

Climate change and provenance

Matching provenance to site and future conditions

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Provenance is a forestry term used to describe the location of the stand from which reproductive material (seeds or cuttings) was collected. A wise provenance choice can help a forest cope with climate change, while poor choices can place it at risk.

Working towards resilience

- Existing and new woodlands have to cope with the changing climate, including increasingly extreme weather events, as well as the arrival of new pests and pathogens. In the short term, it is important that existing trees survive, grow and reproduce whereas in the longer term, woodlands must be able to adapt genetically.
- The choice of provenance of planting stock used to establish new woodlands and the management of existing woodlands to encourage regeneration are both important ways to make future forests more resilient to climate change.
- When sourcing planting stock, it is important to find out as much as you can about its origin and only source from reputable suppliers who produce healthy stock.

Provenance choice for non-native woodlands

Tree species are often found over large geographic areas within which different populations have adapted to particular conditions, so it is important when choosing planting stock to consider which provenance of a given species is likely to be most appropriate for the site conditions and objectives. Recommended provenances for current climatic conditions have

already been established for several commercial species, e.g., Sitka spruce, Norway spruce, Douglas fir and noble fir. A recent assessment of species not yet widely grown in the UK but of potential interest has been used to advise on the best provenances of European silver fir, Pacific silver fir, Low's fir, Japanese red cedar, coast redwood, western red cedar and western hemlock.

Other points to consider:

- Following the original introduction of the Sitka spruce provenances most suited to the UK, a tree breeding programme has identified selections from within these provenances which provide improved vigour, form and timber quality.
- Non-native species that have been grown in the UK for at least one generation may have undergone genetic adaptation as they will have encountered conditions very different from those in their original home locations. They may even have begun to develop landraces (varieties) which produce seeds that are better adapted to British conditions. Therefore, consider sourcing seed from British stands of non-native species or encourage natural regeneration in these stands.

Where growers are concerned about resilience to climate change, they may choose a combination of planting stock from the current recommended provenance and a proportion of stock suited to the anticipated future climate.

Provenance choice for new native woodlands

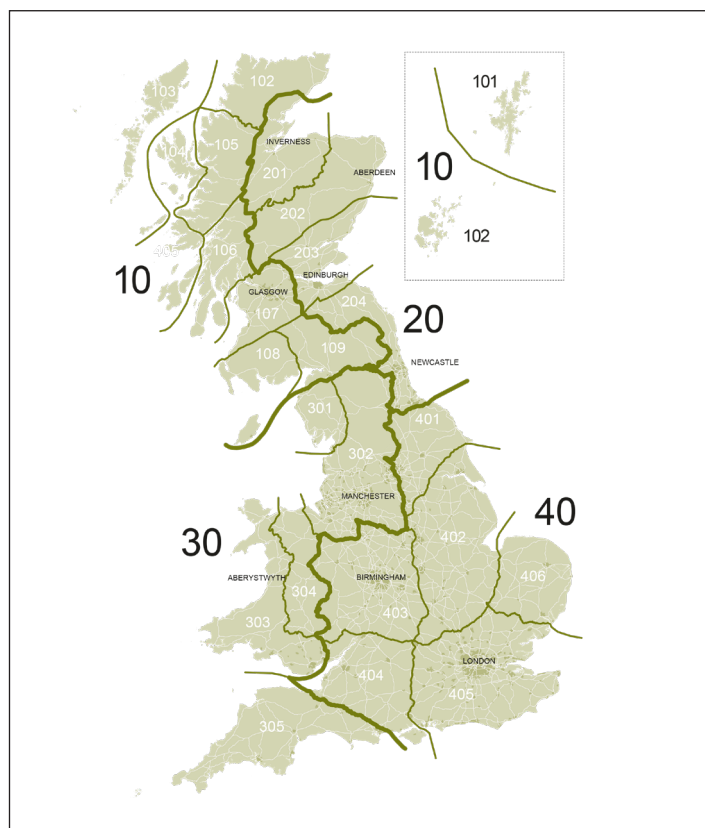
- The general advice is to source planting material (seed or cuttings) from trees already thriving locally because they should be suited

to the current local conditions.

- Where growers are particularly concerned about the resilience of planting stock to climate change, they may choose a combination of local provenance material and a provenance from slightly further south (2° of latitude) which may be better suited to the warmer and drier conditions predicted in the future. Under current conditions, however, material from more southerly origins may grow faster but late spring frosts and early autumn frosts may affect the trees' form or survival.
- The choice of provenance very much depends on the owner's attitude to risk and the risks assessed to be most important at the forest's location.

Reproductive Material Regulations 2002

- There is a system for identifying and tracking the source of seed and plants marketed for the establishment of new native woodlands. As shown in the map, the Forest Reproductive Material Regulations 2002 divide Britain into four Regions of Provenance which are further divided into 24 native seed zones.



Map of the four Regions of Provenance and 24 native seed zones in Britain.

- Most of the material used in establishing native woodlands for conservation purposes falls into the 'source identified' category in this system. Source identified material must be collected within the boundaries of a single provenance or seed zone. However, where timber production is the main objective, planting material should, if possible, come from seed collected from 'selected' seed stands where the trees show visual superiority in key commercial traits.
- Improvement programmes are under way for several native species. Seed from 'Qualified' seed orchards which contain specially selected parents is becoming available. Seed from 'Tested' orchards, which is demonstrably superior for certain traits, will become available in the 2030s.

Management of existing native woodlands

- Many of our native tree species have a widespread range in the UK so they survive and regenerate in very different growing conditions. Evidence demonstrates that populations of trees become genetically adapted to their local conditions.
- Populations of most native species are genetically diverse. Providing there is regular and ample regeneration, this diversity allows natural selection to choose those individuals, from a large pool of individuals, that are best suited to the novel conditions created by climate change. Consequently, the next generations of trees should gradually become genetically adapted to the altered conditions.
- Based on these principles, managers should encourage regular phases of natural regeneration combined with effective control of herbivores.

More information:

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