Forestry Commission
231 Corstorphine Road
Edinburgh
EH12 7AT
http://www.forestry.gov.uk

Using Natural Colonisation to Create or Expand New Woodlands

INFORMATION NOTE

BY RALPH HARMER OF FOREST RESEARCH

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SUMMARY

The creation of native woodlands by natural colonisation is thought to have a number of environmental benefits and is supported by the Woodland Grant Scheme. However, it is an unpredictable process and new woodland may take many years to establish. This Note describes some preliminary experimental results from four colonisation sites in southern England and discusses some of the factors that should be considered when trying to identify sites where natural colonisation may be successful. Some methods of improving the chances of success are suggested.

INTRODUCTION

1. Natural colonisation is the process by which plants and woodlands are allowed to establish from seeds dispersed naturally from local sources. It is distinguished from natural regeneration by the absence of recent woodland cover over the site, but this distinction may be blurred where there are widely spaced trees with low canopy cover on the site, e.g. parklands, heaths and poorly stocked upland woods consisting of scattered trees.

2. Woodland managers perceive a number of benefits from the use of natural colonisation which include:

   - matching of species to the site;
   - patchy distribution;
   - structural irregularity and natural appearance;
   - conservation of local genetic stock;
   - trees which cost nothing to establish.

3. This method of woodland creation is supported by the Woodland Grant Scheme, where it is classified as new planting by natural regeneration. Between January 1992 and December 1997 about 14% of approved new planting was by this method, the majority being in Scotland.

4. The use of natural colonisation has been recommended for the expansion of existing native woodlands and the enrichment of new native woodlands established primarily by planting. It has been suggested that 20–50% of planted sites should remain as open space (Rodwell and Patterson, 1994).

5. However, natural colonisation is unpredictable and woodland may take many years to develop. The reasons for this are complex and include:

   - site conditions at the time of initiating management for colonisation;
   - time of initiation;
   - tree seed availability;
   - germination of seeds;
   - survival and growth of seedlings.

6. The type of site and its initial condition will exert a strong influence on the likelihood of success. Results from a survey of urban and ex-industrial sites showed that colonising trees were positively associated with the presence of sub-soil, small stony substrates such as gravel and ballast, and a weak grass sward. Conversely, colonisation was negatively associated with loam, sand, a grazed sward and sites with no vegetation (Hodge and Harmer, 1996).

7. All sites differ and careful assessment is necessary to determine whether the use of natural colonisation will meet the objectives for management of the site. On most sites positive management to encourage colonisation will be necessary. This will vary with site, for example some may simply require exclusion of browsing animals whereas others may also need weed control.

8. This Note describes some results from field trials, provides information which should help to identify sites where natural colonisation is likely to succeed, and gives guidance on some procedures which may be necessary to improve the chance of success.

EXPERIMENTAL SITES

9. Four fenced plots each approximately 0.3 ha in area were established in southern England to observe the process of colonisation.

Aldewood, Suffolk

10. The plot is in a field corner with hedges and large trees within 5 m of the southern and western plot boundaries; there are 17 woody species within 100 m. The site was originally poor grassland, the soil is a clay which is prone to waterlogging and after fencing the mixed grass and herbaceous vegetation grew about 50 cm tall. Two years after fencing seedlings of five woody species had grown, 75% of those seedlings were ash the remainder being field maple > oak > hawthorn > blackthorn. Both the numbers of seedlings (Table 1), and species growing, declined with distance from the eastern boundary which is closest to the largest parent trees. Blackthorn was only found in the area beside the western hedge and was probably growing from suckers.

Sudbury, Suffolk

11. A plot was established in the corner of an arable field after a crop of wheat had been harvested. There are hedges with trees on the immediate south-east and north-east boundaries of the plot and 15 woody species within 100 m. Within two seasons of fencing, seedlings of five species had invaded the plot, most of these were ash and field maple (45 and 35% respectively), the remainder were oak and *Prunus* sp. with a single hazel. The total number of seedlings present and the number of species growing declined with distance from the hedges.

Church Gresley, Derbyshire

12. This experimental plot was established in the National Forest. It was originally pasture growing on a brown earth soil and is more or less surrounded by trees and woodland comprising 10 potential parent species. After fencing the vegetation grew luxuriantly to produce a dense mixed grass and herb sward about 50 cm tall. Only 16 seedlings grew in the first two years, 10 were hawthorn and 6 were oak, all were close to the woodland edge.

Foxenhole, Devon

13. This site was established within a quarry on a newly re-instated area with a soil consisting of mixed sand, gravel and clay. The site slopes towards the south-west and has mature mixed broadleaved woodland to the east: there are 16 potential parent species within 100 m of the site. After two years, 70% of the colonising seedlings were birch, 20% were oak, the remainder being a mixture of other species. There was a general decline in both the number of species and seedlings growing as distance from the woodland increased.

14. At all sites, only a small proportion of the potential parent species colonised within the first two years of fencing; the species mixture of seedlings present was unbalanced with large numbers of some and few of others; most seedlings were growing within 20 m of the parent trees (Table 1); and the number of species declined with distance from the potential parents.

Table 1 **Total area studied, number of species found as either parents or seedlings, and total number of seedlings per hectare at different distances from parents**

Site	Area (ha)	Number of species		Approximate distance (m) to parent trees		
		Parents	Seedlings	0–20	21–40	41–60
				Number of seedlings ha^{-1}		
Aldewood	0.25	17	5	8250	2000	750
Sudbury	0.25	15	5	9700	650	150
Church Gresley	0.35	10	2	45	*	*
Foxenhole	0.30	16	4	2700	1200	550

* No plots at these distances.

15. At present, most of the seedlings are less than 20 cm tall and it is not clear how many will eventually establish in the weed vegetation developing on the sites, but assessments of seedling numbers, heights and vegetation are continuing.

SEED INPUT

16. The process of natural colonisation should only be initiated when a supply of seed is assured. This may mean deferring any management changes or preparatory operations until a suitable seed year occurs.

17. Tree species have different methods of dispersal and some can travel large distances, but in general any species is unlikely to colonise quickly if it is not already present on, or is close to, the site. The probability of seeds arriving at the site will increase with the number of parent trees.

18. Seed size and mode of dispersal will partly determine whether seeds from any tree will reach a site and can give an indication of how close a species should be to the site before colonisation can be expected.

19. The distance that wind-dispersed seed will travel depends on a variety of factors, including wind speed at time of dispersal, species, and height of the tree. Most seed will fall close to the parent tree and it is probably unrealistic to expect significant colonisation where the distance between the site and parent exceeds that shown in Table 2. However, under exceptionally windy conditions some seed will travel much further.

20. Heavy seed such as oak can also be dispersed by mammals and birds. Small mammals may cache any seed that is edible including ash, sycamore and other species, but distribution is unlikely to occur over long distances and it will be patchy.

21. Some trees (e.g. cherry and rowan) and many shrubs produce fleshy fruits which are dispersed by birds. These may travel long distances, but their distribution is likely to be patchy and associated with sites for perching.

22. Initial species to arrive are most likely to be those which produce large numbers of wind-dispersed seed, and successful colonisation will occur in areas downwind of the parents. The direction of the prevailing wind at the time of dispersal should therefore be considered. Colonisation by bird dispersed species can be encouraged by the use of bird perches and will probably increase as woodland cover develops (e.g. development of rowan and holly understoreys in oakwoods).

23. Success is more likely from species, such as birch, which produce seeds at short regular intervals rather than those like beech which produce large numbers of seeds infrequently (Table 2).

Table 2 Seed characteristics of broadleaved trees

Species	Distance (m)	Mode	Frequency (years)
Oak	20	G, M, B	3–5+
Ash	50–100	W	1–3
Birch	100–200	W	1–2
Cherry		G, B, M	1–3
Alder	20	W	1–3
Beech	20	G, M	5–15
Sycamore	50–100	W	1–2
Rowan		G, B	1–2
Sweet chestnut	20	G, M	
Willows	100–200	W	1–2
Field maple	50–100	W	2
Hazel	20	G, M	
Aspen	100–200	W	
Small-leaved lime	50–100	W	2–3
Hornbeam	50–100	W, M	2–4
Whitebeam		G, B	
Limes	50–100	W	
Crab apple	20	G, M	
Bird cherry		G, B	
Elms	50–100	W	2
Yew		G, B	
Pine	100–200	W	
Wild service tree			1–2
Holly		G, B	2–4

Distance = Maximum distances at which colonisation can be reasonably expected to occur.
Mode = Method of dispersal: G - gravity, W - wind, B - bird, M - mammal.
Frequency = Interval between good seed years.

GERMINATION AND ESTABLISHMENT

24. The availability of seed is an important consideration in identifying sites suitable for natural colonisation but unfavourable site conditions and ill-timed operations may prevent successful germination and establishment of seedlings.

25. Although dormancy characteristics differ between species, many trees do not form a long-lived seed bank in the soil, and seedlings grow from seeds which have recently dispersed. Most species germinate in the spring following production, but others differ: for example willow germinates in the summer immediately after dispersal, whereas ash remains dormant in the soil for two winters before germinating in the second spring after dispersal.

26. Ground preparation can be carried out to improve conditions for germination but it should be used with caution. Whilst it may be advantageous on poor acidic soils it is probably inappropriate on sites with fertile soils as the seedbed provided will stimulate germination and growth of competitive weeds. For large-seeded species such as oak and beech, any ground preparation should be carried out after seedfall in order to bury the seed: with smaller-seeded species such as birch, areas of bare, weed-free soil should be produced before or during seedfall.

27. On some sites weed-free conditions are not required for success and seedlings of a variety of species will establish in weak grass swards, small herbs and low growing ericaceous shrubs.

28. Weed control will be necessary during the colonisation process on sites where the growth of weeds is already vigorous or where it will become vigorous when management changes occur (such as on good agricultural land).

29. If dense bracken is present on the site then it must be controlled during spring and summer until trees are satisfactorily established.

30. Caution should be used when using ground preparation and herbicides as these may damage or kill any seedlings already present on the site.

31. Protection from browsing animals will usually be needed.

CONCLUSIONS

32. There is a perception that, compared with planting, the use of natural colonisation has a number of benefits for the creation of new woodland, but in much of Britain it forms only a small percentage of new planting approved under the Woodland Grant Scheme. The process is unpredictable and sites can be captured by non-woody species before trees can invade. The time taken to achieve acceptable woodland establishment, the species colonising and the distribution of trees across the site are difficult to control.

33. Success is inherently more likely on some sites than others, which probably accounts for its more frequent use in Scotland than in England and Wales. More promising sites are found on well-drained, acidic mineral soils which support a slow growing, weakly competitive flora, for example on lowland heaths and some upland pastures. Sites which are poor for natural colonisation and require intensive management include sites with fertile, moisture-retaining clays and loams that can support vigorous weed growth (e.g. improved pastures and arable fields).

34. As all sites and species differ, a simple single prescription guaranteeing the success of natural colonisation cannot be given, but general principles, which allow identification of suitable sites and some guidance on the management of sites are possible:

- Choose sites which are close to parent trees; for wind-dispersed species these should be downwind of the seed source.
- Colonisation by bird dispersed species may be enhanced by provision of suitable perches, which includes planting trees that will encourage birds on to the site.
- Time operations to initiate colonisation so that they coincide with seed input; avoid poor seed years.

In general, colonisation will be more successful where:

- Sites have poor soils.

- There are suitable sites for germination: on infertile sites it may be useful to provide these by cultivation.

- Appropriate methods of weed control are used. On sites where the potential for the development of a dense ground cover is high, such as arable and improved grassland sites, methods similar to those for establishing new farm woodlands by direct seeding may be necessary (Willoughby, 1996).

- Bracken is controlled where it is present to prevent the development of a dense canopy during summer.

- Areas are protected from browsing.

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Enquiries relating to this publication should be addressed to:

Dr Ralph Harmer
Forest Research
Alice Holt Lodge
Wrecclesham
Farnham
Surrey
GU10 4LH

Tel: 01420 22255
Fax: 01420 23653

E-mail: r.harmer@forestry.gov.uk

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