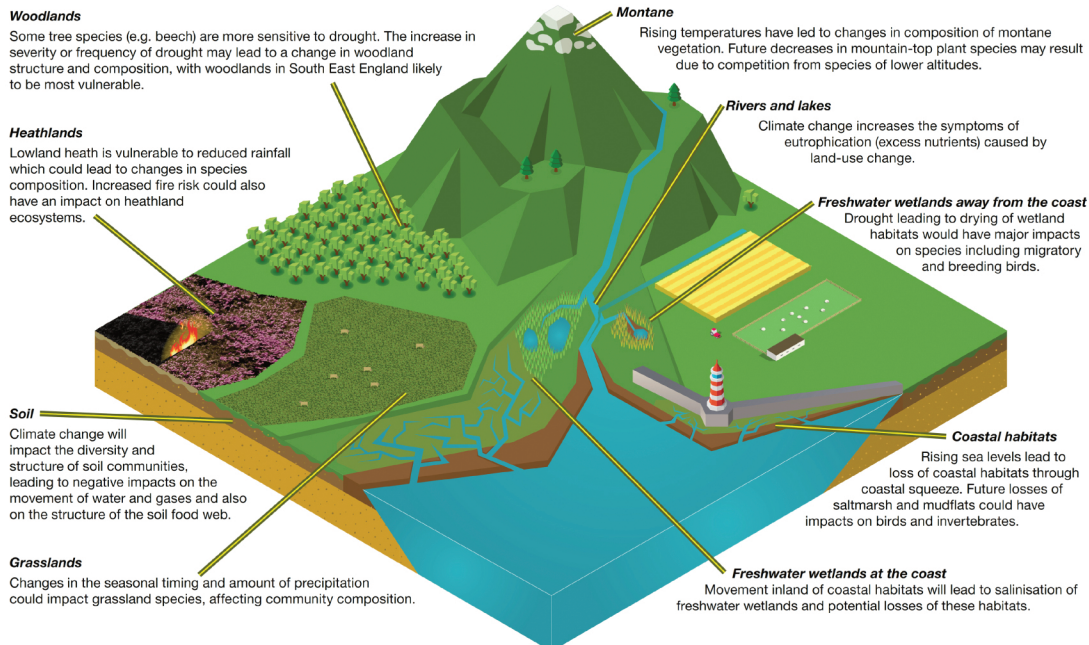
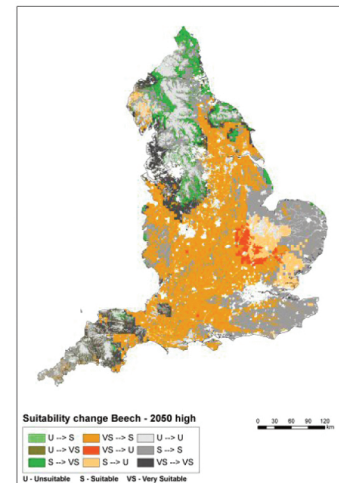




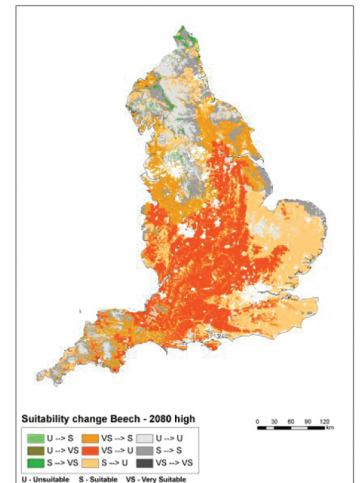
# Climate change impacts on ecosystems



Climate change impacts at a landscape scale. Source: Living with Environmental Change (2015).

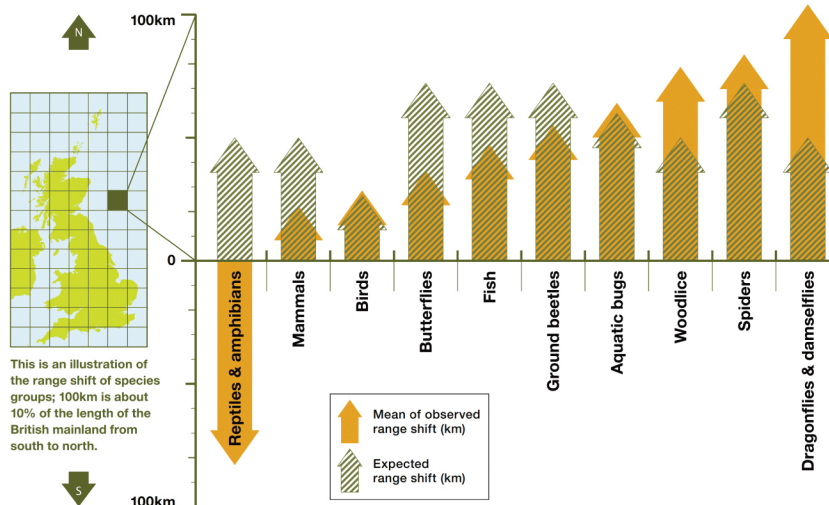


Species suitability map for beech (*Fagus sylvatica*), projected for 2050 under a high emission scenario, using the UKCIP02 climate projections.



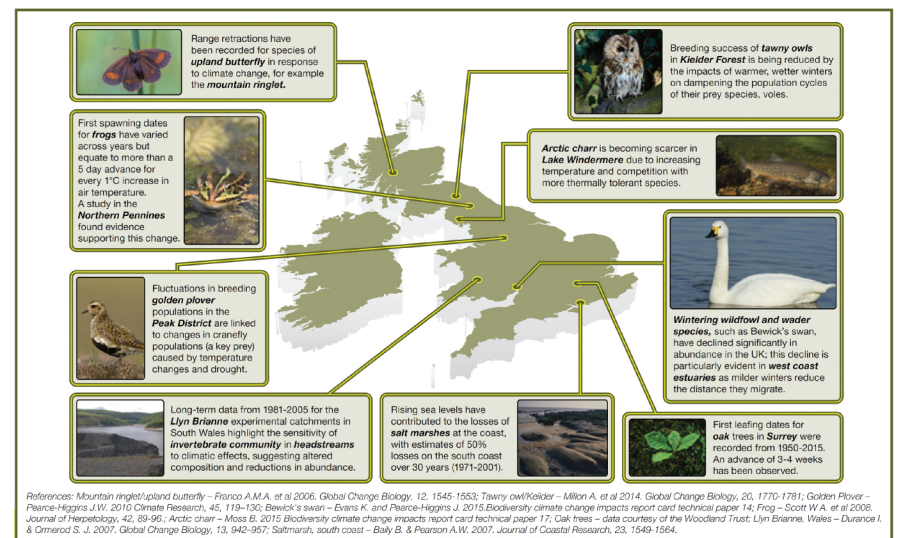
Species suitability map for beech (*Fagus sylvatica*), projected for 2080 under a high emission scenario, using the UKCIP02 climate projections.

Source: Forest Research



Emerging patterns of climate change impacts on wildlife.

This illustrates data on the mean observed shifts in northern range margin for a range of species studied within species groups across 20-25 year timescales spanning 1960-2000 alongside data on the expected range shift of these species groups across the same timescale responding to current levels of climate change. This is to show whether species groups are keeping up with their expected range shifts. Source: Living with Environmental Change (2015).



Examples of observed climate change impacts around the UK. Source: Living with Environmental Change (2015).

Climate change affects both human and natural systems. However, evidence of climate change impacts that have already occurred is strongest for natural ecosystems. In many regions, changing patterns of precipitation are altering hydrological processes, and affecting the quantity and quality of water resources. Many areas are experiencing extreme climatic events, such as heat waves, droughts, floods, cyclones and wildfires, which are at least partly attributable to climate change. Ocean surface waters are becoming increasingly acidic. More than a third of the world's coral reefs are currently being affected by a mass bleaching event, caused by increased water temperatures. Many terrestrial, freshwater and marine species have shifted their geographic ranges in response to ongoing climate change. As a result, the composition of many ecological communities is changing.

Is there any evidence that these changes are actually occurring in our native woodlands?

If so, what might be the consequences for both wildlife and people?

In order to answer such questions, we need to understand the ecology of ecosystems, and how they have coped with environmental change in the past. This can provide insights into how they might respond to change in the future.

## How is climate change affecting ecosystems in the UK?

- Spring life-cycle events, such as leafing, flowering and egg laying, are becoming earlier; the average advance has been nearly two weeks over the past few decades.
- The timing of some autumn events is changing, such as a delay in leaf fall and the fruiting of fungi.
- Many animal species, especially those with more southerly distributions, are spreading northwards; good evidence is available for a range of groups including birds, butterflies and dragonflies. Bird ranges in the UK shifted northwards by an average of 37 km between 1990 and 2008.
- Warming is likely to have facilitated a number of recent natural colonisations of the UK by species from continental Europe (e.g. damselflies, such as the Southern Emerald).
- 70% of wetland bird species have shown a population decline since 2000, partly as a result of changing migration patterns in response to climate change.
- New migratory insects are arriving in the UK and some existing summer migrants are becoming permanent residents; for example, the red admiral butterfly is increasingly overwintering in the UK.
- Mammals that rely on hibernation (e.g. hedgehogs, dormice and bats) are reducing their period of hibernation.
- Climate change is also likely to be affecting soil processes such as nitrogen mineralisation, litter decomposition and soil respiration, which are sensitive to temperature and soil water content.

Evidence also suggests that climate change could also result in major changes in the composition and structure of woodland ecosystems. Tree species such as beech, which are susceptible to drought, could be at particular risk of increased mortality.