

Landscape

The European Landscape Convention (ELC)¹ definition of “landscape” is: “ an area, as perceived by people, whose character is the result of the action and interaction of natural and / or human factors.”

Landscapes vary because of factors such as their underlying geology, soils, topography, land cover, hydrology, historic and cultural development. The combination of characteristics arising from these physical and socio economic influences, and their often complex interrelationships, makes one landscape different from another.²

The Cotswolds are the most prominent and best known part of the band of Oolitic limestone that arcs across England from Dorset to the North Sea. The dominant landform is a steep west-facing escarpment behind which lies the high wold and a long, rolling dip-slope dissected by a series of river valley systems some of which are deeply incised.

The Cotswolds AONB Landscape Character Assessment (LCA)³ identifies 19 different landscape types. Whilst this indicates a great variety of landform and land cover, the Cotswold landscape has nevertheless a strong fundamental unity. Each of the 19 Landscape Types has a list of identified Key Elements. A number of those elements occur across several landscape types and have been combined into 8 principal landscape elements that occur across the area, and which, either singly or in combination, contribute to the unique character and quality of the Cotswold landscape. These principal elements are:

- Drystone walls
- Ancient semi-natural woodland and veteran trees
- Permanent pasture including unimproved calcareous grassland
- Archaeological sites and their settings, and remnant historic landscapes
- Vernacular stone buildings and their settings
- Settlement patterns and their relationship to landscape
- Parkland and historic designed landscapes
- Hedges

The Cotswold landscape has evolved over time as a consequence of economic, social and policy drivers, and will continue to evolve. Climate change and our response to climate change and the ecological emergency will be a significant driver of change in the coming years and decades. The management of change is essential to conserve and enhance the special qualities for which the Cotswolds is designated as a National Landscape and to achieve sustainable economic, social and environmental outcomes.

Landscape character is one of the most important tools for managing and guiding change. It informs understanding of key characteristics, sense of place, special qualities etc. that can then inform judgements – decision making - regarding, for example, development

¹ <http://publications.naturalengland.org.uk/publication/6361194094919680?category=31019>

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https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/691184/landscape-character-assessment.pdf

³ <https://www.cotswoldsaonb.org.uk/our-landscape/landscape-character-assessment/>

management and the siting, design, scale and massing of developments from housing schemes and transport infrastructure to forests, woodlands, or renewable energy projects⁴.

Based on the Cotswolds AONB Landscape Character Assessment⁵ the Cotswolds AONB Landscape Strategy & Guidelines (LS&G)⁶ provides a practical tool to manage change in a sustainable and positive way by identifying forces for change and their implications for landscape character, and by informing developing strategies and guidelines to inform decision making. This ensures that change and development respects landscape character and that key features are conserved and enhanced.

Impacts of climate change on landscape

Collectively the impacts of climate change on the Cotswold landscape identified in the following sections of this Climate Change Strategy are expected to be considerable.

Responding to climate change is urgent but how we respond needs proper consideration to avoid well-intentioned interventions harmful to the Cotswold landscape and the economy that depends upon it.

Farming will remain the principle land use, moving to a system of Regenerative Agriculture which includes a return towards less intensive mixed farming with increased use of short-term herb rich leys, cover crops and different models of low intensity grazing systems. Cropping patterns and timing are expected to change, with the appearance of novel crops introducing new colours and textures into the landscape.

Drier warmer summers would lead at times to a 'droughty', parched landscape of bleached grassland, 'thin' arable crops and wilting trees and hedges.

Woodland and tree cover will increase due to a combination of the Cotswolds contribution to national woodland cover targets to achieve Net Zero by 2050 and increased shelter for livestock and crops including agroforestry and silvopasture systems. The area of grassland, wetland and scrub will increase to deliver habitat creation targets and Natural Flood Management schemes.

The range of tree species will change, with in particular the loss of ash to Ash Dieback Disease and the potential loss of beech on the thinner soils and on exposed sites. Hedges, parkland trees and veteran trees are likely to be lost through more frequent drought conditions and extreme weather events.

The transition to low carbon energy will see demand for solar arrays and wind turbines. The appearance of settlements will change due to the construction of low carbon housing and retrofitting of vernacular buildings. Woodland may benefit due to an increase in management stimulated by demand for biomass for energy.

Aim

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https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/691184/landscape-character-assessment.pdf

⁵ <https://www.cotswoldsaonb.org.uk/our-landscape/landscape-character-assessment/>

⁶ <https://www.cotswoldsaonb.org.uk/our-landscape/landscape-strategy-guidelines/>

The impact of climate change and the Cotswolds contribution to national climate change targets is consistent with conserving and enhancing the landscape character and scenic quality as possible

Strategy

	Strategy	Stakeholders
	Continue to develop understanding of the landscape, its natural and cultural capital and ecosystem services and the impact of climate change	CCB, LNPs, Local Authorities, Defra, CPRE
	Promote and enhance understanding of the landscape and changes likely to result from climate change and national and local policies and actions to mitigate and adapt	Local authorities, Communities/residents (including in neighbouring areas), CPRE, Cotswold Voluntary Wardens, Schools and youth groups, DMOs, businesses dependent on the landscape, NE, FC, EA, and visitors.
	Engage communities in the conservation and enhancement of the Cotswolds and development of the future Cotswold Landscape	CCB, Local Authorities, Town and Parish councils
	Develop guidance to help farmers and land managers adapt to climate change and conserve and enhance the special qualities of the Cotswold landscape. Identify examples of good practice	CCB, FarmEd, GREAT ⁷ , agricultural universities and colleges, NFU, CLA
	Ensure landscape, landscape character and the special qualities of the Cotswolds are part of the decision making process.	Local Authorities, LNPs, LEPs, Town and Parish Councils
	Ensure landscape, landscape character and the special qualities of the Cotswolds are taken into account within Climate Change Strategies, Local Nature Recovery Strategies, Nature recovery Networks, Woodland Strategies etc	CCB, Local Authorities, LNPs, NE, FC, EA

⁷ Gloucestershire Regenerative Environment and Agriculture Transition (GREAT) project

Soil and water

Cotswold soils are predominantly thin and brashy (stony), making them prone to drying out. Deeper alluvial and more clay-rich soils are largely restricted to valley bottoms and dip-slope lowlands, and are less well drained and consequently less prone to drought. Much of the Cotswolds is Grade 3 Agricultural land with small areas of Grade 2

A move away from mixed farming to continuous arable across much of the Cotswolds over the past 60 or so years has led to poor soil structure, depleted soil organic content, soil erosion and reduced infiltration rates. Diffuse pollution from farmland, particularly phosphates bound to silts, has caused issues with water quality in most Cotswold rivers. Soils under permanent pasture can become compacted causing pans, restricting root penetration, reducing water infiltration and increasing run-off

The understanding of the need for good soil management has greatly increased over the past 20 years. Many farms have moved to min or no-till methods improving soil structure, infiltration and organic content. The latter also increases carbon sequestration. However, not all crop and soil types can be managed by min or no-till and the cost of investing in new equipment can be a barrier. Cover crops, rotational leys, including herb-rich leys and mob grazing⁸ are increasingly being adopted as part of a shift towards Regenerative Farming. Increasing soil organic content by 0.1% can increase carbon sequestration by 8.9tonnes per hectare and herb-rich pastures are capable of sequestering up to 20t per year⁹.

The recent average annual rainfall for the Cotswolds AONB has been 800mm. Most of the Cotswolds drain south-east through the river systems and the limestone aquifer. Most Cotswold rivers are tributaries of the Thames, but the River Avon and river systems in the south of the AONB around Bath drain into the Severn Estuary along with the smaller streams running down the scarp such as the Chelt and Isbourne. The Cotswolds are an important source of good quality water both from surface water and boreholes into the limestone aquifer, mostly supplied to areas outside the AONB. However, there are concerns with phosphate and sediment levels in many watercourses and nitrates in ground water supplies. On the basis it is more cost effective to work with farmers to prevent diffuse pollution than it is to remove contaminants at water treatment works Thames Water are working with farmers along the Evenlode to reduce silt and nutrient input and support a move away from metaldehyde slug pellets.

Some rivers, particularly the Windrush, have issues with raw sewage being released from Sewage Treatment Works (STWs) during heavy rainfall events. Such releases are often permitted by the EA. In a two year period there were 50 activations on the Windrush. This is largely a capacity issue with STWs no longer able to cope with increasing population size.

Because of this 'downstream' demand, Catchment Abstraction Licencing Strategies class most of the Cotswolds as 'restricted water availability'. The Cotswolds are not at present an area prone to widespread flooding. However, in extreme rainfall events, such as that of July 2007, some towns and villages are affected by flooding from rivers and/or groundwater.

⁸ **Mob grazing** is short duration (1-3 days), high density grazing with a longer than usual paddock recovery period, boosting pasture resilience, sward recovery and improved soil structure.

⁹ <https://www.farmcarbontoolkit.org.uk/resources/articles/building-carbon-farm-soils>

Predicted impacts of climate change.

Soils: with a predicted 22% decrease in summer rainfall by 2080, the free draining Cotswold soils, particularly the thin brash, will become more prone to drought. Extreme weather events and a predicted 22% overall increase in winter rainfall could lead to flooding, poaching of soils, soil loss and silt and nutrients being carried into watercourses. These combined impacts would lead to soil damage, erosion events, siltation of rivers, nutrient loss and water quality failure. Soil management practices to mitigate these impacts will become increasingly important.

Water: some stretches of Cotswold rivers are already prone to low flows, resulting in damage to riverine habitat, concentration of pollutants and less water available for abstraction. With summers predicted to become drier, this problem will be exacerbated further reducing the amount of water available from boreholes in the limestone aquifer. Conversely, with the risk of flooding is likely to increase in winter months and following extreme weather events, there is likely to be an increased demand for water capture and storage, for erosion control, and for flood management and defence schemes. Invasive species may become an increasing problem in the aquatic environment.

Aim

Soils and water should be sustained through good management to improve their quality and resilience to climate change.

Strategy

	Strategy	Stakeholders
SW1	<p>Manage soils to increase organic content, sequester carbon and increase resilience to drought and erosion including use of:</p> <ul style="list-style-type: none"> • Cover crops • Intercropping • Extended rotations • Min and no-till • Decompaction <p>Promote adoption of Regenerative Agriculture principles</p>	<p>NE, EA, Farmers and occupiers, landowners/managers, agricultural and horticultural colleges</p> <p>ELM</p> <p>Shared Prosperity Fund/replacement of LEADER and Farm Productivity</p>
SW2	<p>Protect water courses from siltation and nutrient enrichment from run-off e.g.</p> <ul style="list-style-type: none"> • Buffer strips alongside water courses and gateways • Cross drains on farm tracks 	<p>NE, CSF, FC, EA, Water companies, Defra</p> <p>Farmers and land managers</p>

	<ul style="list-style-type: none"> • Contour cultivation. • Preventing compaction 	
	<p>Upgrade STWs to cope with growing populations to</p> <ul style="list-style-type: none"> • Improve effluent quality • Prevent raw sewage releases due to storming 	Water companies, EA, Government.
	Promote and support Natural Flood Management in line with LS&G	EA, NE, Wildlife Trusts, Las, Catchment Partnerships, local flood groups, farmers and land managers.
SW3	Avoid low flows due to water abstraction.	EA licencing, Water Companies
SW4	Encourage rainwater harvesting and storage	CCB, Water Companies, local authorities, NFU, CLA, rural businesses, householders.
SW5	Provide information and guidance on rainwater harvesting and sustainable irrigation systems that are consistent with AONB and Board objectives	CCB

Biodiversity

Much of our wildlife-rich habitat has been lost over the last century and many species are in long-term decline. The Cotswolds AONB has, however, managed to partially retain and support a range of habitats and their dependent flora and fauna due largely to a combination of topography, traditional land management practices and legal protection. Many sites of importance for biodiversity are the remnants of semi-natural communities and depend on low-intensity land management practices. Arable is an important habitat in the Cotswolds for farmland birds and arable plants. The Cotswolds AONB contains five SACs, three NNRs, 89 SSSIs, two NIAs and a large number of Local Wildlife Sites.

Of particular significance in the Cotswolds are unimproved grasslands and meadows, ancient woodland, limestone streams and rivers, and open farmland. Many of these areas are under pressure or declining in value as a result of inappropriate management, fragmentation, changes in surrounding land use and management, and perceptions of low importance. Climate change impacts may be expected to cause further declines in value unless addressed.

Since 1994 successive agri-environment schemes have, with some success, sought to conserve and enhance habitats through management and extension. Projects such as Save our Magnificent Meadows, Glorious Cotswolds Grassland and the Gloucestershire Wildlife Trust's Cotswolds Rivers Project have, working with farmers and land managers, conserved and extended priority habitats.

Over the millennia, wildlife has adapted to climate change such as the ice ages and interglacial warm periods due to having space to move across the landscape finding new geographical locations (e.g. by moving north, south or up-slope) that suit their requirements or niche. Nowadays, wildlife is starting from a considerably lower base line, reduced abundance and faces much greater challenges of moving across a dramatically different landscape with little suitable habitat to move through and major barriers such as cities, motorways and intensive land-use. (difficult to adapt due to EXTENT pace of change)

Local Nature Recovery Strategies and Networks

Local Nature Recovery Strategies (LNRS) are statutory documents with spatial mapping to inform and agree priorities for nature recovery on the ground. LNRS map the most valuable sites and habitats for wildlife and identify where nature can be restored, for example, through creation of wetland and wildflower meadows. The aim is to link up habitats, restore nature and provide green space for communities.

The Government's 25 Year Environment Plan¹⁰ published in January 2018 includes a commitment to "develop a Nature Recovery Network to protect and restore wildlife, and provide opportunities to re-introduce species that we have lost from our countryside". The 25 Year Environment Plan has the national target to provide 500,000Ha of additional wildlife habitat

¹⁰ <https://www.gov.uk/government/publications/25-year-environment-plan>

Local Nature Recovery Networks (NRN) are being developed to provide a detailed decision making tool that identifies the best opportunities to deliver nature's recovery. **The LNRS will underpin the Nature Recovery Network**

Cotswolds AONB Management Plan

Outcome 9 (biodiversity) in the Cotswolds AONB Management Plan 2018 – 2023¹¹ is:

The loss of priority habitats and species in the Cotswolds AONB will have been halted and reversed with a robust and a resilient ecological network will have been created across – and in the setting of – the AONB.

This outcome is supported by Policy CE7: Biodiversity

1. Biodiversity in the Cotswolds AONB should be conserved and enhanced by establishing a coherent and resilient ecological network across the Cotswolds AONB and in its setting, focussing on the priority species and habitats listed in Appendix 8. This should be achieved by implementing the following principles¹²

- **BETTER:** Existing wildlife sites should be protected, in line with national policy and guidance, and be brought into good condition through effective and appropriate management.
- **BIGGER:** The size of existing wildlife sites should be increased.
- **MORE:** More wildlife sites should be created.
- **JOINED:** Connectivity between wildlife sites should be improved by creating new wildlife corridors and 'stepping stone' sites and the provision of green infrastructure. The pressure on wildlife should be reduced by improving the wider environment, including the provision of less intensively managed 'buffer zones' around wildlife sites.

2. Proposals that are likely to impact on the biodiversity of the Cotswolds AONB should provide a significant net-gain in biodiversity, particularly with regard to the species and habitats listed in Appendix 8.

3. Biodiversity – in particular, the priority species and habitats listed in Appendix 8 - should be a key component of future agri-environment, land management and rural development support mechanisms in the Cotswolds AONB.

Policy CE8: Rural Land Management, seeks to ensure that changes in land management and land use has regard to and delivers the purposes of conserving and enhancing the natural

¹¹ <https://www.cotswoldsaonb.org.uk/looking-after/aonb-management-plan/>

¹² The Lawton Principles .In 'Making Space for Nature: A review of England's Wildlife Sites and Ecological Network. 2010.
<https://webarchive.nationalarchives.gov.uk/20130402170324/http://archive.defra.gov.uk/environment/biodiversity/documents/201009space-for-nature.pdf>

beauty of the AONB and be compatible with guidance including the Cotswolds AONB Landscape Strategy and Guidelines¹³.

The Colchester Declaration

In 2019 members of the National Association for AONBs signed the Colchester Declaration¹⁴. The declaration, in response to many local authorities declaring a climate emergency and the Landscapes Review¹⁵ which stated that all National Landscapes should be delivering more for nature, seeks to significantly increase the scale and pace of nature conservation activity in AONBs. The declaration includes targets to:

To prepare a Nature Recovery Plan for each AONB.

And by 2030:

- *That at least 200,000 ha of SSSIs in AONBs will be in favourable condition*
- *That at least 100,000 ha of wildlife-rich habitat outside of protected sites will have been created/ restored in AONBs to further support the natural movement of plants and animals*
- *That at least 36,000 ha of new woodland will have been planted or allowed to regenerate in AONBs following the principle of the right tree in the right place*
- *That, by each AONB immediately adopting a species on the threatened list and by preparing and delivering a Species Action Plan, at least thirty species relevant to AONBs will be taken off the list by 2030*

The Nature Recovery Plan is particularly important for the Cotswolds AONB which is otherwise split across six areas developing their own Nature Recovery Strategies and Nature Recovery Networks.

To help deliver the Colchester Declaration AONB Partnerships and Boards are collaborating to develop large landscape scale nature recovery projects. The Cotswolds AONB is part of 'Big Chalk', a visionary scheme to build ecological resilience in and between calcareous landscapes running from the south coast to the midlands.

Nature recovery will be to a great extent, reliant on the new Environmental Land Management Scheme due to fully launch in 2024, mechanisms such as planning net gain and private sector investment. **(explain BNG)**

Ecological Emergency

¹³ <https://www.cotswoldsaonb.org.uk/our-landscape/landscape-strategy-guidelines/>

¹⁴ https://landscapesforlife.org.uk/application/files/7815/6326/2583/The_Colchester_Declaration.pdf

¹⁵ Landscapes Review, final report, Defra 2019.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/833726/landscapes-review-final-report.pdf

An increasing number of local authorities are declaring an Ecological Emergency which puts ecological issues at the heart of the Authority's actions to deliver nature recovery across the authority's area. Some, such as Cotswold District Council have developed Ecological Emergency Action Plans¹⁶.

Predicted climate change impacts on biodiversity

Climate change will lead to changes in temperature, water, soils, land management and land use. There are likely to be changes in the timing of seasonal events leading to a loss of synchrony between species and the resources that they depend on, notably for food and pollination.

Extremes of drought and wet can lead to changes in plant and insect communities through loss and colonisation and expansion in range by more tolerant species.

Consequently, species in areas climatically suited to host particular species and suites of species are likely to migrate, leading to changes in the range and abundance of species, local extinctions and the establishment of species new to the Cotswolds including from the near continent.

Changes in the principal land uses of farming and forestry, such as the timing of cultivation and harvest, new crops and crop varieties, and energy crops (e.g. miscanthus and short rotation coppice), could adversely affect some species. Conversely, some predicted changes in farming and forestry practice could be beneficial for indigenous species, such as through extensive grazing on the Cotswold grasslands.

There is a risk that the national tree planting target to achieve net zero by 2050 and for flood management could impact on open habitats such as grassland and arable directly by planting and/or by cutting off connections or potential connections.

Other potential impacts include an increased threat of wild fire. There is also an increased threat from a range of pests and diseases such as *Phytophthora ramorum* and chestnut bleeding canker, as well as midge-borne diseases. Invasive non-native species may become an increasing problem.

Aim

The impacts of climate change on biodiversity should be mitigated by managing, extending and linking priority habitats, and creating a permeable landscape.

Strategy

	Strategy	Stakeholders
B1	Prevent any further loss of priority habitats and ensure existing habitat becomes more resilient by being well managed	NE, FC, Plantlife, Butterfly Conservation, Wildlife Trusts, local conservation groups, farmers, landowners, LNPs

¹⁶ <https://www.cotswold.gov.uk/>

B2	<p>Extend, link and buffer existing priority habitat.</p> <p>Develop landscape scale projects such as Glorious Cotswolds Grassland and 'Big Chalk'.</p>	NE, FC, Plantlife, Butterfly Conservation, Wildlife Trusts, local conservation groups, farmers, landowners, LNPs and other members of the Cotswold Ecological Network Partnership, local planning authorities
B3	Ensure LNRS and NRNs deliver the Cotswolds AONB Management Plan	Local authorities, LNPs, CS and ELM
B4	<p>Produce the Cotswolds AONB Nature Recovery Plan</p> <p>Ensure connectivity across LNRS boundaries</p>	<p>CCB</p> <p>CCB, local authorities, LNPs</p>
B5	Maximise biodiversity net gain through development	Local authorities, CCB, LNPs, developers
B6	Avoid habitat creation impacting on existing habitat or reducing potential connectivity.	CCB, LNPs, local authorities, FC, NE, EA
B7	Ensure ELM delivers Cotswolds priority habitat and includes options and guidance to suit changing species and habitat needs and trends	NE, FC, Defra, Water Companies, EA
B8	Monitor the impact of climate change on priority habitats and species.	Wildlife trusts, NE, FC, EA
B9	Monitor the impact of pests and diseases and promote management to minimise negative effects	Defra, FC, NE, AHVLA

Historic and Cultural Environment

The historic and cultural environment is not a static aspect of Natural Beauty, but the product of ongoing change. The challenges posed by climate change mostly concern ways in which its effects are managed and opportunities are taken, using lessons from inherently more sustainable past practices, to sustain the historic character of the National Landscape into the future.

The Cotswolds have a particularly rich historic and cultural environment ranging from Neolithic long barrows to Second World War airfields. The Historic Environment Record contains over 17,000 sites within the Cotswolds AONB, including 452 Scheduled Ancient Monuments. The AONB also has 10,433 listed buildings.

The historic dimension of the wider landscape is an important part of the character of the Cotswolds, with 121 historic landscape types identified in the Cotswolds Historic Landscape Character Assessment (HLCA), of which 43 are primary. The Cotswolds were once an area where open field agriculture predominated, and consequently the dominant historic landscape type reflects the enclosure of former open fields, which at their maximum extent covered 65% of the AONB.

Parklands, gardens and historic sites such as the Rollright Stones and Great Witcombe Villa capture and store carbon in grassland and trees. Timber in traditional buildings in the form of frames, trusses, floor boards and window frames etc. lock away carbon, in many instances for centuries.

Traditional buildings are inherently sustainable. The whole life cycle of site clearance, winning, manufacturing, transporting building materials, construction activity, maintenance and repair that represents embodied energy can be annualised at very low levels in pre 1919 buildings. This is offset by relatively more fuel being used for heating etc and relatively poor insulation.

Measuring embodied carbon¹⁷ shows that maintaining, refurbishing and retrofitting traditional buildings can reduce carbon emissions in the built environment by over 60%¹⁸ by 2050 compared to new building.

Refurbishment of 25% of all pre 1919 homes over 25 years (as in scenario IV); carbon emissions are reduced by 10% or 15.5 million tCO₂ e in relation to the baseline

Refurbishing 50% of all pre-1919 residential buildings over ten years would lead to a reduction in carbon emissions of 27% or 39.6 million (tCO₂ e) by 2050 compared to the baseline do nothing scenario.

¹⁷ According to the UK Green Construction Board, when construction, transportation and buildings' electricity use are taken into account, the built environment sector is responsible for up to 42% of total greenhouse gas (GHG) emissions in the UK (UKGBC).

¹⁸ <https://historicengland.org.uk/content/heritage-counts/pub/2019/hc2019-re-use-recycle-to-reduce-carbon/#:~:text=THERE'S%20NO%20PLACE%20LIKE%20OLD%20HOMES,-5&text=Heritage%20Counts%20is%20an%20annual.responsibilities%20for%20the%20nation's%20heritage.>

As the move to green energy sources accelerates, the relative 'greenness' of historic buildings increases dramatically because of the very low annualised embodied carbon. In the Cotswolds this is even more advantageous because of the historic use of local stone, slates or thatch rather than ceramic materials and lime rather than cement thereby avoiding a lot of energy used in manufacturing.

Predicted impacts on the historic environment

Historic assets that have survived previous extreme events and significant warming since the Little Ice Age (early 14th to mid-19th centuries) may indicate a resilience and reflect ongoing adaptability to changing circumstances that will become a further part of their history.

For the most part impacts will be severest where effects of and responses to climate change exacerbate ongoing human pressures that already take their toll.

Warmer, drier summers and wetter winters, along with an increase in extreme weather events such as drought, frost and flooding, would increase the extremes of wetting and drying leading to accelerated decay of stonework and an increased risk of ground subsidence. On the other hand, many historic buildings have more adaptable materials (timber, lime mortars and renders) that are more forgiving than modern engineered structures and have suffered movement over many centuries with long histories of repair – and resultant 'wonky' characteristics. Relatively dense urban settlement (including terraced housing) have a number of inherently sustainable characteristics in optimising use of land and materials.

Less frost damage should occur due to milder winters.

Increased flooding and erosion may cause damage to buildings and to archaeological sites such as earthworks and buried archaeological deposits, as well as to vernacular features like walls and barns in vulnerable locations (though most historic settlements in Cotswold valleys avoided floodplains).

Structural damage, particularly to buildings and monuments, can also be caused by strong wind, either directly or where trees suffer windthrow in historic parks and gardens. Hotter, drier summers can also increase pressure on owners to pursue building adaptation and alterations that may be unsympathetic, increase damage from ultra-violet radiation and increase the risk of fire.

The Cotswolds is one of the most sensitive areas in the country for cultivation damage to archaeological sites such as earthworks and buried archaeological deposits. The key factors that determine such vulnerability include soil composition, slope and erodibility, types of cultivation and different crops.¹⁹ These are interlinked, but the light brashy soils on sometimes significant slopes are key to making the Cotswolds vulnerable to erosion, so that even where cultivation is carried out at the same relative depth, shallow archaeological sites

¹⁹ DEFRA Research Projects [BD1701](#), [BD1704](#), [BD1705](#), [LM0426](#) see <http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=Home&Completed=0>

are gradually truncated. Increased rainfall and run-off from bare ground is liable to accelerate erosion. However there are counter trends (shallower cultivation to save expensive fuel; better soil management; more retention of winter stubbles) that may help to reduce this problem.

Changes in agricultural practices and crops could threaten the visibility, integrity and setting of archaeological remains and historic landscapes, particularly historic designed landscapes and traditional farm buildings.

As with farming and forestry, there is an increased risk to buildings and historic landscapes (such as landscaped parks) from pests, diseases and introduced species.

Actions to mitigate and adapt to climate change, such as tree planting, developing renewable energy sources including biomass crops and associated infrastructure or creating new flood defences and farm reservoirs, can affect archaeological remains and historic buildings, and compromise historic landscapes. Poorly designed or inappropriate energy saving measures can detract from the historic character and fabric of buildings and landscapes.

There are great opportunities to revive historic practices in construction and land management that were always inherently sustainable and rooted in the character of the landscape

Aim

The historic environment of the Cotswolds should be managed to protect it from the negative impacts of climate change, whilst making a positive contribution to the understanding of such impacts and to their mitigation and adaptation.

Strategy

	Strategy	Stakeholders
H1	Reduce carbon emissions from traditional Cotswold buildings and adapt them to a changing climate whilst retaining their special characteristics Produce guidance for building owners	Planning Authorities, HE, CCB, Property owners and managers
H2	Re-purpose, refurbish and retrofit traditional buildings. Avoid replacement where encapsulated carbon benefits can be sustained into the future Promote traditional building materials and techniques that are	Local authorities, HE, owners/landlords,

	resilient and/or adaptable to climate change	
H3	Manage the historic environment to prevent or minimise damage or loss due to the impacts of climate change and adapt in new ways that remain sensitive to historic values and significance	HE, local authorities, landowners and managers, NE
H4	Encourage appropriate design of new energy efficient buildings. New build can incorporate modern techniques as well as old traditional methods re-invented. Improve reuse of recycled building materials	Local authorities, HE, architects and developers
H5	Minimise the visual and physical impact on the historic environment of mitigation schemes such as flood defences, renewable energy infrastructure and tree planting Ensure that adaptations reflect historic landscape characteristics that (eg not building on floodplains; tree planting in topographically suitable areas, reflecting traditional ancient woodland as well as potential to reduce downstream flooding)	EA, FC, HE, local authorities
H6	Improve data and evidence on the climate change impacts on heritage and cultural assets and their contribution to climate change mitigation	HE, CCB,
H7	Improve awareness of the risks of erosion and crop changes archaeological sites under cultivation, map areas of highest risk encourage farm partnerships to invest in means to combat	HE, DEFRA, CCB

	problems such as no till cultivation methods (such as direct drilling)	
H8	Develop ELMS measures that specifically address ways to mitigate direct and indirect pressures of climate change for the historic environment – especially redundant farm buildings and archaeological sites under cultivation.	HE, DEFRA, CCB
H9	Develop historic landscape guidance on suitable locations for woodland planting for carbon sequestration and flood mitigation to reflect long terms patterns of woodland	CCB (FC)
H10	Develop guidance on inherently sustainable historic patterns of settlement, building materials and construction that reflect the historic character of the Cotswolds	CCB HE
H0	Collate and disseminate case studies that illustrate key recurrent issues and best practice in addressing them	HE CCB NT other property owners and managers

Farming

Changes in farming and in land use is one of the principle drivers of change in the Cotswold landscape. The predicted impacts of climate change on farming and Climate Change Committee recommendations for changes in land use will accelerate change and have a major impact on the landscape, on biodiversity and on the economy of the Cotswolds including tourism.

The Cotswolds is a farmed landscape and its landscape largely a product of farming. The special qualities of the Cotswolds National Landscape include 'the high wolds - a large open, elevated predominantly arable landscape with commons, 'big skies and long distance views', 'flower rich grasslands, particularly limestone grasslands' and 'distinctive dry stone walls'.

Farming is worth around £800M to the Cotswolds economy and in turn provides the landscape which supports the Cotswolds tourism industry worth around £1Bn

87% of land in the Cotswolds National Landscape is agricultural land, 49% of which is arable and 43% grassland²⁰. [check the numbers – 49 + 43 = 92] The main crops traditionally grown are winter wheat, spring barley and oilseed rape although the area of the latter has dropped significantly due to the ban on the use of neonicotinoids in 2018.

With the exception of some small areas of grade 2 land, the Cotswold agricultural land is classed mostly as grade 3 (good to moderate) with areas of grade 4 (poor quality) primarily due to limitations of the thin stony soils and areas of steep gradient²¹ affecting the choice of crops and methods of cultivation. Steep gradients often prohibits cultivation and limits farming to livestock.

Farming produces around 10% of the UK's Greenhouse Gas (GHG) emissions though is different from other sectors in that only 10% is CO₂ but 40% is Nitrous Oxide and 50% methane²². The latter two are significantly more potent greenhouse gases than CO₂. Whilst GHG emissions are inherent in food production due to biological processes and chemical interactions in both livestock and plant growth, it is important that emissions are reduced by increasing efficiency of fertilisers, improving soil husbandry, optimising land management and land use, modifying livestock diets, improved storage and use of manures and slurry, turning waste into resources and taking advantage of advances in technology.

In response many farmers are considering moving towards Regenerative Agriculture rather than intensive farming practices, a system that includes reducing the use of chemicals, increasing the use of organic matter from leys and cover crops and increasing stock density but for shorter periods to retain more leaf area etc. There is also growing interest in Agroforestry where trees, usually in widely spaced lines, are grown along with crops to provide tree products (fruit, forage etc) and provide protection for soils, crops and livestock.

The Sustainable Farming Incentive, part of the Environmental Land Management Scheme (ELMs), is due to fully launch in 2024 following a pilot and will pay farmers to manage their land in an environmentally sustainable way through a series of Standards based on

²⁰ <https://www.cotswoldsaonb.org.uk/wp-content/uploads/2017/11/farming-forestry-and-the-equine-sector-in-the-cotswolds-aonb-november-2015.pdf>

²¹ <https://magic.defra.gov.uk/>

²² <https://www.nfuonline.com/nfu-online/business/regulation/achieving-net-zero-farmings-2040-goal/>

management of soils, grassland, field margins, hedgerows etc [This paragraph might be better after the next one]

Following departure from the EU and therefore the CAP, the Government has put in place a new Agriculture Act and Agriculture Transition Plan which includes the phasing out by 2027 the Basic Payment Scheme (BPS) whereby agriculture was supported by payments based on area of land. In future farmers and land managers will be able to apply to join ELMs and receive 'payments for public goods' - from 2024 or earlier if they have a pilot agreement. The financial impact on farm businesses in the Cotswolds from the phasing out of the BPS will be significant, driving the search for diversification and changes in land-use or intensification.

Predicted Climate Change impacts on farming

Grass yields and some crop yields are likely to increase due to an extended growing season, but with a greater variability in quantity and quality, including risk of crop failure due to drought, particularly on the thin brash soils. Crops which currently are not suited to the Cotswolds may become more viable. Changing weather patterns and extreme weather events are likely to impact on cultivation and sowing dates, harvesting, germination success and cause physical damage to crops. In response new and more resilient crop varieties including GM (subject to debate and decision about this controversial issue) and novel crops are likely to be adopted along with agro-forestry. Different breeds of sheep and cattle may be introduced which are better suited to warmer drier conditions.

The farming sector is responding with many moving towards or fully adopting the principles of regenerative or agro-ecological agriculture. The area of cereal and oilseed crops will reduce as land is used for temporary leys to conserve and build soils as part of the arable rotation. This could be partly countered by bringing areas of permanent pasture back into the cropping cycle. Minimal and no-till systems will continue to expand where soils and crop types allow. Further land will be taken out of farming to help achieve national woodland creation targets and low carbon energy production.

Integrated Pest Management is already widely practised but different types of pest and disease are expected.

The trend in reducing overall livestock numbers is expected to continue but the area of land grazed will increase as part of the move to a system of more mixed arable/livestock rotations and for priority habitat creation to achieve nature recovery targets. The result will be a shift to a mixture of mob-grazing techniques²³ and low intensity, extensive grazing.

Longer term farm business planning and diversification to spread risk will have increasing emphasis as will farm co-operation and collaboration to deliver benefits at a landscape scale.

Aim

²³ **Mob grazing** is short duration (1-3 days), high density grazing with a longer than usual paddock recovery period, boosting pasture resilience, sward recovery and improved soil structure

Farming adapts to climate change, moves towards net zero by 2040, produces quality food whilst managing land in an environmentally sensitive way delivering wider public benefits, is economically viable and maintains the special qualities of the Cotswold landscape.

Strategy

	Strategy	Stakeholders
	Encourage and support land management and farming practices that adapt to and mitigate the impacts of climate change whilst still being productive and viable e.g. Regenerative Farming, improved use and storage of manures and slurries and min/no-till	Landowners, Farmers, NFU, CLA, NE, EA, FC, FarmEd, Universities and colleges, Soil Association
	Encourage and support the farming sector to reduce Greenhouse Gas emissions	NFU, CLA, Universities and colleges, NE, EA, FarmEd, RAU, Soil Association.
	Develop and support carbon-offsetting financial instruments which reward farmers for sequestering carbon while also enhancing the landscape	Defra, LNPs, Wild Carbon Trust, Private sector
	Promote and support the uptake of Countryside Stewardship and ELMs and supporting grant schemes such as Farming in Protected Landscapes, the Farming Incentive Fund and Farming Transformation Fund [note – CS only has a few more years to run]	Defra, E.L.M. delivery body, CCB, FWAG, FC, EA, NE, FarmEd
	Provide local guidance support for ELM applicants to ensure local priorities are included and delivered	CCB, FWAG, Wildlife Trusts, Land Agents
	Encourage and support the formation of Farm Clusters across	CCB, FWAG, Wildlife Trusts, FarmEd

	the Cotswolds to deliver benefits at a landscape scale	
	Increase the awareness of the benefits and practicalities of cost-effective climate mitigation measures	NFU, CLA, Defra, EA, FWAG, FarmEd, Universities and colleges
	Provide advice and guidance to farmers and land managers on mitigating the landscape impacts of adapting to climate change e.g. agroforestry	CCB, FarmEd, FWAG
	Localise food production and supply and increase demand for climate- and nature-friendly products. Promote Community Farming initiatives Encourage public procurement of local, climate-friendly food	Farm businesses, NFU, CLA, local communities, GREAT ²⁴ Crown Commercial Services, public authorities, Food for Life
	Monitor the impact of pests and diseases and promote management to minimise effects	Defra, FC, NE, AHVLA
	Support and encourage the use of farm carbon calculators	NFU, CLA, FWAG, CCB, FarmEd, Universities and colleges
	Promote forms of farming business diversification appropriate to the Cotswolds National Landscape	CCB, NFU, CLA, FC, Local Authorities, FarmEd

²⁴ Gloucestershire Regenerative Environment and Agriculture Transition (GREAT) project

Woodland and trees

Woodland covers around 14% of the Cotswolds AONB and the type, scale, location, frequency and sometimes absence of woodland cover is a key characteristic of landscape character.

The most important woodlands are the ancient and semi-natural woodlands, many of which are designated as SSSIs. They consist largely of native hardwoods or Plantations on Ancient Woodland Sites (PAWS) and have a rich distinctive ground flora. Some of the most impressive are the beech-yew woods that lie along the escarpment between Dursley and Birdlip and the ash-maple-hazel woodlands around Bath.

Conifer plantations occur occasionally across the Cotswolds AONB, usually on the high wold and dip slope.

Trees outside of woodlands are important in the wider landscape as roadside trees, trees in fields, hedgerow trees and trees in parks, gardens and urban open space, often as trees that provide strong landscape features either singly or in small groups.

The Government is committed to achieving net zero emissions by 2050. To help achieve this the Government has a target to increase woodland cover in England from 10% to 12% by 2060 in the 25 Year Environment Plan and within its election manifesto to increase tree planting across the UK to 30,000 ha per year by 2025. The annual target for England is 10,000ha. The Cotswolds has a role in delivering these targets whilst conserving and enhancing the landscape and ensuring space for other habitats.

Most woodland in the Cotswolds, including young plantations, is undermanaged or not managed, reducing resilience, biodiversity value and timber quality. A number of woodlands, particularly on the dip-slope and around Bath, were traditionally managed by coppicing providing materials for building, thatching, tool handles etc. Re-introducing coppicing can greatly benefit the wood and biodiversity and provide products such as wood fuel, charcoal and stakes and binders for hedgelaying.

A major threat to woodland and trees are pests and diseases particularly non-natives that have become established in the UK. Others such as Emerald Ash Borer and Xylella have become established on the near continent are a constant threat and being monitored closely.

Ash dieback is present across the Cotswolds and could result in up to 95% of ash trees being lost over time. Ash is a predominant tree in the Cotswolds and the impact will be considerable.

Grey squirrel and deer cause considerable damage in woodlands and young plantations respectively. Their populations continue to grow and will benefit greatly from increased woodland creation.

Predicted climate change impacts on woodland and trees

Woodland and trees have historically seen environmental change but today's growing conditions are different from anything in the past and the rate of change may be up to 30 times faster than trees have ever managed to adapt to on their own²⁵.

Increased timber and biomass yield can be expected in the short to medium term due to a longer, warmer growing season. In the longer term more frequent drier summers will lead to drought stress and a reduction in growth rates and higher risk of secondary disease outbreaks and fire. Both a longer growing season and drought stress will lead to a reduction in timber quality. Increasing intensity of weather events, particularly wind, will lead to increased damage and risk of windthrow.

Woodland and tree cover will increase in response to climate change mitigation and carbon sequestration targets.

Some species, such as pedunculate oak, are expected to fare better than others. The Cotswolds are on the boundary between the south east where beech is predicted to struggle, particularly on drought prone soils and the north and west where is expected to thrive and its natural range expand²⁶. Establishment of new woodland will become more difficult, particularly on the thin brash soils, due to increasing risk of drought conditions.

Changes in rotation length, stocking rates and forestry operations can be expected along with the use of different species and provenance. The current trend towards broadleaves is likely to continue. Markets for biomass/woodfuel are likely to increase.

Aim

Woodland and trees adapt to climate change and become an economically viable resource whilst maintaining the landscape character and special qualities of the Cotswolds.

Strategy

	Strategy	Stakeholders
WT1	<p>Extend the area of woodland actively managed to increase resilience, optimize carbon sequestration and maximize benefits for biodiversity and people.</p> <p>Re-introduce coppice rotation, particularly in woodland with redundant coppice.</p>	<p>NE, FC (via CS and ELM), Landowners, Farmers, NFU, CLA,</p> <p>FC, NE, Small Woods Association, CCB</p> <p>FC, NE (via CS and ELM), Agents/consultants</p>

²⁵ John Weir, National Woodland Resilience Adviser, Forest Services

²⁶ <https://www.forestresearch.gov.uk/documents/942/fcin069.pdf>

	Provide guidance on woodland management and assistance with management plans	
WT2	Provide information and guidance on tree planting and woodland creation ensuring the right tree in the right place for the right reason to conserve and enhance the landscape character and special qualities of the Cotswolds AONB	CCB, FC, local authorities, NFU, CLA, CPRE, communities
WT3	Explore and promote appropriate alternatives to traditional woodland creation such as wood pasture and silvo-pasture.	CCB, FC, FWAG, Woodland Trust
WT4	Woodland creation and restocking after felling should comprise $\frac{1}{3}$ of trees from selected seed sources from the same Region of Provenance as the site to be planted (403 and 404 for the Cotswolds), $\frac{1}{3}$ from the region to the south (404 and 305) and $\frac{1}{3}$ from northern France to increase resilience to climate change as recommended by the Forestry Commission ²⁷ . Importing tree stock or seed should follow current biosecurity measures.	CCB, FC, NE, landowners, agents, nurseries
WT5	Establish Deer Management Groups (DMGs) across the Cotswolds Monitor deer population and impacts	CCB, FC, landowners, Defra (ELM) FC, DMGs
	Monitor the Pine Marten reintroduction into the Forest of Dean and impact on grey squirrel population, particularly any unintended consequences	FC, GWT

²⁷ CCB 2017, Woodland creation and tree planting in the Cotswolds AONB – Tree species and provenance. <https://www.cotswoldsaonb.org.uk/wp-content/uploads/2017/07/Position-Statement-on-Tree-Species-and-Provenance-June-2017.pdf>

WT6	Promote the coordinated control of grey squirrel (link with DMGs above).	FC, landowners, Defra (ELM)
WT7	Monitor the spread and impact of pests and diseases, including those not yet present in the UK and promote action plans to eradicate the pest/disease or minimise effects.	Forest Research, FC, Defra, FC, NE, Animal and Plant Health Agency (AHPA)
	Monitoring feral boar populations in the Forest of Dean and South East (currently absent from the Cotswolds)	FC
WT8	Develop markets for locally produced timber, wood and woodland products	Government, LEP, local authorities, Confor,
WT9	Promote forms of forestry and woodland business diversification that deliver local energy production appropriate to the AONB	Gov, CCB, local authorities, NFU, CLA, FC, Confor. Energy Agencies