



## A forest for the future

*To reverse forest decline, we need natural regeneration and a change in our attitude to ‘non-native’ species, argues Jim Knight.*

In his 1996 book *Natural woodland: ecology and conservation in northern temperate regions*, George Peterkin [1] describes ‘future natural forests’ with the opening sentence: “The forests which would develop if people vacated Britain would differ substantially from those which might be present if people had never arrived.” At a time when forestry in Scotland is again being promoted as a key element of the rural economy and a response to climate change, it is useful to consider what form Scotland’s future forests could take and what society might want from them.

The ‘original’ post-glacial British fauna was broadly similar, in terms of species assemblages, to adjoining continental countries. However,

Above: Mature mixed conifers and native species at Kinloch Laggan—an example of Future Natural? All photos: Jim Knight.

through human action we have lost important fauna such as the large carnivores (wolf, bear, lynx) and some of the large herbivores (elk, auroch). We have also gained grazing species including deer, rabbits and domestic livestock. This considerable herbivore presence has pushed much of Scotland past the ‘tipping point’ for successful regeneration and tree-cover is no longer the norm. British forests have generally become increasingly aged and decrepit as the cohorts of younger trees failed to develop through repeated and continuous browsing and grazing.

### Limited native flora

There is another important factor in why Scottish and British forests have declined as compared to the more resilient forests on the continent—the composition of the UK native flora itself, particularly

the tree and shrub flora. At the end of the last glaciation, most of the British Isles north of the Thames and virtually all of Scotland had recently been covered by ice and was freshly exposed by the big melt. The Holocene era began 11,700 years before present, with the English Channel forming around 8,000 years ago [2] severing direct links to the continental mainland. This left a short window of opportunity of some 3,000 years for the slow processes of woodland colonisation to occur. Thereafter, any new species had to rely on transportation, perhaps in the crop or gut of birds or by human influence in order to cross the sea and reach what had become the British Isles.

Those species who made it unaided, the so-called native species, are ecological pioneers—



largely light-demanding species suited to colonising open ground. Many of the shade-bearing species, including the spruces, firs and maples, are absent and this has significant ecological and commercial consequences. Whereas a mature native Scots pine forest in Norway gradually changes through natural succession towards Norway spruce, which grows freely under the canopy of the pine, such a process could not occur in Scotland because the spruce was not present. Since pine seedlings do not thrive in shadow, Scottish native pine woods tend back towards a more open structure and must await a disturbance, perhaps through fire or storm to open up the canopy, before pine regeneration can again succeed. Open ground species, such as heather, remain and the ecological transition from open heath to forest is incomplete. The potential for continuous timber production from such 'natural' forests is severely restricted.

### Changing climate

When the Forestry Commission was created in 1919, in response to the extreme depletion of forest cover at the end of the First World War, the focus was on faster-growing conifer species, imported from areas with similar climates, which might be able to thrive on poorer upland soils where most land was available. Environmental awareness developed in the 1960s and 1970s, and today there is much improved recognition of all the benefits that forests bring including the wildlife they can support, the soils they can conserve and the flood control and water filtration they can provide, as well as health benefits to people.

Forests also provide one of the simplest and most practical ways of locking up carbon. Along with the conservation of peatlands, planting both environmental and productive forests can sequester carbon so long as the productive forests, when felled,

are replaced. However, forests are more than a stand of trees and there is carbon tied up in the whole biomass, including the shrub and groundcover layers and in the soil humus and, particularly, in the dead wood that accumulates in natural forests.

As future forests will need to respond to a changing climate, diversity is essential. By encouraging and accepting all the species that can thrive in current circumstances rather than being tied to the very limited palette of 'past natural' species that last established spontaneously several thousand years ago, it is possible to develop 'future natural' forests that are both productive and biodiverse and better suited to the changing climatic conditions ahead. For example, more shade-bearing species both broadleaved and coniferous can become part of the new Scottish forest communities, which can also include all the associated species: the microbes, fungi, mosses, insects and so on.

By controlling grazing pressure generally through coordinated herbivore control, thereby allowing natural regeneration to occur opportunistically, forest cover will become the natural default condition, as it is in many parts of Europe, and will spring up spontaneously wherever the land is not being actively farmed and the climate and soils allow.

**To become truly sustainable, the future approach to forestry needs to combine the economic and environmental objectives, and be based largely on natural regeneration, if Scotland is to achieve the mature, diverse forests and the forest culture that is found in continental Europe.**



### Closing the gap

Based on 2018 Forestry Commission Scotland statistics, woodlands are largely based on two main planting models: 'productive' and 'environmental'. A typical productive woodland creation scheme in upland Scotland today might consist of large areas dominated by Sitka spruce, shaped to landform, with some 'environmental' planting of native broadleaves along water courses comprising around 10 per cent of the planting area, as required by the UK Forestry Standard. As it develops, the conifer crop will be 'clear felled' at between 35 and 50 years of age and then replanted as part of a continuing cycle with the native broadleaves left largely to their own devices. Within a few years, fencing is breached and grazing pressure returns, restricting any natural colonisation by seedling trees.

As subsequent generations of trees are re-established after harvesting, there are significant re-stocking costs including the planting stock, the ground preparation and, often, further fencing and tree tubes which, unless actively maintained, will soon cease to be effective. Prescriptive forest plans mean planting to a pre-set regime, which can take no

Above, left to right: Mixed forest near Ligatne in Latvia; High seat to aid deer control—a common sight on the continent.

account of local variations in ground conditions and microclimate. Because the deer population in plantations is often inadequately controlled, the continuing browsing pressure restricts natural species diversification and the development of a woodland ground flora, and the result is then large expanses dominated by the crop species, usually Sitka spruce—effectively, a continuing monoculture.

A typical environmental planting will be based on native species trees in defined communities as proposed by Rodwell and Paterson [3]. Age class distribution is little different to many commercial plantations and the shrub and groundcover elements are usually missing. Any growth of 'non-native' species is often regarded as an unwanted intrusion. Whilst this type of woodland has undoubtedly increased the resource of native species trees from a generally very low level, very few of these new native woodlands produce much timber. The amount of land that can be devoted to this form of land use is open to challenge on the grounds that it is not paying its way.

So long as native species are regarded as 'good' and non-natives as 'bad', the inevitable consequence will be to encourage 'control' of the non-natives, whether justified or not. As natural processes do not recognise these 'man-made' concepts, there is a serious risk of human beings declaring an unwinnable war on a large part of the natural world which is considered to be 'in the wrong place'. We need to close the gap between productive crop and habitat/ecosystem forestry and move on from the 'plantation' system.

### Continuous cover

If a longer timeframe is taken that allows for tree migration following climate change, the concept of re-assimilating some of the 'well-established' European tree species that used to grow here (such as Norway spruce, beech, sycamore) and some others that are quite closely related (such as the North American conifers), becomes much less threatening. This perspective allows the possibility for new forest communities with a much wider range of species (probably closer to the actual forest communities which lived before the glacial world of the Pleistocene) and it becomes possible

to create new ecosystems based on the species that are present now and which would establish if allowed to do so.

Where deer numbers are adequately controlled, forestry can rely much more on regeneration so that natural processes can determine composition based on all the species that are present on the site. Many parts of northern Europe practise forestry on a much larger scale than in Scotland and do so in a way that can be both productive and environmentally beneficial as part of an integrated overall pattern of land use related to land capability. This Continuous Cover Forestry (CCF) is often part of the local culture, particularly on the more sheltered and fertile sites. Harvesting can be much less intrusive with smaller-scale felling works by local operators on a regular basis rather than the more extreme disturbance of large 10- and 20-hectare clearfell lots typical of Scottish operations. There is increasing interest in these alternative options including a CCF group in Scotland.

From the economic perspective, more frequent, smaller-scale timber extraction can favour local industries which can use the timber harvest to support local house-building and joinery industries. Such local connections are rarely seen in Scotland, where the forest crop is normally hauled by road to large, relatively distant mills in a few centres. While windblow is a major constraint in many Scottish upland sites, there is no fundamental reason why adapted forms of such forestry cannot be much more widely adopted. There are some encouraging signs that enlightened foresters are moving in this direction.

### Forest futures

In the future, on the wetter west coast, natural forest composition could be much like that found in coastal British Columbia where Sitka spruce and western hemlock grow in mixture with Douglas fir in the warmer, more fertile areas. Beech and sycamore both thrive on the Scottish west coast and would also have a role alongside all the existing 'original' natives, which would continue as members of the new and expanded community.

Conditions in the drier east are rather different and here the future native forest composition will vary accordingly. Based on the species currently present, a ‘boreal’ type forest composed of pine, both Scots and lodgepole as well as both species of larch, would grow up amongst the heather and blaeberry on the acid podsol areas currently dominated by heather moorland. Both Norway and Sitka spruce and probably some fir and western hemlock would come

an effective response to concerns about climate change and the need to control carbon emissions and, if designed well, trees and woodlands are also a key habitat for wildlife and make very important contributions to soil and water quality, erosion control and to the beauty and recreational value of the wider landscape.

The existing methods of creating new woodlands by planting open ground are likely to continue for the

The choice of objectives for forestry that are set out now will affect land cover in Scotland for many years ahead and good choices should be based on a willingness to re-examine current practice. The most successful and lasting future forests will both pay their way and benefit the environment. By giving priority, wherever possible, to woodland creation based on natural regeneration and by accepting all the existing UK tree species, both native and introduced, as legitimate elements in the modern landscape, a better variety of diverse future forests can be created that will serve the expectations and objectives of society.

**References**

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*Jim Knight is a landscape architect and developed many of the ideas found in this paper whilst undertaking consultation work for Scottish Borders Council. The full discussion paper is available at [www.reforestingscotland.org/a-forest-for-the-future/](http://www.reforestingscotland.org/a-forest-for-the-future/) and a longer abbreviated version appears in Scottish Forestry Volume 73 No. 3. Winter 2019.*



through as a second succession. The eventual forest community is likely to be rather similar to that found in parts of southern Scandinavia and northern Germany where spruce and fir dominate.

In the warmer, drier lowlands and river valleys where brown earth soils predominate, larger broadleaf species including oak, ash, beech, lime and sycamore might predominate along with a wide range of understorey and shrub species. Over the longer term, all these and many other species would compete, adapt and evolve into novel communities far removed from the native communities identified in the National Vegetation Classification [4].

Forestry in Scotland is a key element of the rural economy—all the more so as heavily subsidised upland farming is in decline. More forestry can be

foreseeable future but the plantation system, whether for ‘productive’ or ‘native’ type woodlands, has significant limitations both in terms of the level of management interventions required and the monocultural character of the woodlands created. To become truly sustainable, the future approach to forestry needs to combine the economic and environmental objectives, and be based largely on natural regeneration, if Scotland is to achieve the mature, diverse forests and the forest culture that is found in continental Europe. This is achievable but will require changes in attitude and approach by all the rural interests including a coordinated national approach to herbivore management, backed by legislative changes, perhaps along similar lines to the system in Germany where rights to hunt are coupled with responsibilities to achieve agreed targets.

Above: Regeneration at Glenfeshie.