Climate Change and Tree Provenance

Forest Research, National Forest Company, Forestry Commission, Aggregate Industries.

THE NATIONAL FOREST

Introduction

The research

To establish a series of tree provenance planting trials in The National Forest to research adaptive planting strategies in the face of climate change for commonly occurring broadleaved tree species of economic and environmental importance in the UK. The trials will be monitored in the long-term and will test several approaches that forest managers might use to increase the resilience of planted native woodland species to climate change.

Why do it?

Annual temperatures in the UK are predicted to rise by 3 - 6°C by the 2080s. This will affect native tree species in The National Forest by providing improved growing conditions for some species, whilst for others the conditions are likely to be less favourable. Efforts must therefore be made to maximise the resilience of native trees, woods and forests to ensure that they can adapt to the effects of climate change. As change is likely to be a gradual and unpredictable process, adopting a mixed-tree provenance approach is likely to be less uncertain than reliance on the planting of tree provenance material from a single geographic area.

Aims & objectives

- To establish and monitor a series of planting trials in The National Forest, to investigate how trees of varying provenance adapt to climate change.
- To test the germination of tree seed from locations that currently experience the predicted future climate for The National Forest, by subjecting seed to a range of current and predicted temperatures for the Forest area.
- To contribute to national adaptive forest management research, by testing different tree planting approaches and species mixtures, to help increase the resilience of native woodlands to climate change.
- To provide practical management options for landowners considering woodland creation in The National Forest and beyond, to respond to climate change adaptation.
- To provide demonstration sites that will help raise national awareness of the implications of climate change for tree provenance and species choice.

The Project

Description

The project is part of a national project involving other sites around the UK. The National Forest project is in the early stages of design, but will involve creating a series of tree species planting trials at two contrasting sites, each covering around 2ha, to determine how a range of environmental factors may affect resilience and choice of provenance type. The Forestry Commission and Aggregate Industries (respectively) have made land available at Hartshorne Wood, Derbyshire (on water-retaining clay-rich soils) and Newbold Quarry, Staffordshire (on sandy, free-draining soils). The tree species chosen are those which are commonly planted in The National Forest - Oak, Ash and Wild Cherry; plus Sweet Chestnut, a species of considerable interest for future timber value and its expected resilience to a warmer climate.

Approach

Forest Research has climate-matched regions in northern France and central regions of Italy with the Midlands area for 2050 and 2080 climate change scenarios. The seed material will be secured from the climate-matched regions, tested for its germinability across a range of temperatures and then grown on in the nurseries at Alice Holt, Surrey. The saplings will be planted in a range of provenance and species trial mixtures at the research sites in 2012/13. Assessment and monitoring of the trees will begin in 2013 and will continue into the longer-term.

Timescales

2009-13: Establishment of sites and initial monitoring.

2013+ Long-term research and monitoring.

Budget

Costs are set out for first phase (2009-13).

Forest Research (FR) - £23,300

National Forest Company (NFC) - £18,500.

The land for the tree planting trials is being provided by the Forestry Commission and Aggregate Industries.

Results

Outcomes

The provenance trials will address the following questions:

- For 2050 and 2080 climate change scenarios, which provenance of tree planting stock for a particular species will be most suitable for woodland creation in the Midlands area?
- Where more southerly provenances are recommended for planting, what is the optimum planting ratio of local to other provenance material, to achieve maximum survival rates and growth?
- How will mixing tree provenances affect planting success, woodland stand structure and the relative performance of different tree species?
- How might non-native provenance material affect biodiversity and the incidence of pests and diseases?

Applications

- Provision of new tree planting advice to woodland owners.
- Improved approaches to future woodland planning and management.
- Contribution to national tree planting guidelines for climate change adaptation, through the planting of non-native provenance material.

Further information

Dissemination

- NFC research review seminar 2010.
- Site-based visits to research trials by stakeholders (planned).
- Scientific publication(s) on provenance trial work (planned).
- Annual bulletin, produced jointly by FR and the NFC (planned).
- Forest Research best practice manual (planned).
- The NFC's Forest Scene newsletter.
- Publicity/ press releases of planned project.

Links to published work

Concept Note - Forest Adaptation to climate change: National Forest Planting Trial (2009). Barsoum, N., Cottrell, J., Hubert, J., Evans, S., Ray, D. & Petr., M.

*Choosing provenance in broadleaved trees (*2006). Hubert, J. & Cundall, E. Forestry Commission Information Note 82.

The role of forest genetic resources in helping British Forests respond to climate change (2007). Hubert, J. & Cottrell, J. Forestry Commission Information Note 86.

Using woodland genetic diversity to manage the risks of climate change (2009). Hubert, J. Forestry and Timber News, page 14.

Selecting the right provenance of oak for planting in Britain (2005). Hubert, J. Forestry Commission Information Note 77.

Diagram
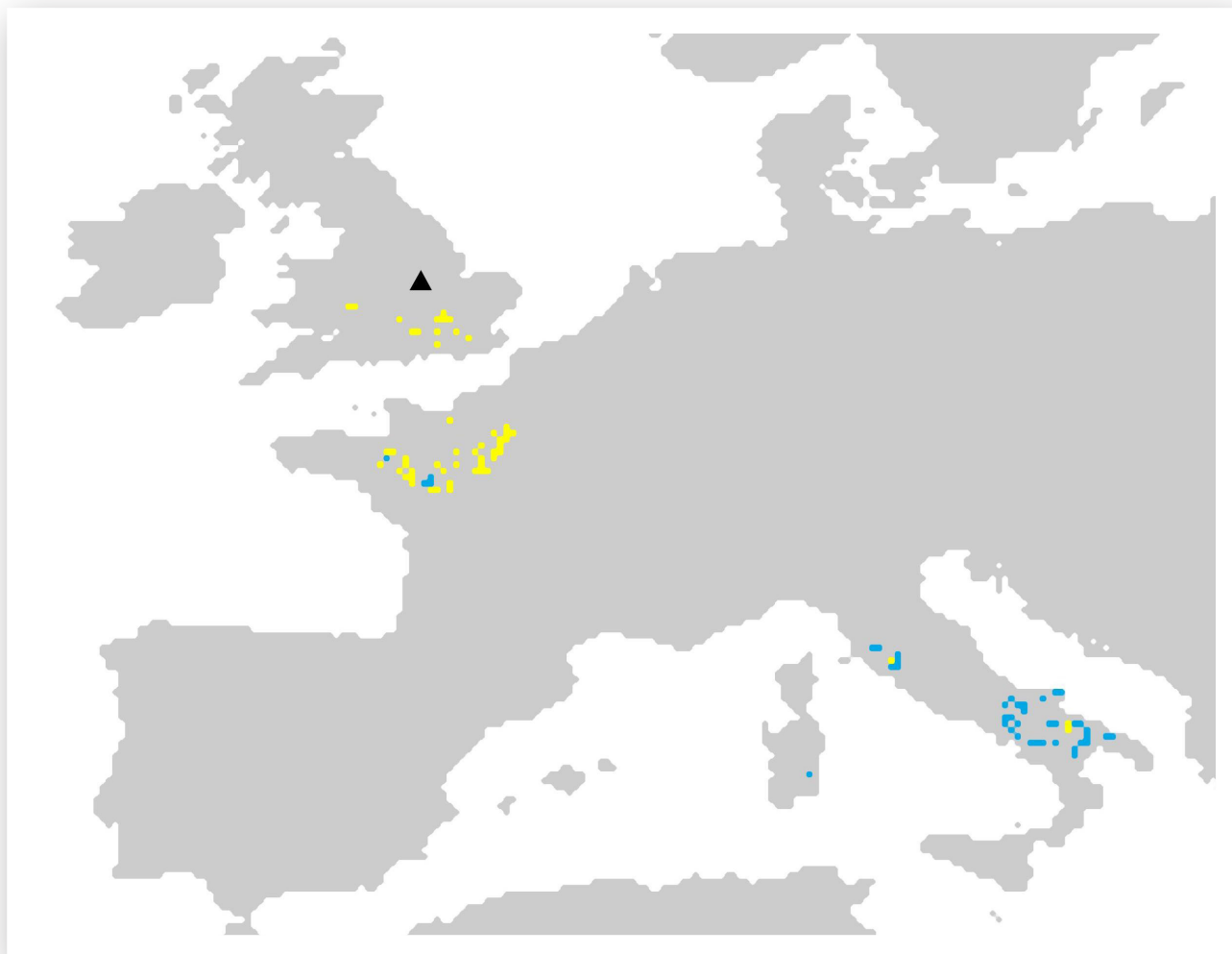
Climate Change high emission scenarios for the 2050s and 2080s.

The blue and yellow areas represent the grid-squares in Europe best matched to each scenario (blue = high emission scenarios for the 2050s, yellow = high emission scenarios for the 2050s, triangle = location of The National Forest). Climate matching was performed on the basis of monthly mean temperature, diurnal temperature range and precipitation, weighted according to the annual range for each variable. Baseline data are from a global dataset of 10 minute resolution provided by the Climatic Research Unit of the University of East Anglia, and the future scenarios are based on the UKCIP02 50 km gridded data-set.

Contacts

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