Beyond the missing ecotone: diversity and dynamism in mountain woodlands

The western Highlands has immense scope for mountain woodland, as Innes Manders *discovers.*

Mountain woodland. My generation is the first (at least in living memory) to grow up in a Scotland where the words are not a contradiction in terms. The absence of woodland from Scotland's hills is often assumed to be a function of the harsh climate. However, in a Northern European context, Scotland's lack of high-altitude woodland is an exception. When considering the unusual lack of upland birchwoods from the Highlands in 1969, two Finnish ecologists recognised heavy grazing as the cause [1]. Only now is the significance of this statement beginning to be widely recognised (e.g. issue 54, page 23). However, due to the lack of natural remnants, limited knowledge of the past ecology of mountain environments [2] and difficulty verifying models [3], it is hard to know what to restore and where.

In 1957, a radical paper looked to mountain woodland across the North Sea [4]. Since then, comparisons with upland areas of Norway have been central to our understanding of Scottish mountain woodland; much credit is owed to the Reforesting Scotland tour of Norway in 1993 and publications herein since (e.g. issue 54, page 28). But as a nation, we are still getting to grips with what mountain woodland might mean for us. And as I sat in my student dorm room in early 2023, looking out to the krummholz (stunted, wind-blown trees growing near the treeline) Scots pines scrabbling up the slopes of Bergen's seven hills, I felt the Norse and their *fjellskog* (mountain woodland) had more to teach us.

Drawing on climatic similarities to my target area of Corrour Estate, I selected Kjerringafjellet as my field site in Vestland, Norway. I spent the early summer of 2023 camped on the hillside and studying the characteristics and distribution of mountain woodland. Working from the premise that climate is sufficiently similar between these two field sites that browsing pressures and land management can be treated as the overriding factor, I developed a simple rule-based model of a 'possible natural scenario' for mountain woodland back in the Highlands.

A possible landscape

As I developed my model and started to apply it in the western Highlands, the immense scope for mountain woodland became clear. If we define mountain woodland as woodland occurring above 400 metres above sea level (m asl), the model suggested Corrour Estate alone could support over 160 km^2 [5]. Treelines and the corresponding potential for mountain woodland would be expected to be even higher further east.

We in Scotland are so unfamiliar with high altitude trees that you could be forgiven for thinking 'that's an awful lot of willows'. Instead, my results predicted pine woodland at Corrour Estate would occur in some areas up to around 550m asl and birch krummholz up to 870m asl, with willow and juniper scrub occurring on steep ground up to nearly 1,000m asl [5]. Although open montane willow habitats are the poster boys of mountain woodland restoration in Scotland, I found that in the oceanic climate of the western Highlands larger populations of montane willows would occur in habitats dominated by birch [5]. Birch, I thought I knew the tree. Across even a single hillside in Vestland, the diversity of downy birch is spectacular: gnarled krummholz forms creaking out from thick blaeberry carpets; tall poles rising with pines in closed woodland; elegant shrubs shading *Cladonia* heath. In one area of steep ground, a landslip or avalanche had formed a thicket of near-horizontal birch growing in such profusion that the

Left to right: Atlantic pine woodland occurs only in Scotland and Norway, but commonly reaches high altitude only in Norway. Here Julia surveys open pine woodland; High altitude trees could become more common in the western Highlands. Tree-form downy birch (right) and Scots pine (left) 810 m asl; Montane willow populations in Scotland are critically low. The same species are abundant in Norwegian mountains. Photos: Innes Manders.

area was almost impenetrable. The density appears to have facilitated the growth of the palatable aspen, grey alder and rowan saplings which occurred here in higher numbers than any other plot I sampled.

Dwarf birch was present too, though less abundant than downy and, intriguingly, not amongst bog vegetation or on deep peat [5]. This provides further evidence that the species' current relict populations on Scotland's blanket bogs constitute refugia from burning and browsing [6]. Similarly, montane willow species including *Salix lapponum, S. lanata* and *S. myrsinites* were not limited to the craggy refugia they are confined to in Scotland. In one area of loose, rocky soil, the large catkins and woolly leaves of *S. lanata* shrubs dominated vegetation across an entire swathe of hillside.

Above the limit of upright trees or shrubs, juniper, dwarf willow and reticulate willow were accompanied by small birch, rowans, pines and Norway spruce. This suggests that reducing browsing pressures could make small, high-altitude trees more common in alpine habitats across the western Highlands.

Julia surveys birch trees on steep ground, where avalanche damage has enabled a dense thicket of birch, rowan, alder and aspen to develop (510 m asl). Photo: Innes Manders.

A radical approach

An ecotone is a transition area where two biological communities meet and integrate. Mountain woodland is often discussed as Scotland's missing ecotone, due to the absence of montane scrub and natural treelines between woodland alpine environments. However, the scale of the scenario I have just described suggests mountain woodland is not so much a 'missing ecotone' as an alternative landscape. While some authors have warned against such 'grand visions', the present ecological state of the Scottish Highlands is so far from the possible natural scenario that such a radical approach may be necessary. It is tempting to view this alternative landscape in the context of the Great Wood of Caledon. (The estimated pine timberline at Corrour is similar to the maximum altitude of 5,000-year-old pine stumps found near the Estate [7]). We may choose to look back to lost landscapes for our own reasons, but as recognised by McMullen (issue 59, page 9) doing so does not necessarily strengthen the case. The landscape and the climate have changed and will continue to do so. This scenario is just one approximation of how the landscape could look under reduced browsing and burning pressures.

Future research could improve the accuracy of this approximation. As an undergraduate project, my research is limited by the sample size and model verification method, and the comparison between Corrour and Kjerringafjellet is not perfect: Corrour's climate is more oceanic (the Cairngorms may be a closer climatic analogue), and Kjerringafjellet supports species of trees and shrubs not considered native here. But even if the sites were identical, to attempt to replicate Norwegian ecosystems exactly would be misguided.

A key insight from Norwegian mountain woodlands is their diversity and dynamism even within small areas. As we move to restore mountain woodlands across Scotland, we should avoid falling into the trap of trying to achieve set species compositions or goals. This does not mean we should just let things be: creating diverse mountain woodland habitats will not be possible without meaningful reductions in deer populations, and if we want to see change on human timescales then boosting populations by planting may be crucial.

My study is a small contribution to a burgeoning field of literature which shows that an alternative Highland landscape is possible. There may be many benefits to promoting its development [8]. Whether this scenario is more 'natural' or not, it will be human values and aims which decide which elements of it to pursue.

References

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