

Climate Change

Potential Impact of Climate Change on the Cotswolds AONB

The impact of climate change on the landscape of the Cotswolds may be considerable. An analysis of predicted trends in rainfall, temperatures and wind speeds will provide an indication of the implications of the actions needed to be taken to mitigate where possible the impact of climate change, and to adapt to the changes which occur.

Future Climate Scenarios for the Cotswolds AONB

For the Cotswolds AONB, the potential changes in climate by 2080 are as follows¹ :

The Cotswolds will continue to get warmer:

- Average annual temperature will increase by up to 4.5°C

Summers will continue to get hotter and drier:

- Warmer by up to 3.5°C
- Drier by up to 55%
- The thermal growing season is expected to continue to lengthen
- Soil moisture levels are expected to decrease

Winters will continue to get milder and wetter:

- Milder by up to 3.5°C
- Winters up to 30% wetter

Some weather extremes will become more common, others less common:

- The number of very hot summer days is expected to increase, and high temperatures similar to those experienced in August 2003 or July 2006 (>3°C above average) are expected to become common by the end of this century
- The number of very cold winter days is expected to decrease, and low temperatures similar to those experienced in February 1947 or January/February 1963 (>3 °C below average) are expected to become highly uncommon by the end of this century
- Winter storms and mild, wet and windy winter weather are expected to become more frequent

¹ *Warming to the Idea: meeting the challenge of Climate Change in the South West, South West Region Climate Change Impacts Scoping Study, South West Climate Change Impacts Partnership, 2003; also, the UK Climate Impacts Partnership (UKCIP) website*

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Additional Information

Climate change will potentially impact on all aspects of the Cotswolds AONB, including^{2,3}:

Biodiversity

- In a warmer climate, species at the southern edge of their range are most at risk of loss from the AONB.
- Those species vulnerable to drought (most importantly beech) or which require a sub-zero period to break seed dormancy would also be at risk.
- Flora and fauna with more southerly distributions and naturalised alien species could expand within the Cotswolds.
- Calcareous grassland is thought to have a medium-high vulnerability to climate change⁴.
- Plant community changes under summer drought and generally drier conditions.
- Herbs and deep rooted species including salad burnet and brunet saxifrage increasingly dominate under drought and drier conditions.
- Existing habitat fragmentation may prevent species expanding or contracting their range, resulting in further habitat fragmentations and possible species / habitat loss.

Historic Environment

- Potential increase in storm damage, light-degradation, rain damage, fungal and beetle damage to historic buildings.
- Maintenance of historical planting schemes will be difficult in gardens which were created in a colder climate.
- Damage to archaeological sites through soil dessication and changing farming practices could affect the integrity of the historic environment.

Natural Resources (e.g. rivers, wetlands, water resources and soil)

- Increased number, frequency and severity of flood events.
- Water resources will come under greater strain as summer droughts potentially grow longer, demand for irrigation grows and water sources face possible increases in harmful organisms and nitrates.
- Rivers and streams are given high vulnerability rank by Hossell et al⁵.
- Increased flashiness of river and stream flow caused by variations in rainfall and increased storm events.
- Lower rainfall to dilute pollutants, leading to reduced water quality.

² *Warming to the Idea: meeting the challenge of Climate Change in the South West, South West Region Climate Change Impacts Scoping Study, South West Climate Change Impacts Partnership, 2003*

³ *The Potential Impacts of Climate Change on the Cotswolds Area of Outstanding Natural Beauty: Attempts Towards Determination and Recommendations for Action, Richard Garland, Thesis submitted in partial fulfilment of the requirement for the MSc Degree in Rural Estate Management, Royal Agricultural College, 2006*

⁴ *Climate change and UK nature conservation: a review of the impact of climate change on UK species and habitat conservation policy, Hossell, J.E., Briggs, B., and Hepburn, I.R., Department for Environment, Transport and the Regions, London, 2000*

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- Increased runoff, pollution and silt into water courses due to increased winter rainfall, storm occurrence and water logging of soil.
- Decreased aquatic habitat quality due to above effects.
- Fish migration and spawning may be impeded by low flows and increased turbidity.

Rural Land Management:

- Higher carbon dioxide levels and temperatures and a longer growing season will enhance yield and quality of some crops and offer the potential for growing new crops such as sunflower, navy beans, sweet corn, grapes and bio-fuels including vegetable oils.
- Increased yields could be offset by a lack of precipitation and soil moisture and farmers are likely to look for varieties and types of crop which suffer less from moisture stress.
- Potential increase in pests and diseases, including species new to the AONB, and a decreased winter die-off of pests and diseases, leading to increased reliance upon chemical control.
- Decreasing growing season precipitation leading to decreasing grass production potential. This may drive farmers to maximise the output from pastures by heavy nitrogen application, with detrimental impacts on the biodiversity of grassland. Alternatively, farmers may decrease the intensity of pasture based farming.
- The unsuitability of the Cotswolds area to animals currently farmed there may lead to either a decreased intensity of farming in the area or selection of breeds which fare better under higher temperatures.

Trees

- Lowland beech and yew woodland is given a vulnerability rank of medium by Hossel et al⁵.
- Broadleaved trees are very susceptible to damage from major storms when in full leaf, while windthrow can be a serious problem for conifers at any time of the year.
- There may be greater susceptibility to fungal diseases such as Phytophthora, particularly for coniferous species, more damage by green spruce aphid, and the prospect of new imported diseases taking hold.
- Increased risk of tree stress and loss through high temperatures and summer drought.
- Increased gaps in woodland due to tree loss from above, leading to increased patchiness of woodland.
- Change in competitive mix of woodland species.
- Small leaves, dieback and increased mast years.
- Increased risk of fires due to drier climate.
- Increased biomass and vigour due to increased temperature and carbon dioxide concentration.

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Tourism

- Longer, more reliable summers and warmer winters extend the tourist season.
- Increased heatwaves and extreme weather in Mediterranean and other overseas tourism areas expected to bring increase in domestic tourism.
- Increased opportunities for outdoor recreation and warm weather services.
- These factors may lead to an increase in congestion, loss of tranquillity and erosion

Consequently the effect of climate change on the AONB may have distinct influence on the character of the area by affecting each of the different elements of the landscape. Loss or changes to woodland species composition, summer scorching of grass, changing arable cropping regimes and fires would all have the potential for a major change to the character of the AONB and if all of the above were to become significant then it is not unthinkable that the designation of the Cotswolds as an AONB may be in question.

Policy options to cope with climate change⁶

Hossell et al., (2003)⁷ suggest that there are three types of management strategies which may be applicable:

Preservation: implies a high degree of intervention to resist natural responses of species and habitats to climate change.

Dynamic Solutions: Include all management responses actively working with the direction of climate changes, recognising that change will be needed to be managed and helped.

Laissez-faire: Strategy acknowledges that in some situations the magnitude of climate change will overwhelm any efforts to protect the species or habitat types.

It is likely that the future strategy will involve a combination of two or more of these three methods, depending upon the severity and speed of climate change and the adaptability of the species or habitat involved.

⁶ *The Potential Impacts of Climate Change on the Cotswolds Area of Outstanding Natural Beauty: Attempts Towards Determination and Recommendations for Action, Richard Garland, Thesis submitted in partial fulfilment of the requirement for the MSc Degree in Rural Estate Management, Royal Agricultural College, 2006*

⁷ Hossell, J.E. et al; Climate Change and nature conservation: implications for policy and practice in Britain and Ireland. *Journal for Nature Conservation* **11** (1) 67-73 (2003)

Case Study: Beech Woodland

Summer drought, higher temperatures and increased storms may have a detrimental effect on the beech woodland which is a special quality of the AONB. The options to deal with loss would be as follows:

Preservation:

- Replace lost beech with new beech trees or encourage natural regeneration of beech within woodland gaps
- Manage the invasion of other species which attempt to colonise the gaps left by the failing beech trees
- Encourage planting of further areas of beech woodland in the hope that increased populations would have a better chance of survival.

Dynamic Solutions:

- Managing the change taking place within the beech woodland, reviewing woodland strategy to favour the planting of more resilient native species (such as oak or ash) to fill the gaps left by failing beech communities.
- Identifying areas where the micro-climate may be favourable for supporting beech woodland and encouraging its preservation within these areas (which may involve the planting of new areas of woodland).

Laissez-faire:

- Recognise that the loss of beech woodland from the Cotswolds AONB may be inevitable due to the scale of climate change.
- Consequently no efforts to keep beech woodland within the AONB are encouraged and the impacts of climate change are allowed to take their natural course.

This scenario would be used for the other habitats and species identified as special qualities of the Cotswolds AONB in drawing up the climate change strategy.