Climate change and tree species

Matching species to site and future conditions

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Tree species are the basic building blocks that form any forest or woodland. If a species is weakened by the impacts of climate change, this could change the composition of the woodland and affect the organisms that live there. Wise species choices can help forests adapt to the changing climate, while poor choices can place them at risk. Key factors to consider when choosing tree species for a new or existing woodland are given below.

Background

- Across Britain, the climate is changing towards milder wetter winters, warmer drier summers, and longer growing seasons.
- There will be more frequent extreme weather events (e.g., winter storms, summer droughts) while warmer springs will lead to earlier budbreak and a greater risk of frost damage. Incidence of pests and diseases will alter.
- These changes will affect individual tree species (and provenances) differentially.
- Growing a wider range of suitable tree species and mixtures will reduce risks/impacts.
- Species selection based on past performance may be a poor indicator of future potential.

The range of tree species available

Many British forests are made up of only a few tree species. However, there are over 30 species which are considered native somewhere in Great Britain while some 500 non-native tree species have been grown here. A small number of introduced species are very important for the domestic timber industry. A good adaptation strategy to reduce risks is to increase the number of suitable species in a woodland: this should involve reviewing existing species choices and considering fresh options including mixed-species stands.

Tree collections can give an idea of species performance but future climate and risks from pests and diseases need to be considered.

Factors that influence species choice

Management objectives

If timber production and financial return are important, consider fast-growing conifer or broadleaved species, which are often non-native. Alternatively, if creation of a native woodland is intended, use predominantly native species. Since forests are normally managed for a range of objectives, growing a range of species with different characteristics is a way of meeting these aims.

Site and climate analysis

Good information on the soils present on a site is essential for sound species selection. Do not rely on information provided in maps or by models without checking on the ground by digging holes and classifying the soil(s) in terms of fertility and moisture. Pay particular attention to changes in slope and aspect, in vegetation or in rooting depth which may indicate differences in soil properties. Consider whether a soil feature that would limit root development (e.g., a hard (iron) pan) and constrain tree growth can be ameliorated.

Use online resources (see below) to estimate how the climate may change at a given site over the course of the century. Pay attention to aspects like lower rainfall and/or higher temperatures that could cause greater drought stress. Use climate-matching tools to identify regions that currently experience the predicted future climate and investigate what tree species are growing well there.

Identifying candidate species

After individual site and climate characteristics have been defined, identify species that can survive and grow in the changing climate. Tree collections in botanic gardens, private estates and the public forest estate throughout the country can give an idea of the performance of species that have not been widely grown in Britain. However, do not assume that either mature trees in existing woodlands or the occurrence of natural regeneration indicates that a species will be suited to future conditions. Consider current and possible future risks from pests and diseases.

Online resources, books or other literature, supported by professional guidance, can provide more information about individual species and their future suitability. When using a computer decision support system (e.g., the Ecological Site Classification), vary soil and climate inputs to test the sensitivity of the predictions about species suitability. Regard such information as a filter to eliminate more risky species. Short-listed species can be ranked by suitability for different objectives (e.g., biodiversity, landscape impact, timber or carbon storage). If trialling unfamilar species, then only plant small amounts to start with and closely monitor their performance, ecological characteristics and the appearance of pests and diseases for at least a decade; consult others before using these species more widely. For some species, a **choice of provenance** may be available.

Forest Development Types (FDTs)

Try to avoid planting or regenerating species in pure stands but instead create stands with a compatible mixture of species. The FDT framework (see resources) offers a structured way of preparing a long-term vision for a forest on a given site that will contain a mixture of compatible species resilient to future threats. It will be particularly helpful where analysis suggests existing species will be vulnerable to climate change.

Nurseries and plant supply

When planting is used to create or restock a woodland, then contact forest nurseries at least six months in advance to discuss requirements and reserve plants of the desired species. Try to obtain information on the available provenances of these species to ensure their suitability (see provenance factsheet). Consider long-term contracts for unusual species/provenances.

More information:

Forest Research Tree Species Pages and online Decision Support Systems such as the Ecological Site Classification v4.0. See also the Climate Matching Tool.

Information on Forest Development Types: **www.forestresearch.gov.uk/tools-and-resources/fthr/forest-development-types/**

Information on the Forest Research climate matching tool can be found here:

www.forestresearch.gov.uk/tools-and-resources/fthr/climate-matching-tool/

Savill, PS (2020) *The Silviculture of Trees used in British Forestry (3rd edition)*.

Further details of our work on trees, forests and forestry is available at:

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