

Growing Broadleaves for Quality Timber

Site Assessment

This Guidance Note is one of a series summarising information presented at a seminar on “Growing Broadleaves for Quality Timber”, held in February 2010 as part of FC Scotland’s Timber Development Programme. These notes provide information on all the main aspects of growing quality broadleaved timber, from choice of planting stock through to timber marketing, together with relevant references and links to more detailed information.

This presentation, which was delivered by Bill Rayner (Forest Research), is available for download through the [seminar web page](#).

Site Characteristics Affecting Tree Establishment

Site characteristics affecting the establishment and early growth of broadleaved trees are summarised in Table 1. Promoting an environment for early tree growth which meets the requirement of the “likes” column will enhance establishment success, encourage rapid early growth and deliver improved timber quality.

Table 1: Tree establishment characteristics – “Likes and Dislikes”

LIKES	DISLIKES
Shelter Free drainage Deep rooting potential Rich nutrition Warm soil temperatures (>5°C) Minimal root competition Sunlight	Exposure Waterlogging Poor or Very poor nutrition Cold soil temperatures (<5°C) Root competition Deep shade

Importance of site assessment

It is essential to make a thorough assessment of the suitability of sites if growing quality broadleaved trees is to be successful. This requires evaluating sites to determine if they are suitable for both growing the desired tree species and the range of silvicultural management techniques envisaged.

Factor affecting tree growth

The factors which affect tree growth can be considered in two groups – those which cannot be modified and those which can. The assessment of some factors can be conducted as a desk-based exercise, using relevant maps and decision support tools, such as [Ecological Site Classification \(Pyatt *et al.*, 2001\)](#) and the [Establishment Management Information System \(EMIS\)](#), which can both be accessed through the [FR Decision Support Services portal](#). The information presented below is largely drawn from these sources.

Factors which cannot be modified

These factors can generally be assessed before visiting the site. Values for the factors 1-3 discussed below, calculated for a site on the basis of grid reference, are available through The Ecological Site Classification Decision Support System (ESC-DSS). Information about underlying geology is now available online through the British Geological Survey [OpenGeoscience](#) facility.

1. Accumulated Temperature

Growing season warmth, which is a major determinant of tree growth rate, can be expressed as Accumulated Temperature above 5°C (AT5), which ranges in Britain from 0 – 2000 day-degrees. The ESC-DSS calculates AT for sites on the basis of grid reference and provides an indication of species suitability (very suitable, suitable or unsuitable) for different ranges of AT. For example, for a site to be classed as very suitable for ash, an AT value of >1200 day-degrees is required. Recent climate change projections, based on a high-emissions scenario, suggest a doubling of AT for some areas of the eastern lowlands of Scotland by the latter part of the century, with Caithness receiving as much warmth for tree growth as the south-eastern lowlands received on average between 1961 and 1990 ([Ray, 2008](#)).

2. Moisture Deficit

Moisture deficit (MD) is the monthly maximum accumulated excess of evapotranspiration over rainfall in the summer months – a higher value indicates a greater frequency of summer droughts. Species suitability for different ranges of MD is given by the ESC-DSS. Oak and silver birch are relatively tolerant of summer drought, being very suitable up to MD values of 200 mm; whereas ash and sycamore operate well in wetter conditions (MD down to 20 mm). Climate change projections show a predicted increase in MD in south and eastern Scotland, and a reduction in western Scotland by the latter part of the century. These changes are likely to affect the future geographical pattern of species suitability, ([Ray, 2008](#)).

3. Windiness

Wind is the most likely limiting factor for tree growth at higher elevations and near many coasts in Britain ([Pyatt et al., 2001](#)). Windiness in British forestry is assessed using the DAMS system ([Quine and White, 1994](#)), which is based on tatter flag data collected across the country. DAMS scores, which can range from 8 to 30 across Scotland (but are typically between 10-18 where trees are grown), have been shown to give a good indication of mean wind speed and the frequency of strong winds. DAMS score for a site can be obtained from the ESC-DSS or from the [ForestGALES](#) DSS. The ESC-DSS can be used to indicate the suitability of different species in relation to DAMS score. Of the commercial broadleaves commonly grown in Scotland, ESC suggests that oak has the greatest requirement for shelter from wind (being classed as very suitable only where DAMS score is 12 or less); whereas the other main broadleaves can stand greater levels of wind exposure (being classed as very suitable up to a DAMS score of 16). In general broadleaves are not limited by risk of windblow, at least not on sites suitable for quality timber.

4. Site geology – soil lithology

The underlying geology of a site defines its topography, determining the incidence of ridges, hollows, outcrops etc. The soil parent material is the rock from which the soil is formed, which is not necessarily the bedrock of a site. The soil parent material and its geographic position, determine the texture, fertility and water holding capacity of a soil. Of particular importance is nitrogen availability, which can be categorised as follows:

- Low nitrogen levels: high quartz and acid granitic rocks.
- Medium nitrogen levels: basalt, low quartz granite and schist.
- High nitrogen levels: calcareous, low silicate and most sedimentary rocks.

Information about geology and soil lithology can be obtained from the relevant maps (see www.bgs.ac.uk/opengeoscience/).

Factors which can be modified

The assessment of factors that can be modified will require a site visit during which soil and vegetation assessments should be made in accordance with standard procedures as set out, for example, in [Pyatt et al. \(2001\)](#). Decision support tools such as ESC-DSS and EMIS, together with existing knowledge about previous tree crops on the site or adjacent crops on similar sites, can then be used to inform decisions regarding species choice, ground preparation techniques and weed control. If you have doubts about these site factors, it is important to carefully re-assess the site and your management options.

Site factors that can be modified are:

1. Soil compaction
2. Soil moisture
3. Soil nutrients
4. Soil temperature
5. Vegetation competition
6. Available light

It is important to find where the site is located on the ESC soils grid by digging a soil pit and/or conducting a vegetation survey. On ex-agricultural land soil pits should always be dug and the soil type, texture and rooting depths should be determined. Evidence of plough pans or other barriers to rooting should be identified, together with the presence of tile drains which could alter the moisture regime of the site markedly if they become blocked.

Species Choice

By making a careful assessment of all the site characteristics, an evaluation of the most suitable tree species for the site can be made using the ESC and EMIS decision support systems.

Conclusions

- In order to grow productive broadleaves that produce high quality timber it is essential to assess the suitability of a site, including variations in conditions across the site, for different species;
- An initial desk-based assessment of site factors which cannot be changed, using readily available online sources of information, will provide a preliminary indication of the potential of a site;
- A site visit to gather soil and vegetation data, and to help interpret the desk-study data, is then required;
- The Ecological Site Classification Decision Support System provides guidance on the suitability of different species on the basis of the site data described above;
- The Establishment Management Information System integrates ESC with other decision support systems to provide advice on all aspects of tree establishment.

References

- Pyatt, D.G., Ray, D. and Fletcher, J., (2001). An Ecological Site Classification for Forestry in Great Britain. Forestry Commission Bulletin 124. Forestry Commission, Edinburgh.
- Ray, D. (2008). Impacts of climate change on forestry in Scotland – a synopsis of spatial modelling research. [Forestry Commission Research Note 101](#). Forestry Commission, Edinburgh.
- Quine, C. P. and White, I. M. S. (1994). Using the relationship between rate of tatter and topographic variables to predict site windiness in upland Britain. [Forestry, 67\(3\), 245-256](#)

Links to further information

- British Geological Survey OpenGeoscience: www.bgs.ac.uk/opengeoscience/
- Ecological Site Classification: www.forestresearch/ESC
- Establishment Management Information System (EMIS):
www.forestresearch.gov.uk/fr/HCOU-4U4JE4
- ForestGALES Decision Support System: www.forestresearch/forestgales
- FR Decision Support Systems Portal: www.eforestry.gov.uk/forestdss/