A review of the potential impacts of climate change on the Bracknell Forest Biodiversity Action Plan

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1. Introduction

Climate change is the long-term shift in the earth's weather patterns and temperature. The Intergovernmental Panel on Climate Change (1) has published information to show that the climate is changing and what the causes of that change are (2). This review explores what the changes in the local climate in Bracknell Forest are likely to be, how that might affect local wildlife, and how the Bracknell Forest Biodiversity Action Plan can respond.

The Bracknell Forest Biodiversity Action Plan (BAP) (3) is a partnership document which sets out how the aim to conserve and enhance biodiversity within Bracknell Forest Borough can be met. The implementation of the plan is overseen by the Biodiversity Forum, a group of local individuals and organisations with an interest in nature conservation. The review of old targets and creation of new targets within the new plan have been carried out with active involvement from the members of the forum. Recently, this group has decided to re-name itself the Bracknell Forest Nature Partnership.

One of the targets of the BAP is to 'Publish a review on the impacts of climate change on the BAP and identify actions and this review is intended to meet that target.

The following sections will summarise the projections for climate change in South East England, examine the potential consequences for habitats and species in Bracknell Forest, propose actions to mitigate for a changing climate and consider the implications for future Biodiversity Action Plans.

2. Climate change projections for South East England

2.1 Climate projections

The Department for Environment, Food and Rural Affairs (Defra) and the Department of Energy and Climate Change (DECC) published the UK Climate Projections 2009 (UKCP09) (4). These detail the likely climate changes to the 2020s, 2050s and 2080s under low, medium and high emissions scenarios.

Under the medium emissions scenario, the following are the central estimates (most likely) of changes in the climate of South East England by 2050:

- An increase in winter mean temperature of 2.2ºC; it is very unlikely to be less than 1.1ºC and is very unlikely to be more than 3.4ºC.
- An increase in summer mean temperature of 2.8ºC; it is very unlikely to be less than 1.3ºC and is very unlikely to be more than 4.6ºC.

- An increase in winter mean precipitation of 16%; it is very unlikely to be less than 2% and is very unlikely to be more than 36%.
- A decrease in summer mean precipitation of -19%; it is very unlikely to be less than -41% and is very unlikely to be more than 7%.

There are projected to be more days of heavy rain (greater than 25 mm of rain falling in a day), fewer days in the winter when heating is required and more days in summer when cooling (air conditioning) is required.

In summary the UKCP09 shows that in South East England the most likely scenario is for warmer, wetter winters and warmer, drier summers.

2.2 Observed changes

The UK Climate Projection also publishes data on observed changes in the UK climate (4). This data shows how the climate has already changed in the period 1961 – 2006. The data (Table 1) shows that already summers and winters are warmer, there are fewer frosts, more winter rainfall and less summer rainfall. There have also be more days where cooling has been required and fewer days where heating has been required.

Table 1: Observed trends in South East England from 1961 to 2006 by season, based on a linear trend

	Spring	Summer	Autumn	Winter	Annual
Change in daily mean temperature (ºC)	1.56	1.77	1.32	2	1.62
Change in days of air frost	–5.1	–0.1	–2.1	–14.8	–23.4
Percentage change in total precipitation	–6.5	–13.1	20.6	23.3	5.4
Change in cooling degree days					26.9
Change in heating degree days					–18.3

The observed trends are consistent with the climate projections for warmer, wetter winters and warmer, drier summers.

3. Potential impacts on BAP habitats

This section outlines the potential consequences of climate change projections for habitats in Bracknell Forest, based on those detailed in the Biodiversity Action Plan. Information for this has been drawn from the Terrestrial Biodiversity Climate Change Impacts Report Card 2012 -13 (5). The impacts are detailed on a habitat by habitat basis.

3.1 Grassland

Increased winter and spring temperatures could lead to earlier spring growth in grassland and a longer growing season. This could lead to more vigorous growth from grasses and greater competition with wild flowers.

Reduced summer rainfall and increased evaporation and transpiration could lead to a change in the species composition of plant communities in wet lowland and floodplain meadows. More dry grassland species are likely to increase in previously wet grasslands due to reduced moisture levels in the soil.

3.2 Woodland

Leafing may commence earlier in the year in response to increased temperatures and this may be having a negative impact on woodland flora, particularly spring-flowering species.

Woodland structure could change as a result of changes in rainfall and temperature. Some trees are more sensitive to drought than others, including beech, birch and sycamore. Wet woodlands on seasonally inundated soils in southeast England may be affected by summer drought as these soils will be drier. An extreme drought could lead to widespread death of sensitive tree species and a change in the character of some British woodlands. This may have an important effect on epiphyte (plants that grow on other plants, particularly trees) communities.

Pests and diseases (both those that are currently present in the UK and those that may be introduced) may become more prevalent or have a greater impact on tree and woodland health as climatic conditions become more suitable.

3.3 Heathland

Lowland heath in southeast England could be threatened by reduced rainfall and the resulting increased fire risk, and could be replaced by dry, acid grasslands.

3.4 Wetland

Reduced rainfall in summer months may adversely affect wetland habitats causing them to dry out, with lowland fens particularly likely to be under increasing threat in southeast England. Drying out of wetland habitats may have major impacts on migratory birds, many of which are dependent on these areas at some point in their life cycle. Lower summer

rainfall may also increase extraction of water from wetlands for irrigation, affecting wetland water levels.

4. Potential impacts on BAP species

The section outlines the potential consequences of climate change projections for Biodiversity Action Plan species. Information for this has been drawn from the Terrestrial Biodiversity Climate Change Impacts Report Card 2012 -13 (5). The impacts are detailed for each group of species.

4.1 Plants

BAP species:

- Ragged Robin (*Lychnis flos-cucli*)
- Devil's Bit Scabious (*Succisa pratensis*)
- Wild Service Tree (*Sorbus torminalis*)
- Cowslip (*Primula veris*)

Plants flowering at the end of summer may be more vulnerable to the impacts of drought and heat stress, as they will benefit less from projected increases in winter rainfall than species that flower in the early part of the year.

4.2 Invertebrates

BAP species:

- Bumblebees (*Bombus* spp.)
- Stag beetle (*Lucanus cervus*)
- Brilliant Emerald Dragonfly (*Somatochlora metallica*)
- Silver-studded Blue (*Plebejus argus*)

Many butterfly species are more numerous in warm, dry summers, although there may be declines in numbers in following cooler, wetter years. Increasing summer temperatures have resulted in population increases for many southern generalist butterfly species and declines in northern butterfly species.

Higher temperatures have resulted in many southern and common British invertebrates having more northern distributions, including dragonflies and damselflies, butterflies, woodlice and millipedes. Although the changing climate might be more suitable for some species, others that need to move to cooler areas of the UK may not be able to, particularly

in fragmented landscapes. A number of invertebrates have colonised the southern UK from Europe in recent years and are expanding their range northwards – especially flying species of Hymenoptera (wasps, bees and ants) and Odonata (dragonflies and damselflies).

Some invertebrate species may adapt their habitat requirements or evolve to cope with changing conditions. For example, as a result of increases in temperature, the requirements of some warmth-loving species (including some butterflies such as the silver-spotted skipper) for sparse or short vegetation may be reduced as they adapt to taller vegetation providing cooler, shaded microclimates.

Warmer spring and summer temperatures have resulted in earlier flight periods for spring species of dragonfly and damselfly and the earlier appearance of some species of hoverfly. Earlier emergence or flight dates have the potential to lengthen the season suitable for reproduction; warmer temperatures may result in faster completion of insect life-cycles at northern latitudes. This may lead to additional generations of insects but they may not survive if access to food is limited.

4.3 Amphibians

BAP species: Great Crested Newt (*Triturus cristatus*)

Lower summer rainfall may result in ponds drying out earlier, affecting breeding in amphibians. However, higher spring temperatures may mean breeding starts earlier.

Some species of reptile and amphibian may be able to exist further northwards as the climate warms, but for some, this northwards movement may be limited due to habitat fragmentation. Other species may find the climate of England intolerable but could move northwards to Scotland.

4.4 Fish

Brown Trout (*Salmo trutta*)

Lower summer rainfall may lead to reduced flow in rivers which could prevent fish reaching spawning areas. More frequent winter flooding may affect the survival rate of eggs and young fish.

4.5 Birds

BAP species:

- Bullfinch (*Pyrrhula pyrrhula*)
- Kingfisher (*Alcedo atthis*)
- Dartford Warbler (*Sylvia undata*)
- Woodlark (*Lullula arborea*)
- Nightjar (*Caprimulgus europaeus*)
- Skylark (*Alauda arvensis*)
- Barn Owl (*Tyto alba*)
- Swift (*Apus apus*)

Lower soil moisture as a result of lower rainfall could negatively affect the breeding success or survival rates of ground-feeding bird species such as the song thrush and blackbird, which feed on invertebrates which cannot tolerate drier soil conditions or those that require moist soils from which to get food.

Warmer winters are likely to increase the survival rates of some resident bird species, contributing to population increases. Warming is also likely to increase the diversity of bird communities.

Increased winter rainfall and spring rainfall could reduce the ability of some small birds to survive overwintering due to reduced food availability, greater energy expenditure, poor reproductive success and higher chick mortality.

Migratory birds may also be affected by a changing climate. For example changes in the timings of natural events, such as earlier peaks in availability of insects before they arrive at their breeding grounds may reduce survival rates.

Warmer and drier summers may cause shifts in traditional water levels in wetlands, increasing predation on birds nesting close to water bodies, such as grebes or swans.

4.6 Mammals

BAP species:

- Hedgehog (*Erinaceus europaeus*)
- Noctule bat (*Nyctalus noctula*)

Spring drought could reduce the breeding success of mammals such as badgers, hedgehogs and moles, which need earthworm prey for their young.

Reduced water flow in rivers as a result of lower rainfall would adversely affect mammals such as water voles and otters.

Mammals that rely on hibernation, such as hedgehogs, dormice and bats, have reduced their period of hibernation during warmer winters, which can affect spring body condition, breeding success and survival rates.

Warmer winters have increased breeding success and/or overwinter survival of mammals, including red deer and Soay sheep, badgers, rabbits and hares.

Climate changes may affect bat populations through changes in their yearly hibernation cycle, breeding success and food availability. Bat species that are associated with colder climates in northern latitudes could be more severely affected by climate warming, with some local extinctions possible.

5. Proposed actions

The following actions are proposed to monitor, mitigate for and manage (6) the effects of climate change on habitats and species in Bracknell Forest.

5.1 Habitats

Monitor changes in the structure and composition of habitats as a result of a changing climate. Information on changes in habitats are vital for implementing actions to mitigate for a changing climate and to manage its effects.

Existing habitats should be in **better condition** through sustainable management practices. For example, woodlands in positive conservation management have a greater range of microhabitats and niches better able to support a wider range of wildlife. **Restoring** degraded habitats is also important.

The management of semi-natural habitats needs to be **flexible** to be able to respond to changes. For example, cutting dates of hay meadows will need to respond to flowering times and growth rates.

Extending or **creating** new habitats will provide more areas for wildlife and improve **connectivity** between habitat patches.

Increasing the **heterogeneity** of habitats increases the range of available microclimates for which different species are adapted.

5.2 Species

Monitor populations of BAP species to identify trends. This allows work to be focussed on those species that are most vulnerable to climate change.

Provide **homes for wildlife**, especially those species that are vulnerable to habitat fragmentation or degradation.

Ensure habitat management is **sensitive** to seasonal changes and is **flexible** so as to avoid carrying out works when species may be vulnerable.

Ensure habitats are **big** enough and in **good condition** to support BAP species.

Improve **connectivity** between habitats and ensure connections are suitable for wildlife to use. Avoid the intrusion of inappropriate human infrastructure, such as lighting or hard surfaces.

Plant native species and avoid non-native species so as to provide homes and food for wildlife. **Control non-native invasive species**, such as Signal Crayfish, Rhododendron or Japanese knotweed, to reduce competition with native species.

6. Implications for future Biodiversity Action Plans

Future BAPs will need to incorporate the above actions and set appropriate targets. Actions and targets should consider the implications of a changing climate and measures that will mitigate for climate change, or allow adaptations to climate change.

Nonetheless, the main approach to nature conservation in the face of a climate change still reflects the key priorities as identified in the Lawton review ‘Making Space for Nature’ (7) which are **bigger** wildlife sites, **better** wildlife sites, **more** wildlife sites and more **joined up** wildlife sites. If the quantity and quality of wildlife sites can be improved, then wildlife and nature will be better able to respond to a changing climate.

7. Summary

The projections for climate change in South East England are for warmer drier summers and warmer wetter winters. The consequences of this for the natural environment are likely to be varied with some habitats and species benefitting, while others decline. Action to mitigate for and adapt to a changing climate is needed and this should be focussed on achieving the aims set out in the Lawton review of more and bigger wildlife sites in better condition and better connected.

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4. © Crown Copyright 2009. The UK Climate Projections (UKCP09) have been made available by the Department for Environment, Food and Rural Affairs (Defra) and the Department of Energy and Climate Change (DECC) under licence from the Met Office, UKCIP, British Atmospheric Data Centre, Newcastle University, University of East Anglia, Environment Agency, Tyndall Centre and Proudman Oceanographic Laboratory. These organisations give no warranties, express or implied, as to the accuracy of the UKCP09 and do not accept any liability for loss or damage, which may arise from reliance upon the UKCP09 and any use of the UKCP09 is undertaken entirely at the users risk.

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