-type: none"> <li>Changes in precipitation cycles linked to climate change are likely to increase flood frequency and depth.</li> <li>Land use management and change can increase, or decrease, flood risk.</li> </ul> <p>Opportunities:</p> <ul style="list-style-type: none"> <li>Allow rivers to follow natural courses and re-engage with their flood plains to help retain and enhance water flow capacity</li> <li>Expand areas of wetland habitats to help increase water retention capacity and slow water release to river</li> <li>Slow down water flow through good soil management and appropriate habitat creation (natural flood management)</li> </ul>	<p><u>Providers:</u> Landowners, farmers</p> <p><u>Beneficiaries:</u> Residents, businesses, government, public</p>

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		<p>the nature of the porous limestone geology and extent of semi-natural habitat features which help retain water and slow release into rivers. Where this capacity has been reduced through compaction of soils, loss of grassland habitats which can intercept large volumes of water, or through other land use factors, action is taken to help manage run-off.</p> <p>Short intense summer storms can overwhelm smaller rivers and streams and urban drainage systems in this area.<sup>2</sup></p>		
<b>Pest and disease regulation</b>	<p>Semi-natural habitats</p> <p>Plants and animals (species and genetic diversity)</p>	<p>A network of over 3,000 ha of existing limestone grassland, lowland meadows and pasture provides a good network of semi natural habitat for pest-regulating species.</p> <p>These are distributed across the area, but are primarily found along the scarp meaning the network coverage is patchy and fragmented on the high wold and dip slope. Stone walls and field boundaries add to the network and are in relatively good condition, although can be species-poor.<sup>2</sup></p> <p>Biodiverse and resilient ecosystems help support natural pest and disease regulation, alongside human interventions.</p>	<p>Issues:</p> <ul style="list-style-type: none"> <li>Climate change is likely to affect species distribution, breeding and establishment but is difficult to predict. Warmer weather could result in an increase in pests and diseases on both farmland and woodland.<sup>18</sup></li> </ul> <p>Opportunities:</p> <ul style="list-style-type: none"> <li>Increase and manage appropriate semi-natural habitats. Seek opportunities to increase diversity of structure and composition within areas of semi-natural habitat to support a variety of pest regulating species.</li> </ul>	<p><u>Providers:</u> Government, landowners, farmers</p> <p><u>Beneficiaries:</u> Landowners, farmers, processors, retailers, consumers, public.</p>

Ecosystem service	Key natural capital assets	Description, quantity, quality and trends	Issues and opportunities	Providers and beneficiaries
			<ul style="list-style-type: none"> <li>• Increase field margins, species-rich hedgerows and beetle banks to encourage a network of habitats for pest-regulating species close to areas of agricultural production (natural pest management).</li> </ul>	
<b>Pollination</b>	<p>Bees and other pollinating insects</p> <p>Semi-natural grasslands</p> <p>Hedges</p>	<p>A network of over 3,000 ha of existing limestone grassland, lowland meadows and pasture provides a good source of nectar for pollinating insects.</p> <p>These are distributed across the area, but are primarily found along the scarp meaning the network coverage is patchy on the high wold and dip slope, where there is little benefit for those cropping oil seed rape, root crops, peas and beans. Novel crops such as flax and lupin, while seasonal, add to this network.</p> <p>Arable cropping on the high wold and dip slope is primarily for cereals and as such is wind pollinated.<sup>2</sup></p>	<p>Issues:</p> <ul style="list-style-type: none"> <li>• The network of semi-natural habitats is poor across the high wold and dip slope, where there would be most benefit to oilseed rape, root crops, peas and beans.</li> </ul> <p>Opportunities:</p> <ul style="list-style-type: none"> <li>• Increase nectar provision within the agricultural landscape through promotion of diverse field margins and creation of more semi-natural habitats.</li> <li>• Create networks of habitat through changes in management and improvements to hedgerows, road verges and field margins.</li> </ul>	<p><u>Providers:</u> Landowners, farmers, NGOs, government</p> <p><u>Beneficiaries:</u> Farmers, growers, processors, retailers, consumers, public.</p>

Ecosystem service	Key natural capital assets	Description, quantity, quality and trends	Issues and opportunities	Providers and beneficiaries
<b>Tourism and recreation values</b>	Landscapes and features Public rights of way National trails Open access land National Cycle Network	<p>It is estimated that the Cotswolds welcomes nearly 16 million visitors to the destination and tourism is worth over £1billion to the Cotswolds economy.<sup>9</sup></p> <p>However, the volume of visitors may be considerably more for the wider Cotswolds area. A 2003 report for the Cotswolds AONB estimated that the area attracts 23 million visitors, many of whom come for the day.<sup>10</sup> 2 million people live within 20 minutes of the AONB<sup>15</sup>.</p> <p>There are also a number of destinations outside this area that include a ‘Cotswold’ offering and which would considerably increase the above figures in terms of value.</p> <p>The importance of the Cotswolds to the rest of the country is recognised in Visit England’s Strategic Framework for Tourism 2010 – 2020 which refers to the Cotswolds as ‘one of England’s long established and world-renowned “attract” brands’, which can help to attract visitors and encourage them to travel and spend more widely in the country as a whole.</p> <p>It is increasingly recognised that the most</p>	<p>Issues:</p> <ul style="list-style-type: none"> <li>• There is potential to grow the number of tourists and visitors in the AONB</li> <li>• There are honeypot areas leading to visitor pressures</li> </ul> <p>Opportunities:</p> <ul style="list-style-type: none"> <li>• Create more multi-user paths and improve greenspace for both visitors and local people</li> <li>• Enhance the existing rights of way network, to help relieve pressures on main routes, and create circular routes linked to towns and villages</li> <li>• Provide interpretation of the landscape and its many features, especially historic features such as hill forts, prehistoric burial sites, and Roman villas.</li> </ul>	<p><u>Providers:</u> Landowners, farmers, NGOs, government</p> <p><u>Beneficiaries:</u> Tourism and recreation businesses, tourists, local visitors, public</p>

Ecosystem service	Key natural capital assets	Description, quantity, quality and trends	Issues and opportunities	Providers and beneficiaries
		<p>important part of the tourism product is the area’s natural beauty, including its landscapes, as well as food and cultural heritage.</p> <p>Recreational opportunities are an important societal need for local people too. Informal opportunities in the countryside include, walking, cycling, running, fishing and a host of other popular pastimes.</p> <p>There are 3,013 miles of public rights of way in the AONB (4,849 km). The AONB has two recognised National Trails, the Cotswold Way and The Thames Path. 16 km<sup>2</sup> (0.79%) of the AONB is registered common land, and 2,516 ha (1%) of land in the AONB is “Open Access”.<sup>11</sup></p>		
<b>Cultural and spiritual values</b>	Landscapes Historic environment	<p>The Cotswolds landscape is the product of many thousands of years of occupation and management, and the area’s natural environment is intertwined with its cultural heritage.</p> <p>The AONB has a wealth of historic environment features including historic settlements and buildings, prehistoric monuments, field patterns, parkland etc. There are 441 Scheduled Monuments in the</p>	<p>Issues:</p> <ul style="list-style-type: none"> <li>• Threats/risks include pasture improvement and arable intensification (ridge and furrow and other archaeological/historic features), lack of appropriate management (field boundaries, historic parkland) and development (traditional village patterns and design/materials).</li> <li>• Under-represented and under-protected hidden/unscheduled/ephemeral</li> </ul>	<p><u>Providers:</u> Government, NGOs, land and property owners</p> <p><u>Beneficiaries:</u> Tourism businesses,</p>

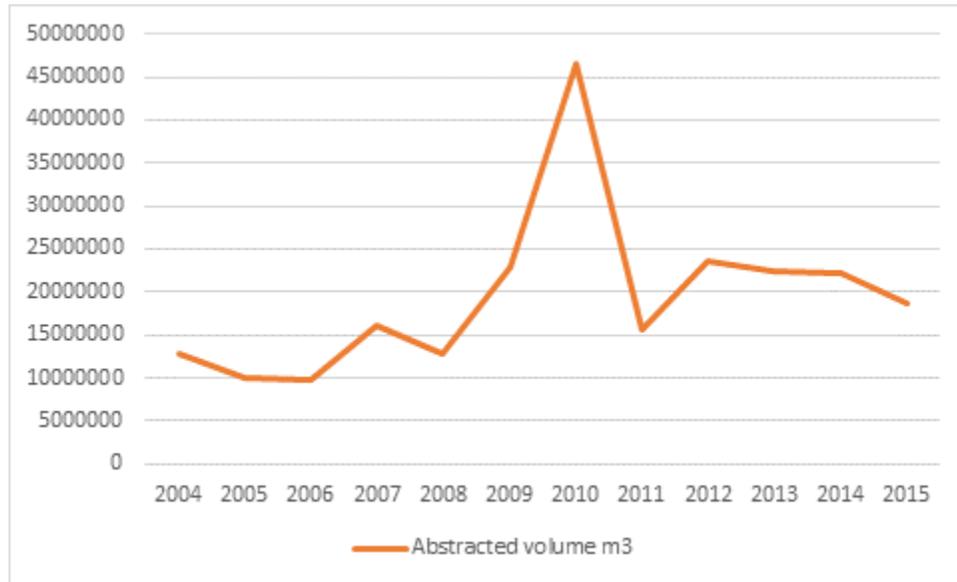
Ecosystem service	Key natural capital assets	Description, quantity, quality and trends	Issues and opportunities	Providers and beneficiaries
		<p>Cotswolds (of which 47 are at risk), 70 Registered Parks and Gardens, and 3 Registered Battlefields. There are also 802 Grade I and II* Listed Buildings and 9,771 Grade II Listed Buildings.<sup>11</sup></p> <p>There are also many less visible and undesignated sites in the AONB, which are arguably more at risk.<sup>12</sup></p> <p>Cultural heritage and the historic environment are of fundamental importance to the social and economic wellbeing of the community, and its sense of identity.</p>	<p>archaeology/heritage</p> <ul style="list-style-type: none"> <li>• Reduced participation in agri-environment schemes is expected with limited Countryside Stewardship budget.</li> </ul> <p>Opportunities:</p> <ul style="list-style-type: none"> <li>• Promote connectivity between farming practice, wildlife, public access and historic environment, especially with new agricultural policy/schemes.</li> <li>• Enhance interpretation and understanding</li> <li>• Protecting historic settlement patterns and promoting appropriate design/materials within new areas of development.</li> </ul>	<p>tourists, local visitors, public</p>
<b>Tranquillity</b>	<p>Landscapes</p> <p>Habitats including woodland and parkland</p> <p>Public rights of way /open access areas</p>	<p>The natural environment makes a significant contribution in terms of tranquillity. Negative influences on tranquillity include noise and light pollution<sup>13</sup>.</p> <p>The Cotswolds AONB has suffered a significant loss in tranquillity in the past fifty years, with a decline in ‘undisturbed’ areas from 84% in the 1960s to 54% in 2007. Factors affecting tranquillity include the major settlements of Bath, Cirencester and Stroud, as well as</p>	<p>Issues:</p> <ul style="list-style-type: none"> <li>• Maintaining tranquillity and dark skies in face of expansion of existing settlements and transport infrastructure.</li> </ul> <p>Opportunities:</p> <ul style="list-style-type: none"> <li>• Retain the sense of uncluttered open vistas on the scarp and high wold by protecting them from inappropriate development.</li> <li>• Protect and enhance the features and uncluttered nature of undeveloped valleys,</li> </ul>	<p><u>Providers:</u></p> <p>Government, NGOs, land and property owners</p> <p><u>Beneficiaries:</u></p> <p>Tourism businesses,</p>

Ecosystem service	Key natural capital assets	Description, quantity, quality and trends	Issues and opportunities	Providers and beneficiaries
		<p>major transport routes including the M4, A417, A46 and A40 and mainline railways that cross the AONB. A sense of tranquillity is nevertheless associated with much of the area, especially the undeveloped valleys and scarp, the areas of woodland and parkland, and the rural lanes linking traditional villages that retain a timeless air.</p> <p>The AONB is one of the darkest areas in Southern England, according to CPRE's 2015 satellite maps (ranked 13<sup>th</sup> in terms of darkest skies in England).<sup>14</sup></p>	<p>woodland, parkland and winding country lanes which add to sense of tranquillity.</p> <ul style="list-style-type: none"> <li>• Where possible, existing obtrusive features (power lines, masts, disused structures etc.) should be removed or more sensitively incorporated into the landscape.</li> <li>• Retain dark skies by opposing developments which lead to a significant increase in noise pollution, light pollution or other loss of tranquillity.</li> </ul>	<p>tourists, local visitors, public</p>
<b>Scientific and educational values</b>	<p>Geology</p> <p>Soil</p> <p>Water</p> <p>Landscape</p> <p>Habitats</p> <p>Plants and animals</p>	<p>There is a wide range of science and education associated with Cotswolds natural environment.</p> <p>Science includes scientific research. This enhances knowledge and understanding of different aspects of the AONB's natural environment, informs and improves future management, and delivers societal benefits.</p> <p>Environmental education occurs through school visits, school and university field trips, learning opportunities for adults, and outreach to communities and businesses. In 2014/15, 1004 school children and 16 schools</p>	<p>Issues:</p> <ul style="list-style-type: none"> <li>• Promoting and undertaking research which contributes to the sustainable management of the AONB</li> </ul> <p>Opportunities:</p> <ul style="list-style-type: none"> <li>• Collating relevant research to date, and co-ordinating future research, focused on the AONB and its sustainable management</li> </ul>	<p><u>Providers:</u></p> <p>Government, NGOs, universities, schools, landowners</p> <p><u>Beneficiaries:</u></p> <p>School children, university students, adults,</p>

Ecosystem service	Key natural capital assets	Description, quantity, quality and trends	Issues and opportunities	Providers and beneficiaries
		<p>participated in countryside learning in the AONB.<sup>11</sup></p> <p>The AONB benefitted from 9,193 volunteering days in 2014/15<sup>15</sup>, which among other things, contributed to research, management and education.</p>		businesses, visitors, wider public
<b>Wild species diversity</b>	Habitats Plants and animals	<p>The Cotswolds AONB supports a wealth of biodiversity with priority habitats covering 16,039ha (8%) of the AONB. Key priority habitats include deciduous woodland (12,451ha), lowland calcareous grassland (2,827ha) and lowland meadows (524ha).</p> <p>4,119ha of the AONB (2%) is designated as SSSI. There are 89 SSSIs. SSSI condition is gradually improving; in 2016, 63% of the area was in favourable condition and 35% in unfavourable recovering condition.<sup>11</sup> The AONB also has five Special Areas of Conservation (SACs), three National Nature Reserves (NNRs), and a large number of local sites.</p> <p>The area supports an abundance of important plants, invertebrates such as Duke of Burgundy butterfly, important overwintering roosts of</p>	<p>Issues:</p> <ul style="list-style-type: none"> <li>• Scrub formation, a loss of species interest and species-rich grassland are the result of a lack of appropriate grazing on biodiverse sites and increase in arable conversion on the scarp and dip slope.</li> <li>• Declining farmland bird numbers, thought to be due to a decline in mixed farms amongst other factors.</li> <li>• Declining woodland birds, linked to a lack of diversity in the structure of woodlands. Lack of management is a contributory factor.</li> </ul> <p>Opportunities:</p> <ul style="list-style-type: none"> <li>• Bring into good condition designated sites and other priority habitats, particularly through re-establishing appropriate grazing regimes alongside scrub and woodland management.</li> </ul>	<p><u>Providers:</u> Landowners, farmers, government, NGOs</p> <p><u>Beneficiaries:</u> All</p>

Ecosystem service	Key natural capital assets	Description, quantity, quality and trends	Issues and opportunities	Providers and beneficiaries
		<p>greater and lesser horseshoe bats and Bechstein's bats, alongside farmland birds and arable plants.</p> <p>(See 'Plants and Animals' in Appendix 1)</p>	<ul style="list-style-type: none"> <li>• Enhance buffering, alongside extension and linking of the core of designated sites, in line with climate change adaptation and landscape-scale working principles</li> <li>• Improve the matrix of habitat for species of farmland birds, particularly on the high wold where arable cropping is most prevalent.</li> <li>• Undertake species-specific management where required, alongside habitat-based approaches</li> </ul>	

**Figure 1: Trends in actual volume of water abstraction in the Cotswolds AONB<sup>16</sup>**



**Note:**

There are a large number of caveats with the data used to create the trend above. The main caveats are listed below:

- Only licences in the Thames area (covering the majority but not all of the Cotswolds AONB) have been included.
- Not all licences are required to submit returns (depending on the age of the licence, the risk posed, and the size of the licence).
- There will be a number of licences that have not submitted returns for certain years.

## References

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- <sup>1</sup> Cumulus Consultants (2015) Farming, forestry and the equestrian sector in the Cotswolds AONB, Update 2015. Report for the Cotswolds Conservation Board
- <sup>2</sup> NE (2013) National Character Area Profile: 107. Cotswolds
- <sup>3</sup> CCB. Managing deer in the Cotswolds.
- <sup>4</sup> FC (2017) NFI Statistics for the SE & London Forest Services Delivery Area. Based on FC's National Forest Inventory (NFI) dated 31 March 2015. The data covers the whole of the Cotswolds AONB.
- <sup>5</sup> EA (2017) Volume of water abstracted from within the Cotswolds AONB. Based on Abstraction Licencing Strategies that overlap with the Cotswolds AONB
- <sup>6</sup> Cotswolds Catchment Abstraction Licensing Strategy December 2012
- <sup>7</sup> EA (2017) Flood risk data for the Cotswolds AONB
- <sup>8</sup> Cumulus Consultants (2009) The future of farming and forestry in the Cotswolds AONB. Report for the Cotswolds Conservation Board
- <sup>9</sup> [http://www.cotswolds.com/dbimgs/Destination%20Management%20Plan%20for%20Tourism%20Across%20the%20Cotswolds%20April%202014\(1\).pdf](http://www.cotswolds.com/dbimgs/Destination%20Management%20Plan%20for%20Tourism%20Across%20the%20Cotswolds%20April%202014(1).pdf)
- <sup>10</sup> SWT (2005) The Value of Tourism to Cotswolds Area of Outstanding National Beauty 2001 & 2003
- <sup>11</sup> CCB (2017) The State of the Cotswolds 2017 Indicators of Change for the Cotswolds Area of Outstanding Natural Beauty
- <sup>12</sup> Moore, T. & Tully, G. (2017) Feedback from Tom Moore and Gemma Tully (REFIT Team, Archaeology Department, University of Durham) on the Cotswolds Area of Outstanding Natural Beauty Management Plan 2013-18
- <sup>13</sup> CCB (2010) Tranquillity and Dark Skies Position Statement
- <sup>14</sup> <http://www.cotswoldsaonb.org.uk/?page=NewsView&itemid=752>
- <sup>15</sup> CCB (2015) South East Protected Landscape statistics 2014/15
- <sup>16</sup> EA (2017) Trends in actual volume of water abstracted from the Cotswolds AONB