Forestry Commission Scotland

Guidance

Developing native woodland habitat networks

Summary

This note advises land managers how to locate native woodland expansion in order to help to develop habitat networks and deliver Scottish Forestry Strategy targets. Native woodland expansion includes the creation of new native woods and conversion from non-native woods. Biodiversity benefits are higher where expansion helps to develop habitat networks, which help woodland-dependent native species to spread and to adapt to climate change.

Three methods are set out to help choose areas for native woodland expansion:

- habitat network plans or strategies agreed by local stakeholders;
- maps indicating *potential native woodland network* areas; and
- guidance for building native woodland networks in other areas.

Potential native woodland network maps for Scotland have been created by Forestry Commission Scotland, based on modelling analyses carried out by Forest Research. The maps include core woodland areas expected to have high conservation value, together with 2 potential expansion zones. These zones represent the distances over which woodland species of slow or moderate colonising ability might be expected to disperse and to establish themselves in new native woods created near to the core areas, within a period of 50-100 years.

The network maps are indicative and are based on modelling assumptions. Decisions should be based on local knowledge and careful choice of objectives. The maps will be updated based on data from the Native Woodland Survey of Scotland and a new digital map of woodlands.

natural scotland
SCOTTISH GOVERNMENT

Introduction

1. This note advises land managers how to plan new areas of native woodland which will help to develop habitat networks and contribute to meeting Scottish Government priorities and targets for native woods.
2. Forestry Commission Scotland will promote this guidance to help land managers interested in native woodland expansion and we will use it to help our native woodlands work on the national forest estate. The guidance should also be helpful to planners preparing development plans.
3. Land managers and owners can use this guidance to help prepare applications for SRDP support for creating native woodland under relevant Rural Development Contracts - Rural Priorities options, including:

- Woodland creation – native woodland planting;
- Woodland creation – naturally regenerated native woodlands;
- Woodland Improvement Grant: Restructuring regeneration using native species (where used to convert areas of non-native plantation to native woodland).

Case officers will use the guidance to help assess priorities for support.

Farmers may also use it to plan the creation of small native woodland areas with grant support from Land Managers Options (Option 18 - Small-scale woodland creation).

Background

4. The **Scottish Forestry Strategy** (SFS) 2006 includes as a priority action to:

Support the creation of new native woodlands, in line with habitat action plan targets and focusing on:

- *forest habitat networks and links to wider habitat networks;*
- *woodland types currently under-represented in Scotland;*
- *areas with the lowest native woodland cover; and*
- *areas that contribute most to urban greenspace networks.*

5. Current Scottish native woodland targets are summarised in Table 1 for the six priority woodland habitat types in Scotland which form part of the UK Biodiversity Action Plan. These targets are the basis for action for native woods in the current SFS Implementation Plan. Wood pasture and parkland habitat targets are not included here, but action for this habitat type should also be considered where relevant.

- **Expand** includes creating new native woodlands and conversion from non-native planted woods to native woods.
- **Restore** means restoring native woodland from non-native plantations on ancient woodland sites.
- **Condition** targets are for improving the biological condition of existing native woods, both semi-natural and planted.

Table 1 - Summary of native woodland targets for Scotland for the period 2005-2015 (kha.)

Targets (total in period)	Pine	Oak	Ash	Wet	Low	Birch	Total
Expand	7.4	7.2	4.0	4.1	4.5	13.3	40.5
Restore	1.6	1.9	0.9	1.0	0.5	3.1	9.0
Condition	17.1	9.3	3.3	3.3	5.0	15.9	54.0

Pine= Native pinewoods; Oak=Upland oakwoods; Ash=Upland mixed ashwoods; Wet=Wet woodlands; Low=Lowland mixed deciduous woodland; Birch=Upland birchwoods.

6. This note focuses on native woodland expansion targets, but condition and restoration work should also be considered to help build habitat networks.

Habitat Networks

7. Habitat networks are patches of habitat that are physically or functionally connected, so that dependent species are able to move and/or disperse between patches to create interlinked populations. The development of networks should increase the resilience of species populations to threats, which is *especially important for species which are slow colonisers and/or those living in small fragmented populations.*

8. Networks should help wildlife adapt to **climate change**, both by encouraging more robust populations that can survive change in *situ*, and by making it easier for species to colonise new areas if current sites become unsuitable. The predicted pace of climate change means that networks will need to be developed and functioning over the next few decades to relieve the growing pressures on our wildlife. Research is underway to understand this issue better.

9. A variety of **forest habitat network** reports and plans and spatial planning tools have been developed in recent years. Interest is growing in developing plans for **integrated habitat networks** to design mosaics of arable, wetland, grassland, moorland and woodland habitats to get the best overall outcome for wildlife.

10. In the more urban regions, planners are developing **green networks** where human uses are the prime focus but where improving connection of wildlife habitats is usually also an objective.

Planning native woodland expansion

11. Native woodland expansion should preferably be focussed around existing native or ancient woods, to help develop diverse and resilient native woodland habitat networks. However, in areas of very low native woodland cover some more isolated planting will be needed to develop new 'nodes', which can form the basis of future networks.

12. There are three main sources of guidance for targeting native woodland expansion to help develop networks:

- habitat network plans or strategies where these have been agreed by local stakeholders;
- maps of *potential native woodland networks* based on existing core woodland habitat;
- guidance for building native woodland networks in other areas, including planting new nodes.

Locally agreed network plans

13. A number of local habitat network and green network plans or strategies have been developed in the last few years, many based on landscape ecology modelling. Some network plans may be incorporated into local authority development plans or indicative forestry and woodland strategies. Most indicate a fairly strategic vision for where native woodlands, other habitats or green space development should be directed, but some also pick out woods of high conservation value in more detail.

14. Where a network plan has been agreed with local stakeholders, it should be used to guide native woodland expansion. The maps and guidance in this note may often also be used to help target particular areas within strategic network plans. If there is any conflict, the agreed plan should generally take precedence.

Examples of woodland species that are slow colonisers.

Left - Scottish wood ant (*Formica aquilona*) nest

Right - Plagiochila heterophylla - a liverwort of old western woods

Maps of Potential Native Woodland Networks

15. Forestry Commission Scotland and Forest Research have developed a set of *potential native woodland network* maps to help focus native woodland expansion, improvement and restoration. The maps can be seen on the **Land Information Search** facility on the Forestry Commission website.

    Forestry Commission Scotland staff can also view the maps on the Forestry Commission Scotland **map browser**.

16. The maps show potential networks centred on core areas of woodland. The core areas are woods included in one or more national datasets that indicate high conservation value:

- ancient woods and long-established woods (both from the Scottish Ancient Woodlands Inventory),
- woodlands on designated sites,
- Caledonian Pinewoods Inventory woods,
- semi-natural woods, as estimated from the Scottish Semi-natural Woodlands Inventory dataset (SSNWI)*

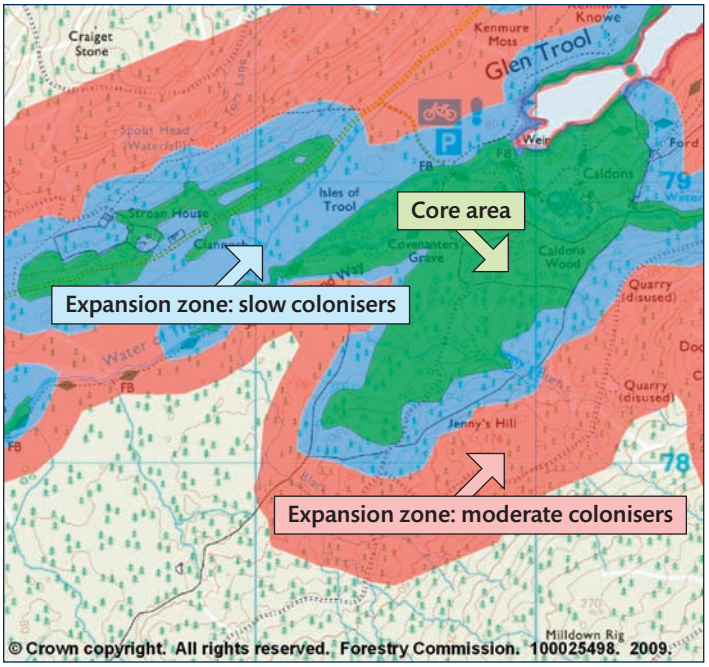
* the analysis included all SSNWI areas with over 80% semi-natural canopy structure and with canopy cover of at least 20%.

17. Some of these datasets are up to 20 years old, *so the maps are indicative and need to be treated with caution*. Forestry Commission Scotland's Native Woodland Survey of Scotland and the updated digital map of all types of woodland will allow the network maps to be revised over the next few years (See para.31).

18. Around these core areas, two network expansion zones have been defined using the **BEETLE** modelling tool developed by Forest Research. The zones are for:

- slow coloniser species (up to 250m.) such as ancient woodland plants;
- moderate colonisers (up to 1000m.), which include a range of woodland plant and invertebrate species.

Figure 1. An example map of a Potential Native Woodland Network



19. The potential expansion zones suggest where locating new native woods would best develop ecological connection to core woods. They indicate the predicted maximum distances at which a new native wood planted today would be expected to be successfully colonised by a range of characteristic woodland species dispersing from the nearest core woodland, over a period of around 50-100 years. Crucially, this is the period over which we will need to develop functioning networks to help species adapt to rapid climate change (para.8).

20. The zone widths vary according to the land use and habitat type next to the core woodland. The model assumes that the maximum colonisation rates (250m or 1000m) will occur only where the newly planted wood is connected to the core network area by planted native woodland, since this most closely resembles the preferred semi-natural woodland habitat. If the new wood is separated from the core woodland by an unwooded area, woodland species will need to cross this less suitable habitat to colonise the new native wood, and so colonisation rates and

How much could the Potential Native Woodland Networks contribute to native woodland expansion targets?

The analysis which developed the network maps was carried out by Forest Research for Forestry Commission Scotland. A **report was published** by Forestry Commission Scotland in 2008. The report estimated areas within the networks that are technically suitable for the various priority native woodland types, and for each of the three UKBAP target types, using models based on climatic and soil information.

The individual woodland and target type predictions have not been included in GIS maps, because the underlying information was not reliable enough for detailed site level use. The analysis produced regional estimates of the potential quantity and pattern of each native woodland type. Users can see regional maps of predicted native woodland types in pdf form, together with the report.

The estimated total area with potential* for native woodland expansion (all types) was 326kha for the 250m network, including:

- 1137kha for currently unwooded land;
- 189kha currently planted with non-native woodland, which might be considered for conversion to native woodland.

For the 1000m network the total potential* expansion area was estimated at 583kha, including:

- 296kha unwooded land;
- 287kha non-native woodland.

The Scottish native woodland expansion target of 40,500ha (2005 to 2015) represents just 12.5% and 7% respectively of the potential* expansion areas in the 2 networks.

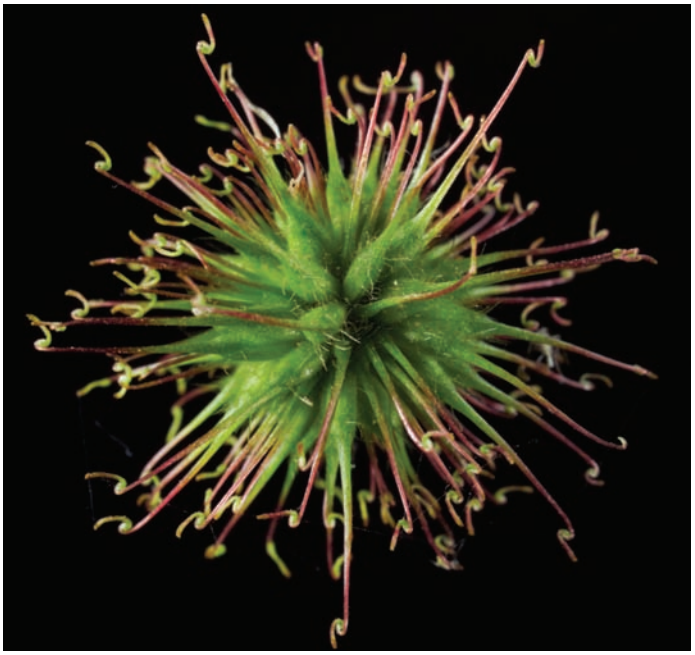
* Maximum areas based on ecological potential only: see paragraph 21.

expansion zone widths are reduced. The zones are narrowest where arable or brownfield land are the intervening land use types.

21. Urban and aquatic areas and areas designated for open habitats were excluded from the network expansion zones. Many other areas within the potential expansion zones may be important for open landscapes, habitats or species and so may not be suitable for woodland creation. Likewise non-native woodland areas on the network maps may not be suitable for conversion to native woodland for various reasons. **The zones are indicative only; the pros and cons of planting or converting a given area to native woodland must be factored in locally.**

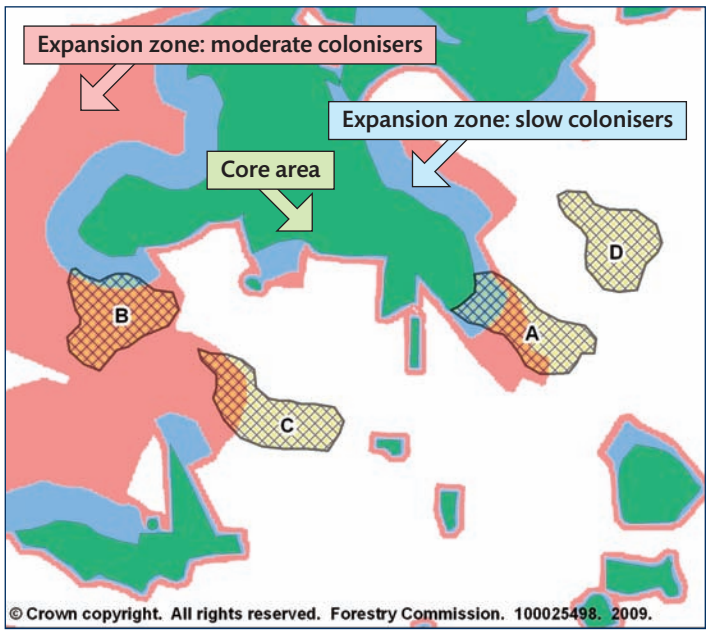
How to use the maps to locate new native woodland

22. As a general rule, try to locate areas of *planting or natural colonisation* of new native woodland so that they are adjoining or close to core woods in the networks. *Conversion* or *restoration* of planted non-native woods into native woods should also be considered in this way where relevant.



Wood avens (Geum urbanum) is a 'moderate coloniser'. The fruit attaches to animals to aid dispersal.

Figure 2. Potential Native Woodland Networks: options for locating new native woodlands
(see para 23 for explanation of symbols and letter coding)



23. Expected biodiversity gains from new or converted native woods over the next 50-100 years will tend to be in descending order as follows (See figure 2).

A) *Sites adjoining or partly adjoining core woodland.* All types of woodland species found in the core woodland should have a good chance of colonising the new native wood in this timescale.

B) Sites *which are not directly adjoining any core woodland but are at least partly within the 250m network*. These sites should have good potential for colonisation by both moderate and rapid colonisers, and animal species that can use closely adjacent patches of woodland for daily or seasonal needs. At least some slow colonisers should be able to establish.

C) *Sites outside the 250m network, but within the 1000m network*. Should be reached by moderate and rapid colonisers, but slow colonisers may not establish populations in less than a century.

D) *New woodlands outside both expansion zones*, are likely to have slower biodiversity gains, confined initially to mobile species and rapid colonisers. They can help build potential longer-term ecological connectivity to other woodlands and so help develop long-term networks at a larger scale. However they may not contribute much to climate change adaptation for vulnerable species, at least during this century.

24. *However each case needs to be looked at on its merits.* The maps and guidance are only a starting point, and there will often need to be adjustments. For example:

- where the map information is inaccurate or out of date;
- where local constraints or objectives conflict with native woodland expansion;
- if particular UK priority species and habitats are important locally, the design may need to be tailored to their needs, for example in red squirrel strongholds;
- to take account of local features like hedgerows or shelter belts, which may provide ecological linkages that are not on the maps;
- where a native woodland type on a site outside the 1000m network may be given higher priority because it is regionally scarce;
- where new 'nodes' need to be planted as a basis for future habitat networks in areas with little native woodland cover (see below).

Riparian woodlands are often refuges for woodland species which colonise new native woods.

Guidance for building networks in other areas

25. Some native woodlands will not be included in the potential native woodland network maps, for example narrow riparian woods or recently planted native woods. Outside the mapped network areas, *priority for locating new or converted native woodlands to help develop forest habitat networks should be in areas adjoining or close to mature native or riparian woodland habitat*. Again, the greatest benefit will come from physical connection. Table 2 gives guidance on distances for locating new woods in different types of land use.

26. The size and ecological quality of source woods are also important. In general, woods of over 5ha in area and 100m width are likely to support a good range of woodland species and act as good sources to colonise new woods, although many narrow riparian woods are also species-rich.

Table 2 - Indicative distances for locating new native woods in relation to existing native woods to encourage colonisation by woodland species

Intervening land use type (between existing and new native woods))	Distance range for high biodiversity gain (m.)*	Distance range for moderate biodiversity gain (m.)**
Arable, improved pasture, brownfield sites	0-20	20-50
Acid grassland, heath, wetland	0-40	40-120
Scrub/open ground mosaic, wood pasture	0-60	60-250
Non-native planted woodland	0-125	125-500

*Distances across intervening land cover type between new and existing native woodlands (source wood) over which slow colonisers may reach the new woodland in 50-100 years; based on 250m network model.

**Distances between new and existing native woodlands over which moderate colonisers may reach new woodland in 50-100 years; based on 1000m network model.

Establishing new native woodland network 'nodes'

27. In some localities with low native woodland cover, e.g. parts of the Southern Uplands, there may be no existing native woodlands around which to build networks. Some new native woodlands will therefore need to be created to form the basis of future networks. To develop a good range of features and species in the long term, these new areas should preferably exceed 5ha and 100m width and should be linked directly to features which can hold woodland species, such as non-native woodlands, semi-natural riparian habitat, scrub, and hedgerows.

Green networks

28. The main emphasis in green networks is on designing networks for use by people; e.g. for recreation, scenic value and improving the quality of life around urban areas. But they can contribute to biodiversity and native woodland habitat networks as well, by drawing upon the targeting principles and maps in this guidance. Forestry Commission Scotland will encourage this approach to planning green networks.

Deciding what native woodland type to plant

29. There are several source of advice to help, including:

- **Action for Scotland's Native Woodlands** describes priority native woodland types and key actions to expand, restore or improve their condition;
- Forestry Commission Bulletin 112 *Creating New Native Woodlands* gives guidance on selecting suitable species and native woodland type and on planting methods and design -it can be **ordered** from the Forestry Commission website;
- The **Ecological Site Classification** (ESC) decision support tool produced by Forest Research also helps choose native woodland type and species;
- **Forestry Commission Forestry Practice Guides 1-8**, The management of semi-natural woodlands, describe

woodland types and their management and advise on expanding existing native woods.

- **Seed sources for planting native trees and shrubs in Scotland** advises on regional lists of native species and suitable types of seed source.

A native woodland network in an upland landscape

Future developments

Habitat network planning tools

30. Forest Research have published a suite of **regional analyses** using the BEETLE modelling tool, together with guidance on potential uses. Forest Research can also carry out analyses for particular areas and objectives. A modelling tool to help users develop *integrated habitat networks* is now being developed, led by Scottish Natural Heritage. This could allow users to test options for the location and design of woodlands to achieve the best overall biodiversity benefit, through balancing woodland and open ground species' needs.

Updating the Native Woodland Habitat Network map

31. The *Native Woodland Survey of Scotland* will map and survey native woodlands throughout Scotland by 2013 and will describe the current extent and condition of each native woodland type. Results will be reported for each local authority area starting in 2009/10. Forestry Commission Scotland will develop a programme for the revision of the network maps to incorporate the survey information.

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Published by - Forestry Commission Scotland, 'October 2009
D&IS - PDF - OCT09