

Position Statement

Tree provenance choice in a changing climate

The Woodland Trust's view

November 2020



WOODLAND
TRUST

Tree provenance choice in a changing climate

Tree provenance choice is a vital tree-planting decision, with potential benefits, risks and long-term consequences. Advice on considerations for tree provenance selection can be contradictory. The Woodland Trust's position on this issue is based on selecting suitable UK provenance to promote adaptation and resilience, and to reduce the pest and disease risk from imported seeds, saplings and trees.

The Woodland Trust's view on tree provenance choice

- Decisions on provenance choice in a changing climate are potentially complex, usually based on limited information and evidence, and can have long-term implications for woodland management.
- For woodland conservation, resilience, and enhanced biosecurity, evidence suggests that tree seed sourced from local UK provenances will be best adapted for UK sites in the long term.
- Genetic variation is high within populations of native UK trees (often exceeding the variation between populations), indicating a high capacity to adapt to change given the right conditions, such as regular cycles of natural regeneration.
- Selecting provenances from 200–550km (2–5 degrees latitude) further south may help to enhance timber yield, but can be a high-risk strategy – for tree survival and form, for local wildlife, and for disease risk.
- Selecting suitable tree species for a planting site is just as important a decision as selecting suitable provenance in terms of survival and adaptive potential.
- Wherever possible, trees should be sourced from within the UK in order to prevent further introductions of damaging pests and diseases.
- Natural regeneration of trees and shrubs enables selection pressure to act on seedlings and thus drives site-based adaptation.

The Trust will:

- source all trees using the UK and Ireland Sourced-and-Grown-Assurance (UKISG-A) scheme to minimise the risk of importing new pests and diseases
- encourage and enable everyone seeking to plant trees to have access to UKISG-A planting stock
- promote natural regeneration for woodland expansion wherever possible, giving space for nature to recover and gain resilience through natural selection



Seed sourced from local provenances will be best adapted to local conditions

- advocate policy and funding support for natural regeneration
- use seed from local provenances in planting schemes
- support research into long-term resilience of woods and trees
- work in partnership with other land managers and policy makers to ensure that landscape resilience is secured.

Understanding tree seed selection and provenance

The provenance of tree seed describes its geographical origins. When planting trees of any species, selecting an appropriate provenance is an important decision which can influence tree survival, 'performance' (for any given objective), longevity and reproductive potential. A key aim of provenance selection is to find seed that will be well-adapted to the prevailing conditions in which it needs to grow. More recently, likely future climate projections (e.g. temperature and rainfall fluctuations) have also led to considerations of whether provenance selection can influence the adaptedness of trees to future conditions.

A recent extensive evidence review on this topic, *Genetic considerations for provenance choice of native trees under climate change in England* (Whittet et al. 2019)¹ highlighted the complexity of the issue of provenance choice.

The evidence does not promote a one-size-fits-all approach to provenance selection; rather a more nuanced and varied approach which is dependent upon the species of tree in question, and the management objectives proposed.

For example, if the objective is a single-rotation plantation tree 'crop', there could be benefits in sourcing seed from further south, as those trees will have a longer growing season than trees in a local environment (between 200 and 500km), and consequently could produce more timber. However, this has to be balanced against the demonstrable risk that such trees may be maladapted to the new environment they find themselves in. For example, they are more susceptible to frosts and, therefore, poor tree survival or form is often reported.

For woodland conservation, tree longevity and enabling future generations of trees are stronger motivations than timber yield. It is a much less risky strategy to select trees of as local a provenance as possible, giving due consideration to selected tree seed growing at a similar altitude, as well as latitude. Such trees are likely to be better adapted to the prevailing environmental conditions (including climate, weather, and pests and diseases), and thus more resilient long term. It is vital that these trees are enabled to reproduce naturally. Regular cycles of natural regeneration will encourage 'survival of the fittest', with each subsequent generation adapting to its environment. It has been shown that trees of local provenance are often 'average' in terms of growth performance, neither best nor worst, but that they often out-compete non-local trees when it comes to surviving extreme conditions (Whittet et al. 2019)¹.

It has been argued that using local provenance and enabling natural regeneration will not allow trees to adapt fast enough to the speed of the changes in projected climatic/pathogen conditions. A major issue is that long-term data on the effectiveness of 'predictive provenancing' is not currently available. Often, we don't know or can't know how trees will adapt to future conditions. However, we do know that UK native trees have very high genetic variability (largely thanks to the majority being wind pollinated, and to the varied geography of the UK) and, therefore, their genetic potential to adapt is high. Individual UK trees also have a high level of 'phenotypic plasticity', with some trees able to live for up to 1,000 years, adapting to the changing conditions around them throughout this period. This is why we need to relieve the pressure on trees, for example by managing herbivores more effectively.

Too often, the biosecurity risk of importing any plant material, including seed, is not considered when making provenance selection decisions. There are a number of diseases which can be transmitted through seed: pine pitch canker, for example. It is, therefore, important when seed is being imported to source it in a responsible manner and ensure it has been through all of the correct biosecurity processes. In addition, trees sourced from distant provenances (e.g. a latitude 2–5 degrees further south, or up to 550km) can be unsynchronised with local wildlife; for example, by flowering before local pollinators appear.

The Woodland Trust's vision is for a UK rich in native woods and trees, for people and wildlife. The evidence suggests that this can be achieved by sourcing seed from within the UK, and that sourcing seed from further south is unnecessary and adds an unnecessary level of risk.

1. Whittet, R., Cavers, S., Ennos, R. and Cottrell J. (2019). Genetic considerations for provenance choice of native trees under climate change in England. Forestry Commission Research Report



Checking stock at a UKISG accredited tree nursery

NEIL INGRAM



WOODLAND
TRUST

The Woodland Trust, Kempton Way, Grantham, Lincolnshire NG31 6LL.

woodlandtrust.org.uk

The Woodland Trust logo is a registered trademark. The Woodland Trust is a charity registered in England and Wales number 294344 and in Scotland number SC038885. A non-profit-making company limited by guarantee. Registered in England number 1982873. 14982 11/20