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Ancient Tree Guide no.7: Trees for the Future

This leaflet is the seventh in a series about ancient trees:

No 1: *Trees and Farming*

No2: *Trees in Historic Parks and Landscape Gardens*

No3: *Trees and Development*

No4: *What are Ancient, Veteran and other Trees of Special Interest?*

No5: *Trees and Climate Change*

No6: *The Special Wildlife of Trees*

No7: *Trees for the Future*

They are available from the Woodland Trust or can be downloaded (as a pdf file) in English and Welsh from www.ancient-tree-forum.org.uk.

Mae'r daf len hon ar gael yn Gymraeg fel pdf o wefan.

Further reading:

Veteran trees: A guide to good management (2000) ed H. Read. Available as a pdf from their website at www.naturalengland.org.uk

Trees and How to Grow Them. M. Lipscombe and J. Stokes available from the Tree Council www.treecouncil.org.uk

The Good Seed Guide. J. Stokes. Available from the Tree Council www.treecouncil.org.uk

Grazing Ecology and Forest History (2000) F.W.M. Vera. CABI Publishing.

Our Trees. A guide to growing Northern Ireland's native trees from seed. (1996). Dinah Browne. Conservation Volunteers Northern Ireland.

Our Trees. A guide to growing Northern Ireland's native trees from seed. (1996). Dinah Browne. Conservation Volunteers Northern Ireland.

Tree Guide. Johnson, O. (2004) Collins.

TIN014 (2007) Traditional orchards: planting and establishing fruit trees. Natural England

Niinemets, U. and Valladares, F. (2006) *Tolerance to shade, drought, and waterlogging of temperate northern hemisphere trees and shrubs*. Ecological Monographs, 76(4) pp. 521–547

Bergman, K-O., (2006) *Living coastal woodlands – conservation of biodiversity in Swedish Archipelagos*. Swedish Forest Agency.

Advice and information about ancient and veteran trees: www.ancient-tree-forum.org.uk

Record an ancient, veteran or other tree of special interest: www.AncientTreeHunt.org.uk

Tell us about a wood or tree under threat and get lots more information about fighting a threat: www.woodsunderthreat.org.uk



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Front cover: Oak sapling regenerating in protective scrub, Borkener Paradise, Germany/Ted Green. Back cover: Keith Alexander.

Diagram on p8: Neville Fay. Printed on recycled paper ♻ 4251 12/09





Ancient and veteran trees are rich reservoirs of biodiversity and they are cultural icons. In the UK we are fortunate to have many such trees in our landscape. There has, however, been a significant loss of these trees because of the disappearance or neglect of commons, traditional orchards and parkland since the 1850s and the removal of hedgerows. There appears to be a growing imbalance between the loss of mature and ancient, open-crowned trees and the next generation of new trees to replace them. The Ancient Tree Forum and the Woodland Trust believe that we must encourage tree establishment of the right tree in the right place to ensure there will be at least as many, if not many more ancient trees in the future.

Some of the oldest trees in the UK started life in a very unplanned way – with little or no human influence and as such are our wildest trees in Western Europe. There are advantages to such establishment by natural processes, and this guide is aimed at promoting them where possible in order to ensure we

have 're-wilded' ancient trees for the future. Although natural regeneration is preferable, it might be necessary to plant trees. While there is plenty of existing guidance on planting to create or restock woods, plantations, orchards and hedgerows, and on planting trees in gardens and streets, this guidance emphasises some of the most important factors that should be taken into account in order to ensure that the young trees will become 'ancients' of the future. This guide is primarily for landowners and professionals who want to establish trees that can develop full, open crowns and live long enough to become ancient. These will be in landscapes that are kept open by grazing animals and are the most important today for wildlife associated with the ancient and veteran trees. They are also the places that in the past have been celebrated by owners and landscape designers, artists and writers as some of the most beautiful landscapes in the UK.

Wild spaces needed for wild trees

Trees have been reproducing themselves naturally for millennia; however the landscape is now subject to so many competing interests that trees and shrubs are usually allowed to grow only in the exact places where we want them. A planted tree can be placed just where we want it, while those that grow 'wild' may be seen as 'neglected' and 'untidy'. There are certain areas of wood pastures and parkland where natural regeneration of trees and shrubs can take place, but these are now rare and very special. There is still a great deal we are learning from tree establishment in these situations.



The challenges for self-sown

WTPL/Margaret Barton



Winged seed and acorn

WTPL/Pete Holmes

Hitting the spot

The seeds of most trees have specialised mechanisms that allow them to disperse naturally either by:

- The wind – the seed cases are light and have wings or other structures to help give them lift so they fly a long way.
- Birds or other animals – some seeds have evolved to be attractive to animals, for example, by becoming an energy-rich food source. Those that escape being eaten have an energy store that is valuable for the early development of the seedling, although some seeds or berries need to be eaten to break their dormancy.

Natural selection

When natural regeneration occurs, only those seeds that land where the conditions are right will survive. Any seedling that does survive has the advantage that it started its life without the stresses of being grown under the artificial conditions and then being subjected to the shock of replanting.



WTPL/Rosey Norton

Rooted to the spot

If the soil is in good condition and contains an undisturbed and undamaged assemblage of micro-organisms, then the root may immediately be colonised by mycorrhizal fungi, which help with water and mineral gathering, as well as protecting it from pathogens. Immediate colonisation by mycorrhizal fungi will increase the chances of the seedling's survival and the eventual growth of a healthy tree.



An oakling from an ancient oak acorn raised in organic soil with mycorrhizal fungus fruit bodies present around the root zone.

Ted Green

Light and shade

In open habitats such as grasslands, both shade-tolerant and light-demanding trees can become established, but since shade-tolerant trees are sometimes more vulnerable to drought they might not be able to survive so well in the open, where moisture levels can fluctuate more widely.

In woods with closed canopies the seedlings of only the most shade-tolerant species such as yew can eventually become large trees.

The seedlings of light-demanding species cannot survive in very shady conditions (e.g. under the crown of the parent tree), and so these species can be dispersed only if their seeds are carried further afield, perhaps by wind or animals. Oak and hawthorn are examples of light-demanding species that generally need very open spaces in order to become established, although hawthorn can later sometimes survive as an understory in woodland. A shade-tolerant seedling will usually require increased light levels at some developmental stage to grow into a large tree.

Phoenix regeneration

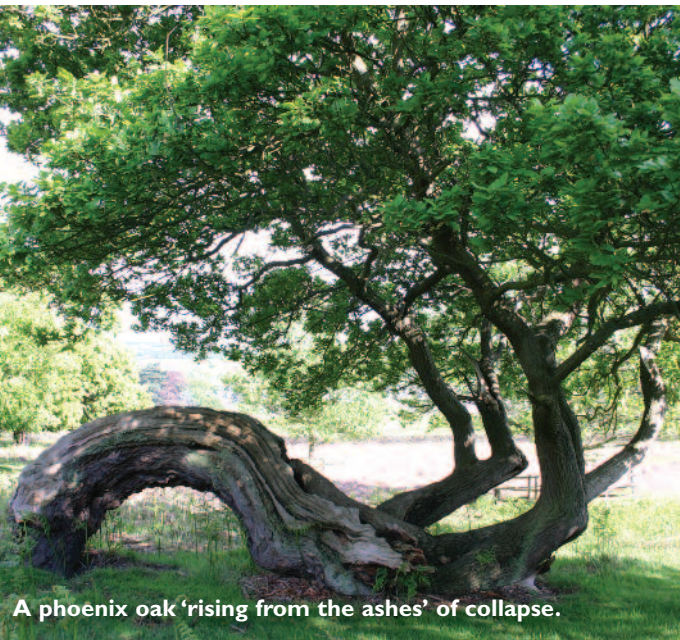
If fallen trees are allowed to remain in situ, with roots remaining in the ground, they can continue to grow in a horizontal position, with their branches growing up towards the light. If the crown of such a tree makes contact with moist soil, it can form adventitious roots, so that the tree acquires a new rooting position. Eventually, the original root system and the horizontal trunk could die and decay, so that the tree appears to have 'walked' across the landscape or created groves. Such collapsed, but regenerating, trees are called phoenix trees. New roots can form in the same way in the layering of branches that bend down and touch the ground. Such branches can act as flying buttresses, propping up aging trunks and making them more stable.

How you can help

- Set aside places where tree establishment can occur through the wildest, natural processes.
- Allow 'phoenix' regeneration and branch-layering of trees by leaving the collapsed tree or layering branches alone and in some circumstances protecting the re-growth from grazing.

Tree	Shade tolerance Approx %	Height (metres)
Scots Pine	33	40
Common hawthorn	39	15
Silver birch	41	30
Midland hawthorn	49	15
Pedunculate oak	49	38
Ash	53	30
Alder	54	28
Rowan	55	25
Sessile oak	55	42
Sweet chestnut	63	36
Field maple	64	25
Sycamore	75	38
Holly	77	23
Hornbeam	79	30
Small leaved lime	84	42
Yew	89	25
Beech	91	40

Table 1: Comparison of light requirements of common tree species and height of tallest specimen in UK. The ranking by shade-tolerance is derived from a desk study (Niinemets & Valladeras, 2006). They analysed the rankings provided in a wide body of literature. They applied some statistical rigour to the ranking of the species but this does not necessarily mean that the ranking holds true across all the geographical and genetic range of variation. In particular, yew in the UK is generally regarded as more shade-tolerant than beech, despite their reversed ranking in the table.



A phoenix oak 'rising from the ashes' of collapse.

Ted Green



Ted Green

Establish grazing by cattle, traditional horses or native deer.

The value of scrub

Browsing by livestock affects not only establishment, but also species composition and development of trees and shrubs. It is essential to have sufficient browsing by wild animals and domesticated stock to keep landscapes open enough for light-demanding trees and shrubs to thrive – but not too much browsing or from unsuitable animals so that seedlings are all eaten and their leading shoots cannot grow above the browsing height.

The palatability of leaves to animals influences tree establishment. One reason why most of our deer parks are dominated by oak is that it is much less palatable to deer than ash, for example, and so its seedlings are more likely to survive. On the other hand, many of our cultural landscapes are rich in veteran and ancient trees managed as pollards. These include ash pollards in the Cotswolds, and in the Lake District, where their branches were cut for fodder in summer droughts or

kept as tree ‘hay’ for feeding to animals in winter.

Young trees often survive better if they develop within thorny scrub, e.g. blackthorn or bramble, which is less affected by browsing. Oak seedlings often grow at the edge of thorn clumps, where jays tend to bury their acorns. At Hatfield Forest in Essex, there was a tradition of gathering acorns and tossing them into thorn scrub to promote the development of new wild trees.

Regeneration will occur also if there is other protection such as fallen branches, dead wood or even plants that are unpalatable because they have chemical (eg hound’s-tongue) or structural (e.g. thistle) defences¹.

Although thorny defences can enable young trees to escape excessive grazing or browsing, certain kinds of livestock can break through them. Goats and sheep that originated from southern and eastern Europe are adapted to browsing leaves through the thorny scrub

and are specifically chosen as a ‘tool’ controlling scrub development in herb rich grasslands and heathland. Exotic muntjac deer from Asia, appear to be able to eat plants that are otherwise unpalatable to native wild animals and to rare breeds.

Manage regeneration

In order to ensure that open-grown trees can attain their full crown-size without competition, it is preferable to have too little regeneration than too much. If too many trees establish at the same time, the result could be a closed-canopy woodland. It can then be onerous and contentious to remove trees. It could be easier to think in terms of how many trees need to be established and how frequently, and then compare those ideas with what is happening.

How you can help

- Establish grazing practices, choosing a type and density of animals suitable for browsing to allow sufficient regeneration, but not too much.
- Encourage different forms of scrub to develop as a nursery for tree regeneration.
- Leave fallen wood to provide shelter and nutrients for seedling development.
- When deciding how much regeneration to allow, ensure individual trees can grow to maturity and into old age without their crowns touching or being over-topped by other neighbouring trees.
- Monitor regeneration and adjust the stocking densities to manage it.
- Share experiences with other land managers.
- Consider protecting some wild saplings if it is difficult to manage browsing stock.

“The thorn is the mother of the oak”²

Humphry Repton

¹ Smit C, Den Ouden J & Müller-Schärer H (2006). Unpalatable plants facilitate tree sapling survival in wooded pastures. Journal of Applied Ecology 43: 305-312.



Jill Butler

Scrub in parkland protects wild regeneration of trees.

Browsed young trees regenerating in wood pasture, survival owing to protective thorny scrub.



Ted Green

Planting for future ancient trees with open crowns

Why plant trees?

Tree planting may be necessary where natural regeneration is too unpredictable. For example where:

- a particular tree species is required for a particular purpose and there are no suitable wild-seed sources nearby.
- current age structures are weighted to mature and ancient trees and replacements are needed urgently.
- important amenity tree features need to be maintained.
- the aim is to involve people, especially children.

The right tree in the right place

When planting, as when encouraging natural regeneration, it is important to consider the light-demanding or shade-tolerant characteristics of the trees. Blocks of even-aged and closely spaced trees have a structural uniformity that is of limited value for wildlife. The planting of a range of species can produce a more diverse habitat, but if these include any that are both fast-growing and shade-tolerant, they could out-compete the saplings of light-demanding species. When planting more formal groups of trees such as roundels or avenues, the choice of species and spacing is particularly important, since competition for light will have aesthetic as well as ecological consequences.

Always remember that trees and shrubs grow best when root growth is good and competition for moisture and nutrients from other plants is low. Inorganic fertilisers negatively affect mycorrhizal fungi and should not be used.

Some non-native trees, especially of European origin, can be useful in reducing the age-gap in tree populations because they grow more quickly. Sweet chestnut, which grows faster than oak has a similar heartwood and therefore some of the species associated with oak may find it a suitable alternative host.



A Scots pine, possibly up to 1000 years old, which has grown in the open all its long life and has a very wide crown.

Too close for comfort

Scattered, open-crowned trees² are recognised to be keystone structures in a wide range of landscapes and are objects of great beauty. The maintenance of a tree-free zone around them is important or the older tree will otherwise be damaged by shading from the more vigorous younger tree as it matures and the shape of the younger tree being affected as it grows.

The minimum amount of space required by a tree or shrub to grow to its full crown height and spread – especially the development of the lower branches – depends on the species (and genetics) and also on its situation. Provide each tree with an area that is at least as wide in radius as the expected height of the tree (see chart on p 5) e.g. Scots pine has a top height of 40m and is very light demanding, so should be planted at 40m centres.



² Manning AD, Fischer J & Lindenmayer DB (2006). Scattered trees are keystone structures – implications for conservation. *Biological Conservation* 132: 311-321

It is often said that planting extra trees allows for loss, but such failures are unpredictable and the result generally is an overcrowded stand with a few small gaps. Early thinning to compensate is also often recommended, but rarely takes place.

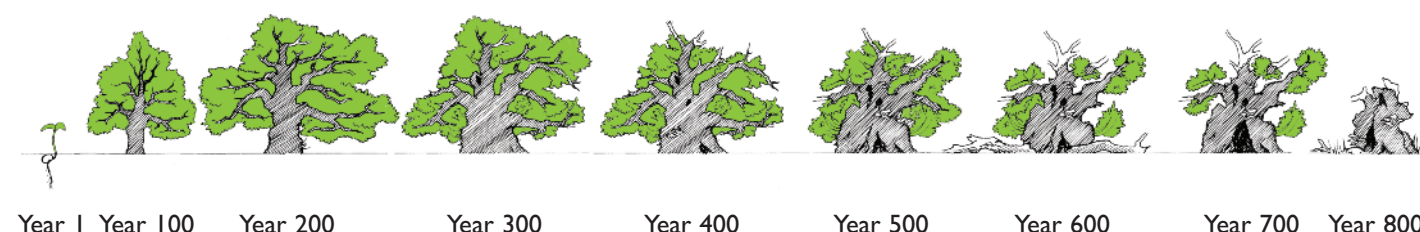
Allow space for future planting in decades and centuries to come, so that a wide age structure is developed. As oaks can live for 900 years, there has to be plenty of space in which future generations can be established.

Research undertaken in Sweden (Bergman, 2007) to assess the minimum area to maintain a sustainable population of trees indicates that there should be 160 hollowing oaks, on average 2.8 per hectare, within an overall area of 57 ha.

Bridging the age gap while young trees develop

Young trees are the ancient trees of the future, but mature and late-mature trees are also important because they will provide habitat-continuity when today's ancient trees die. Where an age gap could break habitat-continuity, trees that are not yet veterans could be 'veteranised' or pollarded (preferably with specialist advice). If they are pollarded, their smaller crowns could also make space for more new trees. Veteran trees that have died should be retained standing or could be re-erected after they fall because of their continuing biodiversity value.

Diagram showing the stages in the life of an ancient tree



Allow plenty of space between trees as well as sufficient space for the tree itself.

How you can help

- Allow sufficient space for trees to grow to full crown potential. With oak, for example, lower branch growth can extend more than 15m from the trunk. For good lower, lateral branch development allow 30-40m between trees and the same distance from existing trees.
- Phase planting over centuries according to the expected lifespan of trees – more space is needed where replacing species that tend to have very long lives.
- Orchard trees, e.g. fruit trees, the spacing has evolved from the fruit production industry, enabling optimal flowering and fruiting of trees. In a mature orchard, trees are at about 10-20m spacing.

- Consider using thorny shrubs such as hawthorn to protect young trees – a common practice of landscape gardeners such as Humphry Repton and 'Capability' Brown.
- If possible gather seed from ancient trees nearby and scatter at the edge of scrub or thorny bushes or grow on in organic conditions.
- Consider European non-natives that might provide veteran characteristics more quickly than native trees for wildlife benefits for continuity of the ancient tree habitat.
- Retain dead standing trees or re-erect them, to enhance wildlife habitat and aesthetic impact especially where decaying wood habitats have been badly depleted.
- Ensure that planting is compatible with historic designed landscapes.

Diagram showing the space required for a large crowned tree at different stages of its life.

