

**FORESTRY COMMISSION SCOTLAND
TREELINE WOODLANDS AND RURAL DEVELOPMENT CONTRACTS
RURAL PRIORITIES (RDC - RP)
GUIDANCE NOTE NO 13**

1. Summary

Native treeline woodlands is a term that includes various forms of native woodland, and scrub that are situated above the timberline. The timber line is the point where altitude and exposure prevent the growth of marketable timber.

Treeline woodlands can enhance biodiversity by creating a transition zone above normal treeline and can also provide landscape benefits by softening and naturalising forest edges.

For RDC funding - treeline woods will only be supported where they encourage the expansion of existing semi-natural woodlands or enclaves of already established high-elevation trees and shrubs and where they will contribute to core FHN expansion zone.

Within Rural Priorities, up to 25% of the area of new native woodlands funded under the native woodland creation model may be allowed as treeline woodlands and receive expansion payments.

2. Purpose of the Guidance Note

This note provides guidance on the use of RDC-RP to support the creation and expansion of native treeline woodlands.

3. Background

Treeline woodlands and montane scrub are very rare habitats in Scotland due to historic deforestation and continued land use pressures such as grazing and burning.

It is now widely accepted that extending woodland cover 'up the hill' to create a treeline zone can enhance biodiversity and create a softer visual boundary between forest and open hill. FCS will encourage the restoration and expansion of native treeline woodlands in Scotland, especially where it will help to create a continuum of woodland cover, which reflects climatic and edaphic gradients from the valley floor to the biological limit of tree growth.

Very little is known about the natural distribution of treeline woodlands and montane scrub in Scotland and there is little practical experience of how to create and manage these sites at the extreme limits of tree growth, so we will need to adopt a positive but cautious approach to grant aiding operations **under RDC – RP.**

4. What are Treeline Woodlands?

Treeline woodlands refers to woodland or scrub above the timber line. This limit will vary depending on species and site. Much of the land classified as F7 in the Macaulay Forest Land Classification is above the commercial treeline.

Treeline native woodland includes two main zones:

- Areas of scrub woodland above the timber line, usually composed of various combinations of tree and shrub species such as birch, rowan, hazel, Scots pine, willows or juniper. It becomes more stunted and scattered as altitude and exposure increases up to the natural 'treeline'
- Montane scrub, in the montane zone (or alpine zone) above the natural treeline, is composed of dwarf woody shrub species including various prostrate willow species, dwarf juniper (*Juniper communis* spp *nana*) and dwarf birch (*Betula nana*).

In practice the treeline is a misleading term since the two forms merge into each other according to local topography and site factors.

Treelines are thus transition zones where woodland canopies begin to break up and montane habitats such as, heath or grassland begin to dominate. It is important to recognise that some high elevation open ground habitats are of very high biodiversity value e.g. calcareous grassland, and some may be designated as open ground features and so may be unsuitable for treeline expansion.

The natural treeline is estimated to vary from about 650m in the central (continental) region of Scotland to around 250m in exposed places close to the west coast (oceanic). However, since windiness is a primary influence on tree growth, there are very exposed parts of the north-west mainland and the Western and Northern isles where the natural tree-line will be much closer to sea level.

5. Creating Native Treeline Woodlands using RDC - Rural Priorities

Native treeline woodlands may be developed to extend existing semi-natural woodland, or be created as part of a new area of native woodland.

New treeline woodlands should consist entirely of native species, which are within their natural range. The conservation value of these treeline woodlands will depend upon suitability of the site and proximity to other woodland.

Creating treeline woodlands should follow the principles of creating new native woodlands described in FC Bulletin 112:

- Take advantage of natural regeneration whenever possible where seed sources exist and are likely to yield acceptable results (stocking and species mix) within a reasonable timescale.
- Where planting is necessary, match locally native tree and shrub species to site type. Pay particular attention to the need to select seed sources from seed zones and elevations suited to the proposed planting site. Planting densities should be quite high to reduce the risk of unacceptable planting

failure arising. Planting should be confined to suitable micro sites eg in sheltered gullies, corries and burnsides, or pockets of fertile base-rich soil. So the proportion of unplanted area may normally be quite high.

- Allow new native woodlands to become semi-natural in the long term by using minimal soil disturbance, little or no artificial drainage and by trying to mimic natural patterns of plant spacing and distribution.

In order to maximise biodiversity, woodland areas should be inter-connected in a matrix of woodland cover. It should be borne in mind that similar linkages must also be considered for moorland habitats in the montane zone.

Local SNH staff or specialist vegetation surveyors should be consulted at an early stage to advise on relative values of open habitats.

Our priority for RDC funding is to extend existing native woodland.

5.1 Extending Existing Native Woodlands

The preferred means of creating treeline woodlands is to encourage the expansion of existing semi-natural woodlands where upper margins have been limited artificially by grazing, burning or fencing. Ideally, this should be achieved through natural regeneration although seed production will often be very limited due to elevation and exposure and as such, planting will often be required. Where suppressed seedlings exist, grazing pressure should be reduced to facilitate seedling growth. Existing seed trees should be allowed to regenerate, either from the semi-natural forest below, or from scattered seed trees above the woodland. However results from natural regeneration at high altitude are likely to be more variable - and the timescale for successful establishment is likely to be longer - than at lower altitudes. Moreover, seed availability is a major obstacle to establishment more than a few hundred metres distance from mature trees (French et al, 1997). Isolated remnants of truly montane species of woody shrub, such as the dwarf willows are often reduced to a small number of viable plants.

When expanding treeline woodlands through planting, it is possible to establish core patches of native species as future seed sources matched to the site. These may be able to expand naturally over time, developing into a mosaic of habitats, which relate to site fertility, drainage and exposure.

It is vital to protect planted or naturally regenerated areas from browsing by culling deer, removal of sheep or by fencing. It may be possible to carry out ground preparation such as burning and scarifying to provide a seedbed and improve the chances of natural regeneration of treeline woodland occurring. However, this has been little tested as yet, and caution is necessary before intervening to this degree.

5.2 Extending the Treeline in Conifer Forests

Native treeline woodlands may also be created above the timberline in conifer plantation forests. However until we have more experience of this it should be focussed on extending native riparian woods above the forest edge (as this is

where the seed source is most likely to be, and it will also avoid creating future design problems from planting strips of treeline woods 'hanging' above felled forest areas).

Above non-native conifer forests, in areas where grazing pressure is low, a new type of ecosystem is likely to develop above the timber line consisting of mixtures of native and non-native species. We have yet to develop an understanding of how these ecosystems function and how they contribute to woodland biodiversity. These are a lower priority for RDC funding but might qualify in some cases for WIG support.

8. Management Tools to Plan Treeline Woodlands

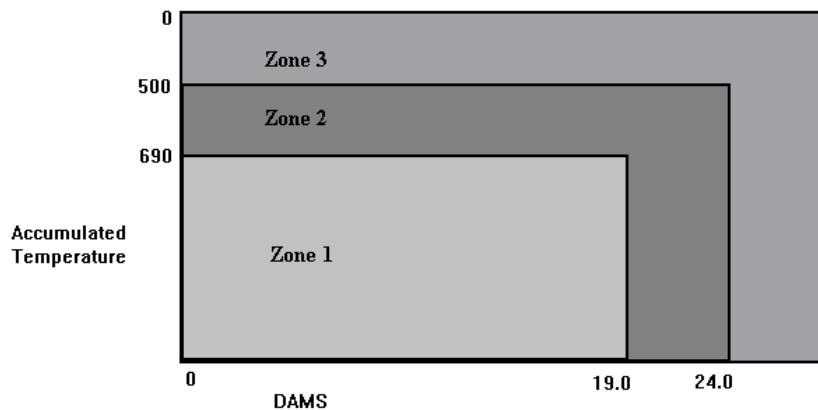
The complexity of the relationship between altitude and the treeline means that there is no definitive guidance about optimal location. However, there are a number of management tools, which can help inform decisions about making grant aid available.

a) The Native Woodlands Survey of Scotland (NWSS) provides maps and a wealth of information on all current native woodlands in Scotland above 0.5ha in size. This can be used to plan the location and composition of expansion of treeline Woodlands. Details of the local authority areas where data is currently available can be found on the NWSS pages on the FCS website.

b. Windiness Scores - Detailed Aspect Method of Scoring - (DAMS)
DAMS data provide an indication of relative windiness (exposure) which has been applied to the whole of the UK using a digital terrain modelling technique.

A Forest Research Study found that both exposure and warmth influence the extent of woodland areas in upland Britain, but that neither factor alone is sufficient to define woodland limits.

Using DAMS and Accumulated Temperature (AT) data, Scotland has been divided into 3 zones (Figure 1)



Zone 1 - Land capable of supporting commercial forestry

Zone 2 - Land capable of supporting non-commercial forestry

Zone 3 - Land unsuitable for tree growth

Figure 1. DAMS Scores - Potential Distribution of Woodland Area in Scotland

Within zone 2 (including the treeline woodlands) 90% of the sites sampled within the study had an AT higher than 575°C and a DAMS value of less than 22.5. The study concluded that if woodlands are established within these limits, they may extend by natural regeneration into colder, more exposed areas closer to the biological limits of tree growth. The study also indicated that there are no apparent differences between the upper exposure limits of Scots pine and birch woodlands.

Forest Research at the Northern Research Station can provide DAMS data for any site in Scotland at 250m resolution.

Information on how to use DAMS scores is provided in the Forestry Commission's Research Information Notes nos 230 & 231.

c. Ecological Site Classification (ESC)

The moisture and nutrient regimes of soils have also been identified as limiting factors to tree growth. The most effective way of assessing their influence is through ESC. It is critical with treeline woodlands that the relatively better drained and relatively more fertile sites are selected for initial establishment. Woodland cover can subsequently regenerate to a more natural extent. Information about ESC and how to use it is available in the Forestry Commission's Research Information Note No 260 and Technical Paper No 20.

d. Natural Vegetation Classification (NVC)

Britain has only a few good examples of natural treeline woodlands to act as role models. What is clear however is that only the most hardy tree and shrub

species capable of surviving high exposure levels are likely to form a component of any new treeline woodlands. These are - Scots pine, Downy and Dwarf Birches, Rowan, Juniper, Eared Willow and certain prostrate Willows.

Thus, most new treeline woodlands are likely to be scrubby extensions of pinewood (W18) and upland birch (W17 and W4) woodland as well as upland mixed ashwoods and hazelwoods (W9) on base- rich soils near coasts. Juniper can develop into a scrub community of its own (W19) both at treeline elevations and on more base rich soils in, for example, the Border hills. More commonly, juniper is found as a component of upland pine and birch woodland. Juniper (spp.nana), along with pine seedlings and dwarf willows can be found as components of montane heaths - above the normal scrub line, and as high as 800m in the Cairngorms.

Finally, a number of dwarf willows can form montane willow scrub communities (W20), usually confined to base rich soils in areas with low grazing pressure, such as crags; and as such opportunities for expansion are limited.

e) advice on juniper scrub management and how this can be funded under RDC-RP can be found at <http://www.forestry.gov.uk/forestry/inf-d-7rlm6m>

9. Requirements for RDC - RP Applications

The following guidance should be noted by Case Officers when considering RDC – RP applications for treeline woodlands:

- The rationale for grant aiding treeline woodlands is to enhance biodiversity and soften visual boundaries.
- Applications should provide input to Biodiversity Action Plans.
- Species should be locally native and matched to site in accordance with the vegetation indicators and soil conditions. A mosaic of woodland should be established which will allow natural expansion over time.
- Where a new native woodland proposal includes a treeline woodland component, then this should not exceed 25% of the total area of the scheme.
- **Treeline woods will only be supported where they will contribute to core FHN expansion zone.**
- The applicant must supply adequate site information to enable the Case Officer to consider an application for grant aid. Information on DAMS, ESC, current soils and vegetation, adjacent/source native woodlands and target woodland NVC categories will be essential. This information will assist an applicant to design an appropriate scheme.
- An applicant should supply information about existing tree cover and existing regeneration, which is visible or has been suppressed.
- Upward expansion of an existing semi natural woodland is the preferred option for creating treeline woodlands.
- A DAMS score of 19 (AT of 690°) is a good indicator of where treeline woodlands begin. However, for grant aid purposes, the DAMS score for any area to be grant aided should not exceed 22.5 and the AT value should be higher than 575°C. On-site verification will be essential.

- Because of the increased uncertainty of results and timescale for achieving them, a review date at years 2 and 4 in the RDC-RP contract is essential.
- Planting should be targeted at the more fertile, better drained soils and seedlings should be sourced from a suitable matching region and altitude.
- Proposals should integrate with any existing woodland and the FC Scotland Landscape Architect consulted where visual problems may arise.

10. Specification

The minimum stocking density for planted native woodlands at year 5 is 1600 stems per hectare with up to 25% of the area open ground. Treeline woodlands are likely to have significantly lower stocking levels and higher levels of open ground than is required for other forms of woodland.

The main specifications are:

- target stocking density of treeline woodlands, at establishment, is at least 1100/ha in planted areas with plants in-groups of 2-3m spacing.
- to achieve the minimum native woodland specification, the stocking density and open ground levels in the remaining areas will need to be adjusted to ensure overall compliance.

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