SUMMARY REPORT

LONDON climate change PARTNERSHIP

Adapting to climate change

Creating natural resilience

October 2009

NATURAL ENGLAND

London Biodiversity Partnership

SUPPORTED BY LONDON DEVELOPMENT AGENCY WORKING FOR THE MAYOR OF LONDON

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Foreword

Two-thirds of London's land area is occupied by green spaces and water. These habitats support many familiar species, such as the house sparrow, robin and many varieties of plants, as well as nationally rare species including stag beetle, black redstart, water vole and rare chalk grassland species.

Climate change has been identified as a key challenge for London, but there is little understanding of how it may impact upon London's biodiversity, or how climate change adaptation strategies (to respond to flooding, drought and overheating) could present opportunities or threats to biodiversity. Accordingly, the London Climate Change Partnership, Natural England, London Biodiversity Partnership, London Development Agency and Greater London Authority commissioned research from Land Use Consultants to inform 'biodiversity friendly' climate change adaptation planning, decision making and action in London.

Climate change will impact directly on biodiversity as well as people. For example, hotter temperatures may lead to a change in species composition in certain habitats. Adaptation measures adopted to respond to flooding, drought and overheating could also benefit biodiversity. For example, measures to restore natural floodplain functions could restore habitats and benefit species, as could 'urban greening' measures needed to keep London cool. However, if opportunities are not actively identified, such biodiversity benefits could be missed, or biodiversity could be harmed by unsympathetic climate change adaptation activities.

This report is a first step in ensuring that climate change adaptation interventions respect and benefit London's biodiversity. We urge you to consider the issues presented here and how you and your organisation can help to implement the recommendations presented.

Gerry Acher, CBE LVO
Chair, London Climate Change Partnership

Andrew Jones,
Chair, London Biodiversity Partnership

Alison Barnes,
Director, London region
Natural England

Sutcliffe Park river restoration
© Environment Agency

Introduction

As London's climate changes we may see a decline in certain species, whilst other species are likely to expand their range, in turn changing the composition of London's habitats. How can we respond to such change most effectively?

The three main threats to London from a changing climate are:
1) Overheating
2) Flooding
3) Drought

The draft London Climate Change Adaptation Strategy[1] details a range of measures to respond to these threats. Some of these could affect biodiversity.

This document sets out actions needed to ensure impacts on biodiversity from climate change are minimised and opportunities are maximised.

Climate change in London could affect biodiversity in two distinct ways:

1. Direct effects e.g. changes in species composition due to higher temperatures.
2. 'Knock-on' effects resulting from climate change adaptation actions to address overheating, flooding and drought.

Decision makers should work together to ensure:

1. Biodiversity is managed in such a way as to be as resilient as possible to climate change.
2. Opportunities to benefit biodiversity through climate change adaptation measures are optimised, and any threats minimised.

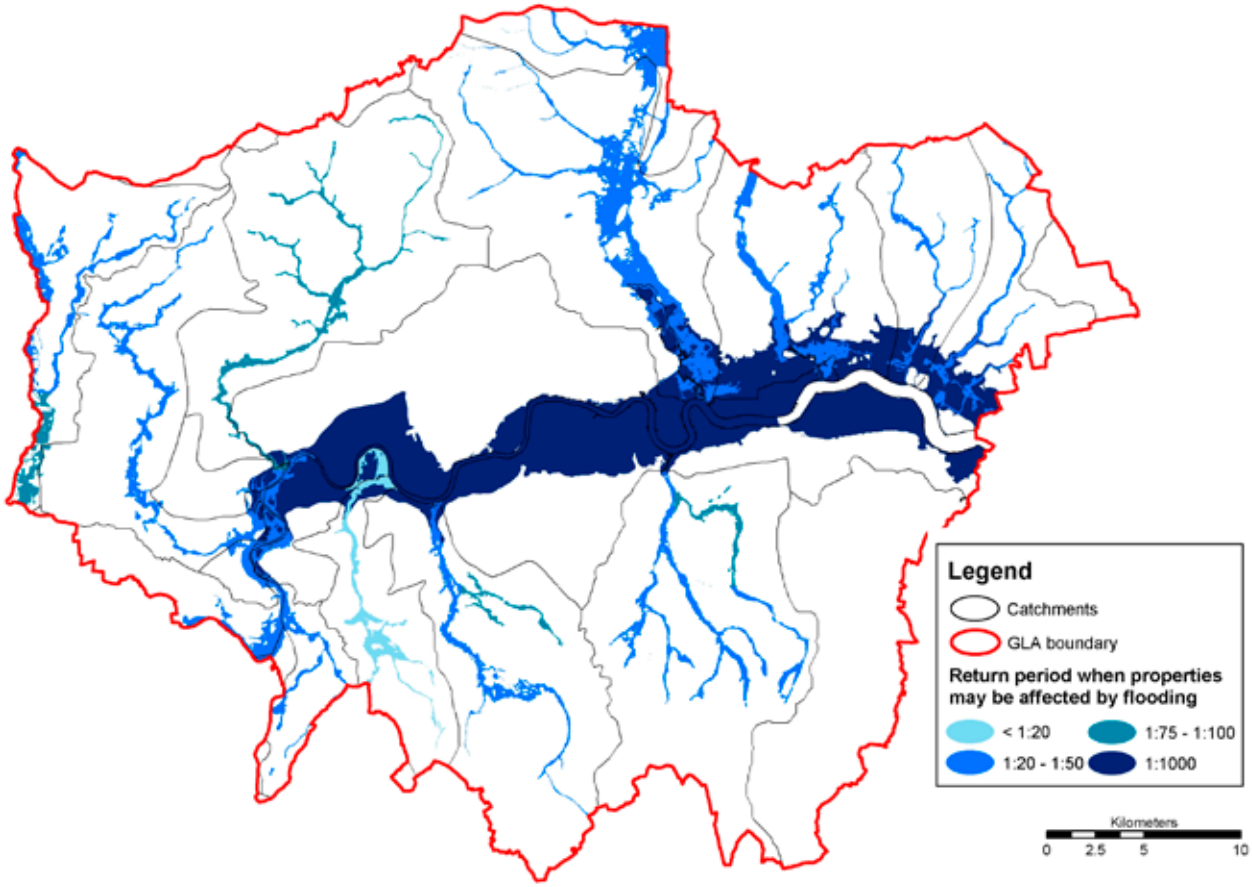
Whatever we do to cut greenhouse gas emissions from now on, climate change will continue for some decades because of emissions already in the atmosphere. This means that London will experience increasing risks of flooding, overheating and drought.

London's Changing Climate

Flooding

Current probability of flood risk from the Thames and its tributaries. London is prone to flooding from five sources - tidal, fluvial (from rivers and tributaries), surface (from rainfall), sewer and groundwater flooding. Climate change will increase the probability of flooding through more frequent intense rainfall, rising sea levels and increased tidal surges.

Tidal and fluvial flood risk

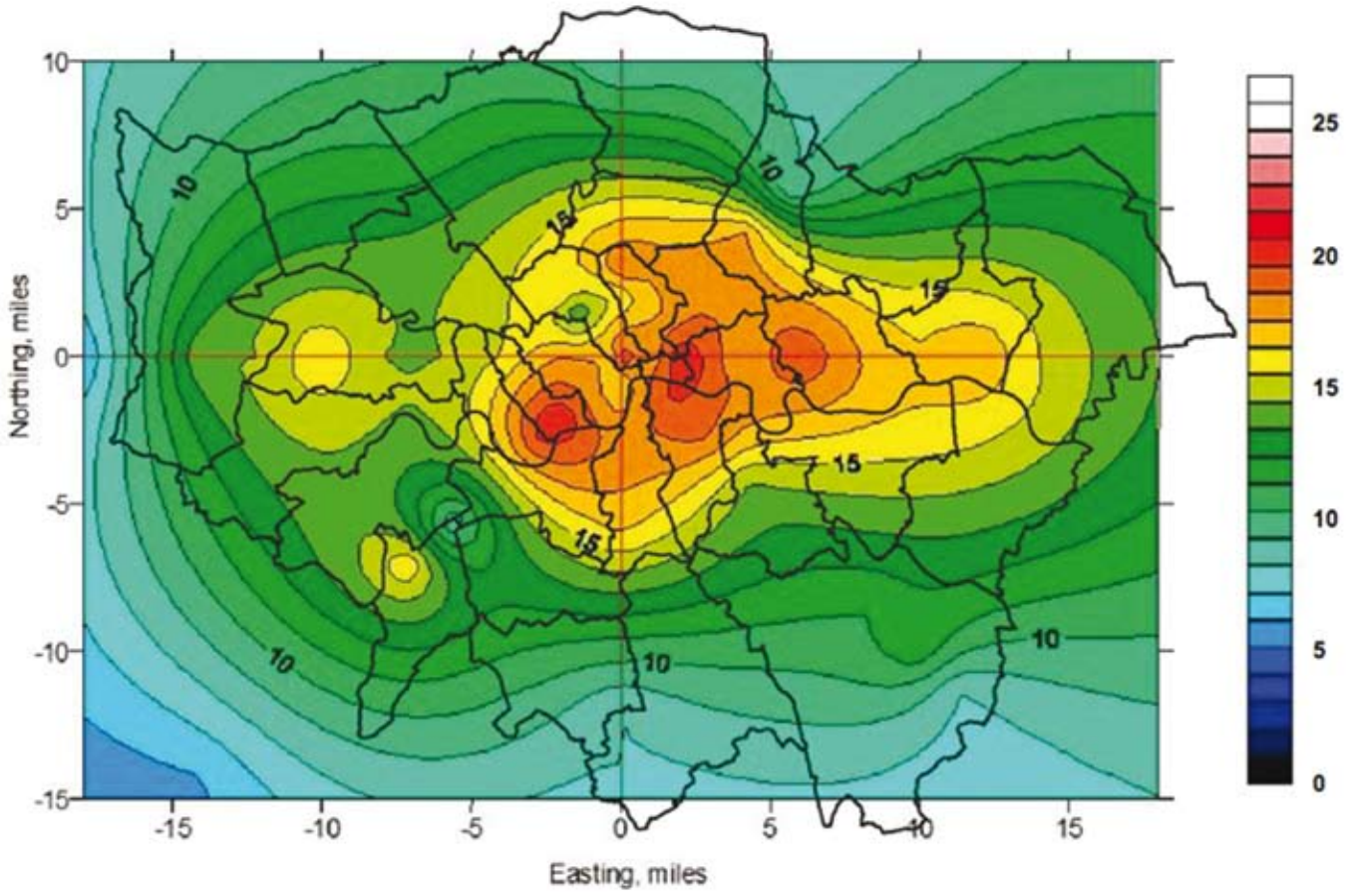


Source: Environment Agency.

Overheating

London experiences an Urban Heat Island effect, such that in Summer 2003 temperatures in the centre of London were up to 10°C higher than outlying rural areas. By the middle of this century we can expect temperatures similar to recent heatwaves in most summers.

The London urban heat island

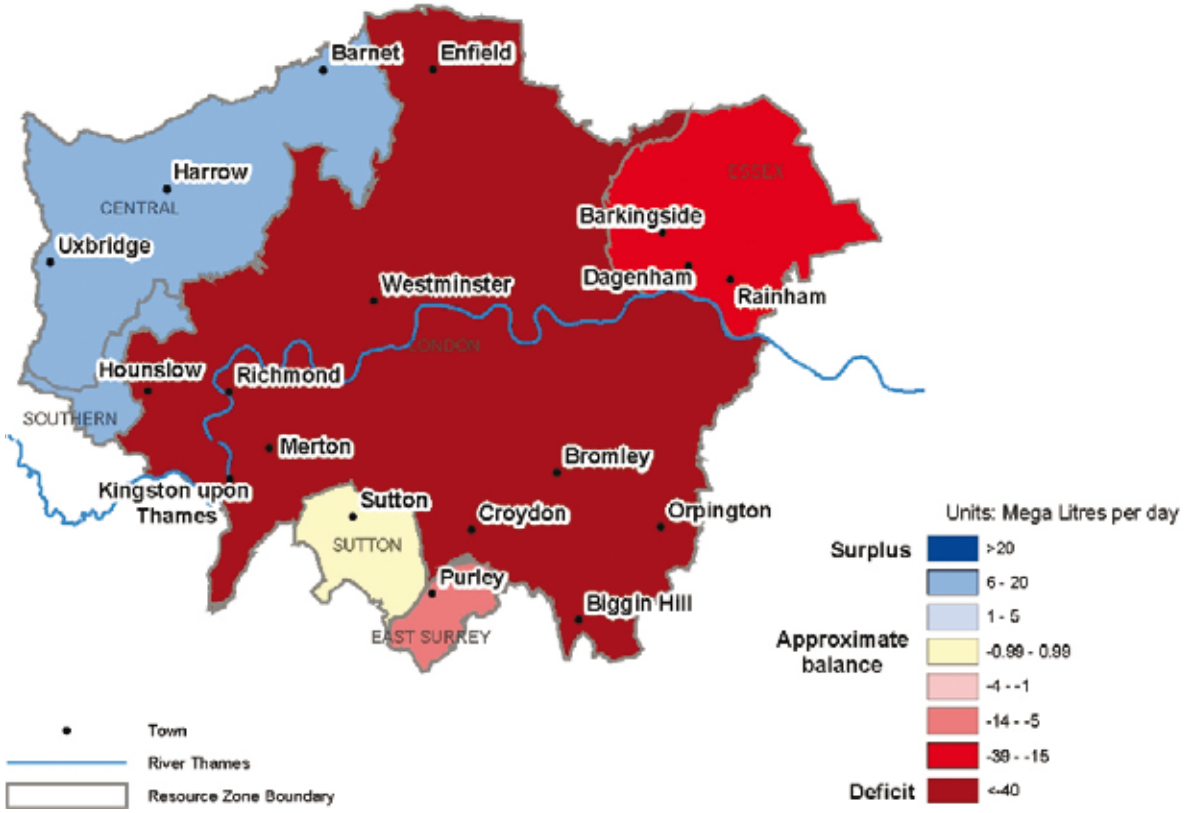


Source: GLA/Watkins et al. (2002). The London Heat Island: results from summertime monitoring, Building Services Engineering Research and Technology, Vol. 23, No. 2, 97-106.

Drought

London's estimated water supply availability in a dry year for 2008/09 showing areas of deficit. London's future rainfall is expected to become more seasonal, with more winter rain (up to 30% more by 2080s) and less in summer (up to 50% less by 2080s). This will further increase the imbalance between the supply and demand for water in London.

Estimated water supply availability (in a dry year) within Greater London for 2008/09.



Source: Environment Agency

London's Biodiversity

London enjoys a remarkable amount of space for nature in contrast to many other major cities. Two-thirds of its area is occupied by green spaces or water. The maps overleaf illustrate the distribution of key habitat types, which include:

- Fresh and saltwater habitats - rivers and streams, canals, lakes and ponds.
- Woodland - including ancient woodland.
- Lowland grassland and heath - including acid grassland, neutral grassland, floodplain and coastal grazing marshes and chalk grassland.

London's habitats provide a range of important functions including:

- Providing homes for wildlife.
- Creating a sense of place.
- Recreational opportunities, including access to nature and supporting healthy living.
- Regulating the hydrological cycle and flood management.
- Economic benefits through visitor spend and attracting businesses.
- They have their own intrinsic value as part of our natural heritage.

Southern Hawker Dragonfly
© Mike Waite

Watervole © Mathew Massini

How will climate change affect london's biodiversity?

Direct Effects

Changing 'climate space' for London's habitats and species

Climate space is the area a species can live in because the climate is suitable. As climate changes, so too will the climate space suitable for different species. For example, wasp spiders, which are found on the south coast of England, are extending their distribution northwards as winters get milder.

London is subject to an urban heat island effect, whereby temperatures are higher compared to the surrounding countryside, due to the thermal mass of buildings and thermally absorbent surfaces. Rising temperatures could particularly threaten habitats such as rivers and standing waters.

Some London species are likely to decline as conditions become unfavourable (for example, too hot or too dry), but others may become more common. New species are likely to colonise London's habitats as their climate space shifts northwards from Europe and southern England.

However, species decline may be hastened and colonisation by new species limited due to a lack of habitat connectivity or dispersal capabilities. Many of London's most valued habitats occur in isolated pockets, surrounded by areas of dense urban development and infrastructure. This lack of connectivity acts as a barrier to species dispersal. This is particularly the case for acid grassland and heathland.

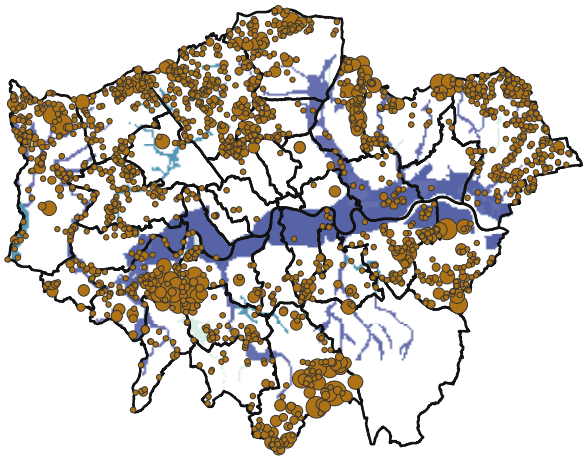
Habitats: impacts will be mixed

Key findings:

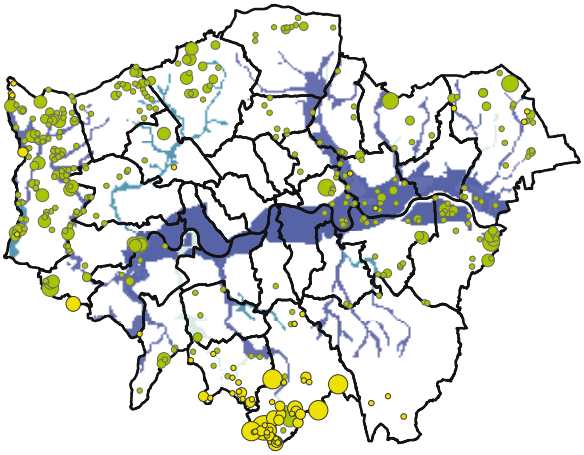
- **Standing water habitats** could experience a loss of some species of amphibians and fish due to reduced water availability.
- **Rivers and streams** will be affected by higher summer temperatures due to reduced oxygen levels. Increased flash flooding could lead to scouring of in-stream habitats and increased pollution.
- **Amenity grassland may be more difficult to maintain due to increasing temperatures**, as this vegetation type is highly susceptible to drying out. This may present opportunities for ecological enhancement utilising drought tolerant native plant species.
- **Neutral grassland and heathland are likely to be at medium risk from the direct impacts of climate change.** Changes in the relative abundance of characteristic species may occur. For example, grasses may become

London's habitats in relation to the probability of flooding

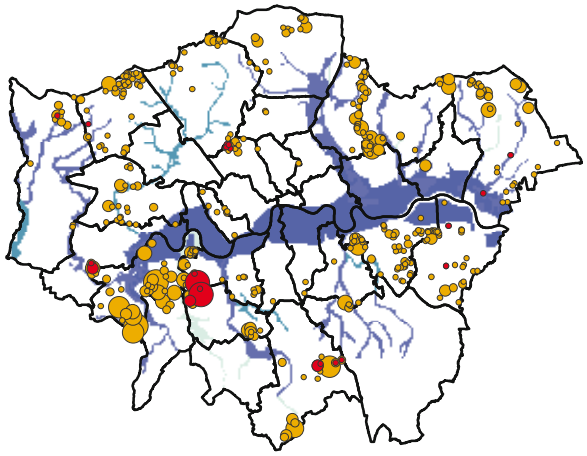
Woodland



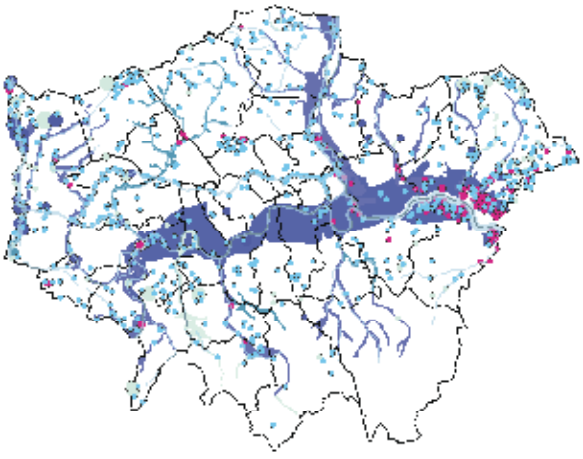
Neutral Grassland and Chalk Grassland



Heathland and Acid Grassland



Standing Water and Wetland Habitats



Area of London protected by flood defences
(with probability of flooding expressed as a return period)

- 1:1000 year
- 1:75- 1:100 year
- 1:20 - 1:50 year
- <1:20 year

Habitat type

- Acid grassland
- Heathland
- Chalk grassland
- Neutral grassland
- Woodland
- Ponds
- Eutrophic standing water
- Reed bed
- Wet woodland

N.B. Maps produced before L.B. Bromley data available.
Source: London Biodiversity Partnership/ GLA

NOTES: The standard of protection provided by London's flood defences, and hence the likelihood of being flooded can be mapped for tidal and fluvial flooding.
This probability is usually expressed as a 'return period'. The 'return period' is how often a flood of a given magnitude would be expected to occur over a long period of time.
For example, '1 in 100' means that a flood of that severity would occur only once, on average, every hundred years.

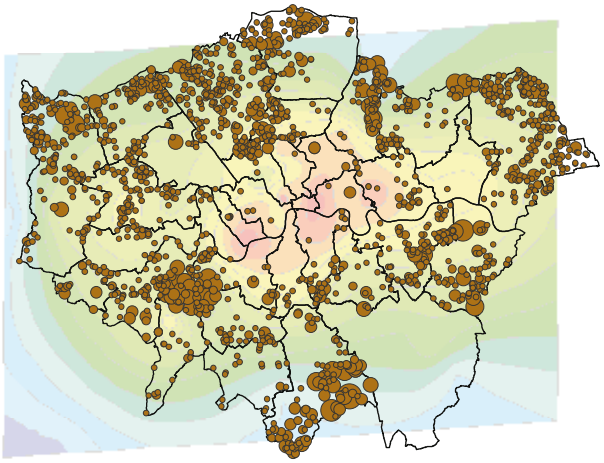
Common lizard.
© www.davidgreenphotography.co.uk

more prevalent than heather on heathlands, and deeper-rooted herbs on neutral grasslands.

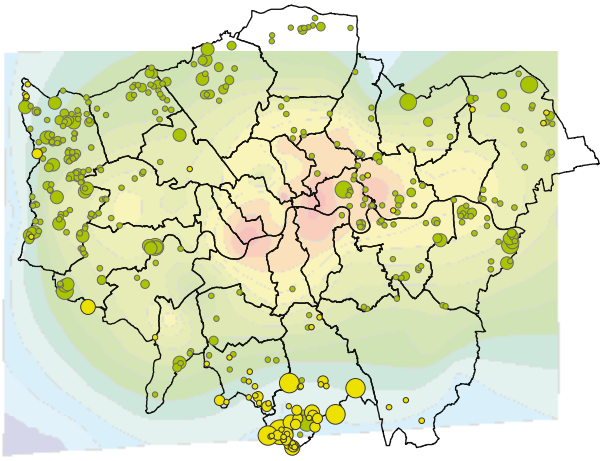
- **Woodlands are also likely to see a change in species mix.** Increased severity and regularity of summer drought may disadvantage shallower rooting tree species and characteristic species such as beech may decline. Woodlands will also be affected by storms leading to increased wind-blow of canopy trees and milder winters may foster greater survival of insect pests.
- **Acid grassland is likely to be moderately resilient** to the direct effects of climate change, particularly summer drought. If acid grassland is not to diminish in overall species richness, efforts will be needed to vary site topography and reduce barriers to species dispersal. Some loss of species with poor dispersal abilities is likely to be inevitable.
- **Chalk grassland is likely to be relatively resilient** to the direct effects of climate change because many species characteristic of this habitat are adapted to conditions of moderate drought and exposure. Climatic warming could increase the climate space available to several chalk grassland species in southern England which are currently at the northern edge of their distribution.

London's habitats in relation to urban heat island intensity

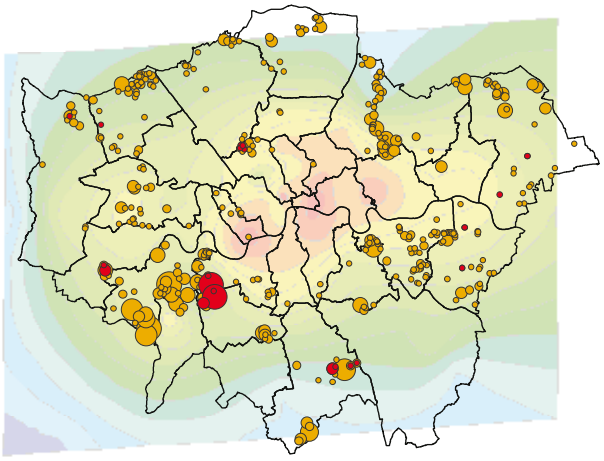
Woodland



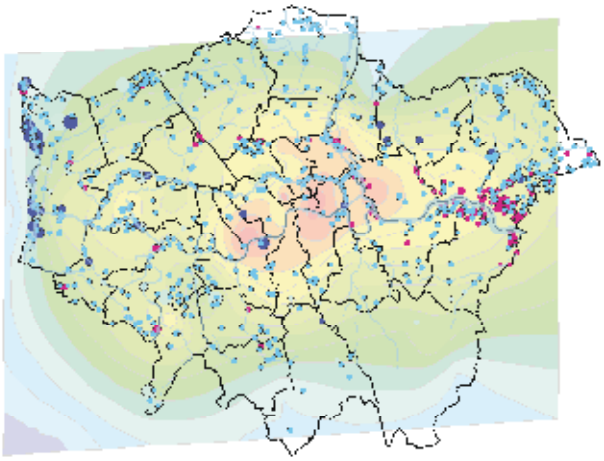
Neutral Grassland and Chalk Grassland



Heathland and Acid Grassland



Standing Water and Wetland Habitats



0 5 10 Km

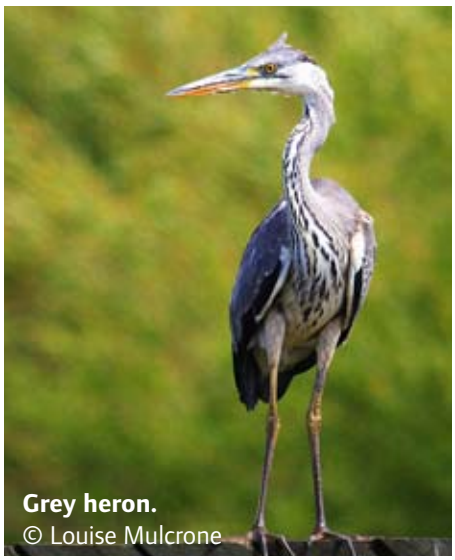
The number of occasions that temperatures exceeded 19°C for 48 consecutive hours.

21	17	13	09
20	16	12	08
19	15	11	07
18	14	10	06

Habitat type

- Acid grassland
- Heathland
- Chalk grassland
- Neutral grassland
- Woodland
- Ponds
- Eutrophic standing water
- Reed bed
- Wet woodland

N.B. Maps produced before L.B. Bromley data available.
Source: London Biodiversity Partnership/ GLA/ Watkins et. al. (2002). The London Heat Island: results from summertime monitoring. Building Services Engineering Research and Technology, Vol. 23, No. 2, 97-106
Notes: This Canopy Layer Map was developed using air temperature measurements gathered in 1999 - 2000.
The canopy layer heat island is the urban heat island we are most familiar with. It refers to the increased air temperature between ground level and roof height.



Grey heron.
© Louise Mulcrone

Species: some will be more resilient than others

- **Species dependent upon water based habitats** could be particularly adversely affected by drought.
- Milder winters and warmer summers could stand to benefit **reptile species** such as the common lizard.
- Some species such as the **grey heron and peregrine falcon** are likely to be relatively well equipped to respond to climate change
- The **responses of many species to climate change are uncertain**. Some are already declining for reasons unconnected to climate change. Climate change could exacerbate these existing problems, increasing the likelihood of further local extinctions. Other species may benefit from the availability of an expanded climate space, enabling their northwards colonisation, but only if they are able to disperse to suitable habitat patches in London.

A pragmatic response to climate change

Suitable climate space is likely to be lost for some species and gained for others, and decision makers and site managers must accept that changes in habitats and species will occur.

Focus should be placed upon conserving functional habitat processes which support biodiversity, for example, flooding cycles in a wetland or grazing regimes on a grassland, rather than trying to target management actions at the conservation of particular species.

TABLE 1: Principles for enhancing the ability of biodiversity to adapt to climate change[2]

	Applicability to London
1a. Conserve Protected Areas and other high quality habitats.	High
1b. Conserve range and ecological variability of habitats and species.	High
2. Reduce sources of harm not linked to climate change.	High
3a. Conserve and enhance local variation within sites and habitats.	High
3b. Make space for the natural development of rivers and coasts.	Medium-high
4. Establish ecological networks through habitat protection, restoration and creation.	Medium-high
5. Make sound decisions based on analysis	High
6. Integrate adaptation and mitigation measures into conservation management, planning and practice	High

Climate change adaptation measures present opportunities for biodiversity

Overheating

- Initiating a pan-London programme to identify, prioritise and implement opportunities for urban greening.
- Requiring all London boroughs to use their Open Space Strategies to manage the urban heat island through protecting local green spaces and identifying opportunities for urban greening.
- Helping Londoners adapt their behaviour and lifestyles to higher temperatures, in particular adapting parks and gardens to hotter summer temperatures.

Reprofiling © London Biodiversity Partnership

Flooding

- Creating new and enhancing existing flood storage capacity in urban green spaces.
- Requiring the installation of Sustainable Urban Drainage Systems (SUDS).
- Restoring rivers to provide increased floodwater storage.

Brown roof © London Biodiversity Partnership

Risks to biodiversity from climate change adaptation activities must also be managed

Examples include:

- Tree planting (to provide shade and cooling) in existing high quality habitats (or areas identified for the creation/restoration of other habitats - as detailed in the London Regional Delivery Framework) must be carefully plannned.
- More intensive use of habitats by people during hotter weather.
- The potential for heat exchange technology (where water is used to cool buildings and then returned) to cause thermal pollution of aquatic habitats.

Sutcliffe Park © Environment Agency

Pen Ponds car park grassland recovery project: **before (May 2004)**
© Nigel Reeve, The Royal Parks

...and after (August 2005)
© Nigel Reeve, The Royal Parks

Ensuring climate change adaptation actions benefit london's biodiversity

The three key responses needed to maximise biodiversity opportunities in the light of climate change are:

1) Urban greening and development of ecological networks:

- Incorporate biodiversity aims into planning/delivery of urban greening (parks, green roofs, etc)
- Increase connectivity between habitats
- Use drought tolerant species
- Create topographic/climatic niches
- Create a mix of habitat types.

2) River restoration and flood storage:

- Incorporate biodiversity aims into river restoration and flood storage schemes.

3) Appropriate wildlife habitat management to maximise the ability of biodiversity to adapt to climate change:

- Create micro-climatic variation through varied topography to help species respond to changes in temperature
- Use appropriate management practices e.g. to control invasive species
- Use drought-tolerant species/cultivars
- Monitor species change.

Monitoring biodiversity, checking traps.

Table 2: recommended actions for key players

1) Urban greening & development of ecological networks	
Recommendations to Mayor	
Mayor to **define objectives** and scope of a London wide Urban Greening Programme to provide improvements in terms of flood and overheating risk management and biodiversity, and to consider the need for an overarching vision and strategy document.	GLA Group (with Natural England and Environment Agency)
Mayor to **establish Urban Greening taskforce** as recommended by draft Climate Change Adaptation Strategy	GLA
Mayor to **review/implement fiscal measures** to encourage climate change adaptation with biodiversity benefits e.g. through funding criteria as part of Priority Parks bids.	GLA
Recommendations to London biodiversity and climate change partners	
Establish a working group to support the work of the Urban Greening Taskforce to ensure the climate change adaptation and biodiversity opportunities of urban greening are realised. The working group should: • **Identify** spatially specific **strategic priorities** where urban greening measures could have particular climate change adaptation and biodiversity benefits e.g. areas of opportunity to enhance connectivity/ permeability or to develop buffers around existing sites. • **Promote the specific recommendations** (below), to key delivery organisations. • **Collect and share case study information** on climate change adaptation and biodiversity benefits of measures. • Work with delivery partners to **promote one or more demonstration projects**[3] that show how urban greening measure can deliver climate change adaptation and biodiversity benefits.	Range of partners (Natural England and London Biodiversity Partnership)
Recommendations to local level delivery partners	
Boroughs to **develop policy and strategy** to deliver biodiversity friendly urban greening (in line with Borough BAPs) through Climate Change Action Plans, LDFs and supplementary planning documents e.g. Open Space Strategies /Design Guides.	London Boroughs
Raise awareness of the role and value of green spaces (public spaces and private gardens) in delivering climate change adaptation and biodiversity benefits.	London Boroughs, London Wildlife Trust, Groundwork

2) River restoration & flood storage	
Recommendations to London biodiversity and climate change partners	
Establish a London Rivers Restoration Group to ensure biodiversity opportunities of river restoration and flood storage are realised as part of a wider approach to flood risk management/climate change adaptation in London. The partnership should: • **Identify opportunities and priorities** for river restoration and flood storage and communicate clear messages to all partners involved in delivery. • **Review the need to develop guidance** or sign-post to existing guidance on design of restoration and flood storage schemes to ensure project level delivery maximises climate change adaptation and biodiversity benefits. • Work with partners to **promote one or more demonstration projects**[4] that show how making space for rivers can enhance flood storage capacity and deliver biodiversity benefits.	Natural England and Environment Agency
Recommendations to local level delivery partners	
Undertake community engagement to consult communities on river restoration and flood storage options, and to raise awareness of the need for such measures (for biodiversity and to respond to flood risk).	Environment Agency, London Boroughs
3) Appropriate wildlife habitat management to maximise the ability of biodiversity to adapt to climate change	
Maintain a London wide system of **species and habitat monitoring**: • Identify indicators to monitor e.g. species potentially under stress, northward migration of species, phenological changes. [Illustrate with photo of SouthernHawkerDragonfly - or could go on back cover] • **Monitor the success of any measures** introduced to adapt biodiversity to climate change (e.g. micro-climatic variation within sites).	Partners including Natural England, GIGL, LBP, LWT, London Boroughs
When planning/managing sites: • **Create micro-topographic and hence micro-climatic variation** e.g. through development of a range of grassland heights. • **Review management practices** to ensure they are appropriate in the face of climatic change e.g. grazing periods, mowing regimes, control of invasive species etc (based on the findings of monitoring and site observations).	Natural England, LBP, LWT, London Boroughs, and all other partners involved in the planning and management of wildlife habitats

Footnotes

1 Greater London Authority, 2008 available at http://www.london.gov.uk/mayor/publications/2008/08/climate-change-adapt-strat.jsp

2 Defra (2007) Conserving biodiversity in a changing climate: guidance on building capacity to adapt.

3 When planning/managing sites: Create micro-topographic and hence micro-climatic variation e.g. through development of a range of grassland heights.

Review management practices to ensure they are appropriate in the face of climatic change e.g. grazing periods, mowing regimes, control of invasive species etc (based on the findings of monitoring and site observations).

4 The Mayesbrook Park scheme is under development as a demonstration project http://www.trrt.org.uk/index.aspx?articleid=15960

Project partners

www.lbp.org.uk

www.london.gov.uk/lccp

www.lda.gov.uk

www.naturalengland.org.uk

This project was supported by:

www.defra.gov.uk/environment/climatechange/

www.london.gov.uk

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www.wildlondon.org.uk

It was undertaken by Land Use Consultants **www.landuse.co.uk**