

English Nature Research Report 653

### **Long-term ecological change in British woodland (1971-2001)**

Report Authors: K.J.Kirby, S.M.Smart, H.I.J.Black, R.G.H.Bunce, P.M.Corney and R.J. Smithers

Date: July 2005

Keywords: Monitoring, climate change, woodland, eutrophication, grazing, shading, stand development, ground flora, soil pH, trees and shrubs

### **Introduction**

The countryside and its woods have changed greatly over the last 50 years. This project explores and measures changes in woodland soils, tree and shrub layers and the ground flora through a re-survey of woods first studied 30 years ago. The work was carried out largely by the Centre for Ecology and Hydrology and was funded by Countryside Council for Wales, Department of Environment, Food and Rural Affairs, English Nature, the Forestry Commission, Joint Nature Conservation Committee, Scottish Natural Heritage and the Woodland Trust.

### **What was done**

In 1971 103 woods across Britain were selected as representative of a wider sample of 2,453 woods (> 4 ha) surveyed in the late 1960s. Within each of the 103 woods sixteen 200m<sup>2</sup> plots were located at random and records made of soils, tree and shrub composition, and ground flora with each plot. Between 2000 and 2003 (the '2001' survey) the sites were revisited and the plots re-recorded on as close to the same point as possible. The original recording methods were used. The results from the 2001 survey were compared with the original data and changes identified at plot and site levels.

### **Results and conclusions**

The key findings were:

- a marked decline in ground flora richness, particularly amongst woodland specialists;
- a reduction in small woody stems and regeneration, but an increase in basal area of woody species;
- a decrease in the open habitats;
- and a marked increase in soil pH.

The broad composition and structure of the whole suite of woods was not dramatically different in 2001 from that in 1971. Some of the results indicate some recovery from past damage - for example the increase in soil pH. Other changes, most particularly the decline in woodland specialist richness, represent deterioration in the quality of the woods.

*continued >>>*

We also found effects on species distributions and abundance correlated with climate change over the last 30 years. Given the changes that are already being observed in the phenology of species, it seems likely that effects on woodland species abundance will become even more common in the next 50 years. Under climate change conditions, in general, larger populations (or meta-populations) are more likely to survive and spread than small ones. This supports the case for an increase in woodland area and for improving connectivity within the landscape, but also for addressing other causes of species decline that do have a clear management solution

Signs of eutrophication in the ground flora were detected that were correlated with models of diffuse pollution and the management of adjacent land. Increased nitrogen inputs at the edges of woods from adjacent agriculture can be addressed in part through developing buffer strips next to woodland and by developing dense vegetation at the wood edge. The significance of diffuse pollution impacts for woodland species is becoming more widely appreciated. Impacts may be reduced by maintaining high shade levels - in effect ensuring that light levels rather than nutrients act as the limiting factor.

Given the generally young nature of most of the stands, then without deliberate management intervention broadleaved woods are, on average, likely to become older and darker in the next twenty years. Opening out the wood temporarily may increase the abundance of some species, which is desirable if existing woods are to act as sources for the colonisation of new woodland.

In undertaking such management we must be aware of the increasing potential of interactions with and between other drivers (climate change, nitrogen deposition, deer grazing) to influence the outcome.

## English Nature's viewpoint

All long-term woodland studies gain in value with time: equally we are conscious that some of our analyses would be more useful if there were not such a long gap between the survey times. The data will be made available for further analyses. Consideration will be given to linking at least some of the sites surveyed into other woodland surveillance programmes.

## Selected references

- BUNCE, R.G.H., & SHAW, M.W. 1973. A standardised method for ecological survey. *Journal of Environmental Management*, 1, 239-258.
- KIRBY, K. J., & THOMAS, R. C. 2000. Changes in the ground flora in Wytham Woods, southern England, from 1974 to 1991 - implications for nature conservation. *Journal of Vegetation Science*, 11, 871-880.

## Further information

For the full report or other publications on this subject, please contact the Enquiry Service on 01733 455100/101/102 or email [enquiries@english-nature.org.uk](mailto:enquiries@english-nature.org.uk)

For further information about the work of English Nature, please visit our website at: [www.english-nature.org.uk](http://www.english-nature.org.uk)