6 Woodlands in a changing climate

6.1 Climate change and woodland communities

Climate change is now indisputable and it is widely accepted that as a result of past emissions of greenhouse gases, the earth is committed to continued warming during the 21st century. This warming alone may have profound consequences for global ecosystems and people's lives. The actual rate of warming will depend on future emissions and concentrations of greenhouse gases, which is dependent on the actions of governments over the next few years on curbing greenhouse gas emissions. It is projected that summers in Britain will get warmer, and winters milder. Wales, parts of Scotland and the South East may have drier summers, and wetter winters. Climate change is also expected to cause changes to the seasons, increase the frequency of extreme weather events such as storms and cause a rise in sea levels. For more detailed information on projected climate change in Britain, the UK Climate Projections (UKCP09) website, based on methodology designed by the Met Office, provides maps and graphs on a national and regional basis, illustrating projected climate change to the end century, based on different CO_2 emissions scenarios. Despite a wealth of information, the future is still uncertain, as the projections are just that – uncertain signposts towards future options for adapting to climate change. But climate change cannot be ignored, and the precautionary principle demands that woodland owners and managers think seriously about how to respond.

Woodland communities

Woodland communities are already being affected by climate change, which is clearly illustrated by the timing of bud break in spring. For example, some woodland trees and shrubs are already flushing much earlier in southern England than they were 20 or 30 years ago (Collinson and Sparks, 2008; Smithers and Sparks, 2010). This trend could change the balance of tree communities; for example oaks could begin to dominate at the expense of ash in southern oak-ash woodlands. Early flowering woodland plants such as bluebell and wood anemone could suffer from shading by earlier leafing cow parsley. Disruptions to the synchrony of woodland events may mean that migrant birds miss a peak of caterpillars as they raise their young, or plant pollination may suffer if a species flowers before its pollinators have emerged. Inevitably it seems, the composition of woodland communities will change. Of particular concern to woodland owners, storms are projected to increase in frequency, which could cause longer term damage and bring about changes in woodland ecosystems. There will of course be beneficiaries, and in this case it could be species which require deadwood. Others unfortunately might be exotic pests such as the oak processionary moth and the Asian longhorn beetle, which may gain a foothold in Britain, or fungi causing tree diseases.

Scientists have developed sophisticated models to study the effects of projected climate change on the composition of woodland communities and the distribution of selected species. The Environmental Change Institute at the University of Oxford leads the way in this kind of research (Walmsley *et al.*, 2007), though even their results cannot forecast with any precision the actual effect on the ground. Nevertheless, the insights that the models provide give some indication of how woodlands might change over the coming decade. For example, beech might be expected to expand in the north and west, but within its natural range in southern Britain it may be vulnerable and lose its potential as a timber tree, particularly on thin soils on south-facing slopes. Any change in the status of beech in lowland beech and yew woodland would change the plant community on the woodland floor. Ash might also become less suited to conditions in the south, whilst expanding its range in Scotland.

Forestry Commission studies using the Ecological Site Classification decision support system also indicate that climate change will affect woodland succession and species assemblages, leading to gradual but widespread changes in woodland communities.

6.2 **Sourcing seed in a changing climate**

When seed of trees or shrubs is required for enrichment planting or the creation of new woodland, it has been widely assumed that 'local' seed is best. In this context, the term 'local' usually refers to the source of the plant material, i.e. the location from which the seed was collected. 'Local provenance' is another term sometimes used to describe seed collected locally, but strictly it should only be applied to populations of trees known to be adapted to local conditions, and not to have been introduced by humans. In contrast, the 'origin' of seed is the natural range from which a species was originally derived.

The Forestry Commission's Voluntary Scheme for the Certification of Native Trees and Shrubs aims to match native seed sources to planting sites, particularly for semi-natural and new native woodlands (Herbert *et al.*, 1999; Forestry Commission Scotland, 2006b). Twenty-four local seed zones are designated, based on major climatic, geological and landform divisions in Britain, each divided into two altitude bands, above or below 300 m. Natural distributions of native trees and shrubs within these zones have been taken into consideration and a special set of collection zones has been drawn up for indigenous Scots pine. With this exception, the main seed zones are probably rather conservative because relatively little is known about genetic diversity in British trees, or how their populations will respond to environmental changes as the climate warms.

Fruits of spindle ready for collection in November.

In practice, the gaps in our knowledge of tree genetics mean that we should continue to use seed of local provenance for enrichment planting and woodland creation, following the present Forestry Commission native seed zones. Seed should be collected from sufficient trees in semi-natural stands to capture as much genetic diversity as possible, to give planted trees the best chance to adapt to climate change (Blakesley and Buckley, 2010). The following guidelines should help if you are planning to collect your own seed:

- Collect seed from healthy, viable tree populations in semi-natural stands such as ancient woodland; avoid woods which are close to other stands or plantations where the trees have been selected in breeding programmes for forestry purposes.
- Conditions at the collection site should match as closely as possible the characteristics of the planting site in terms of the local climate, topography, soil and vegetation type.
- Collect from a reasonable number of individuals, say 20–30, as widely spaced as possible (at least 50–100 m apart) to avoid closely related trees.

Further details on seed collection may be found in the Forestry Commission's '*Using local stock for planting native trees and shrubs*' (Herbert *et al*., 1999).

6.3 **Connectivity and habitat networks**

In the past, conservation has focused heavily on protecting individual sites such as ancient woodland and species-rich grassland. Many sites are relatively small, and in some areas, they are highly fragmented. To cope with climate change, natural ecosystems will need to respond and adapt quickly, and species may need to move through the landscape. Limited reserves therefore can no longer guarantee long term protection, and the wider countryside will need to play a much greater role in supporting wildlife. Conservationists must consider how existing areas of semi-natural habitat and the wider countryside can best be managed in an integrated way to support the dispersal and colonisation of species which is likely to take place.

Management plans for semi-natural habitats may need to be reviewed and modified, but a much greater problem will be to overcome the large areas of inhospitable countryside that currently surrounds many of our protected areas and sites of conservation interest. The concept of ecological networks is one which has received a great deal of attention in recent years, which combines habitat creation and restoration in the wider landscape with the conservation of existing biodiversity by maintaining and expanding protected areas. These two actions are probably the most important ways of minimising the effects of climate change on semi-natural habitats and wildlife in Britain (e.g. Hopkins, 2007; Wildlife Trusts, 2007).

Connectivity might be restored between isolated patches of core woodland by creating new woodland or hedgerows, which act as buffers or dispersal routes, thus establishing a woodland habitat network. This would enable the more 'mobile' species to move between patches of woodland as they may naturally have done prior to human disturbance of the wildwood. In theory, an ecological network functions as a whole, irrespective of the size of the parts, so a network of small woods should interact in a similar way to a single, extensive site. Wildlife should be able to disperse more freely between sites, increasing the chances that habitats and communities will survive the changing climate. Small woodland owners have a major opportunity to contribute to the success of ecological networks through the management of their existing woodland for wildlife, with the possibility of new planting to expand or buffer these woods.