

**MONTANE  
SCRUB  
ACTION  
GROUP**



# Scrubber's Bulletin 13



# Scrubbers' Bulletin No. 13, December 2017

The Bulletin of the Montane Scrub Action Group,  
a partnership of individuals supported by their organisations

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Earlier issues of the Bulletin, along with other publications related to montane scrub and treelines can be found at [www.msag.org.uk](http://www.msag.org.uk)

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This issue of Scrubbers' Bulletin is dedicated to the memory of Donald McVean, the pre-eminent Scottish Ecologist of the second half of the 20th Century who died in May 2017. Neil Mackenzie has provided a fairly full account of Donald's, still relevant, contribution to the ecology of treelines and montane scrub, while the remaining contributions provide three different examples of treeline and montane scrub restoration activity, one in its infancy from northern England and two from the Highlands.

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The text in issue of this Bulletin has been given a pastel background, is left justified and uses a font which is intended to be easier to read on screen. If you have any issues with reading the text please let us know.

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# SRDP 2014-20 Forestry Grant Scheme

## Woodland Creation, Native Low Density Option

### An example from Trees for Life's Dundreggan Estate

*Mick Drury, Trees for Life Projects Officer (mick@treesforlife.org.uk)*

During the latter stage of the preceding SRDP round (2008-13), MSAG was active in discussing the need for specific support for treeline woodland creation with the Forestry Commission. We were pleased to see this emerge in the current round as one of the Forestry Grant Scheme's (FGS) Woodland Creation Options, i.e. Native Low Density (hereafter NLD). The option contributes benefits towards several aims of the overall FGS, principally the restoration of 'lost' habitats, protecting soil and water, and improving landscapes. In addition to treeline and scrub habitats the option is aimed at supporting wood pasture systems. Full details can be seen at <https://www.ruralpayments.org/publicsite/futures/topics/all-schemes/forestry-grant-scheme/woodland-creation/native-low-density-broadleaves/>

In 2016 Tfl's Dundreggan Estate in Glen Moriston was awarded grant aid for Native Woodland Creation for the new Allt Ruadh planting scheme. The main area comprises 160 ha of planting under the Native Upland Birch option. The NLD element is for an additional 15.9 ha of planting, an area just within the maximum 10% of the associated option allowable (see below for a brief overview of eligibility criteria). The whole scheme has been awarded capital funding for deer fencing together with fence marking for black grouse, an important bird on the estate. It's worth pointing out that NLD is available in association with all other woodland creation options, including the conifer options, or as a stand-alone scheme.

The ground lies largely on slopes with a south-westerly aspect from around 250-500m asl (see map, next page). A small area of remnant birchwood sits close to the lower part of the site. The NLD area (compartments 5 & 7) lies between 450 and 500 m asl; the upper part of the Upland Birch area also rises to around 500 m asl in a sheltered SE facing recess. Soils are thin peaty podzols. Ground preparation has been undertaken using wide-tracked excavators to create inverted mounds of minimum 1sq m.

Planting at the lower end, in compartments 1 and 2, began in autumn 2016, undertaken by a mix of contractors and volunteers on our Conservation Weeks, and has continued through compartments 3 and 4 during 2017, compartment 4 occupying a third of the NLD area. Fertiliser application, either rock phosphate or as high phosphate granules, has been applied to trees in alternating areas, with monitoring plots set up to compare effectiveness. In 2018 we will be planting the upper part of the site, including the remaining NLD area in the spring.

The approved NLD species mix comprises 30% dwarf birch, 30% downy birch, 15% aspen, 15% juniper, 5% eared-willow and the remaining 5% a mix of montane willows. The proportion of 'native woody shrubs' permissible within the option is negotiable, in this case it was 55%. Planting has and will be above the 500 stems/ha required to allow for some losses. There is a small area of 'designed open ground' at the upper fenceline.

The application process was reasonably smooth, given the novelty of the option, with the FCS case officer supportive. However, so far the uptake of the NLD option has been limited in Highland region. Elsewhere in Scotland there have been a few other applications, including a significant area in the Borders for the enhancement of golden eagle habitat. Members of the MSAG have offered to provide initial advice to any interested landowners or land managers (contact the chair Diana Gilbert [diana.gilbert2@btinternet.com](mailto:diana.gilbert2@btinternet.com) for further information).

## Native Low Density Option Eligibility

The general Woodland Creation eligibility criteria apply to applications. In addition the following conditions apply

Maximum area is 10% of main/other options, and not more than 25 ha. Maximum 10 ha allowable as a stand-alone application. (There are exceptions e.g. for golden eagle habitat).

Up to 50% open ground permitted.

Minimum stocking density 500 stems/ha at year 5.

Capital grants are available for fencing etc.

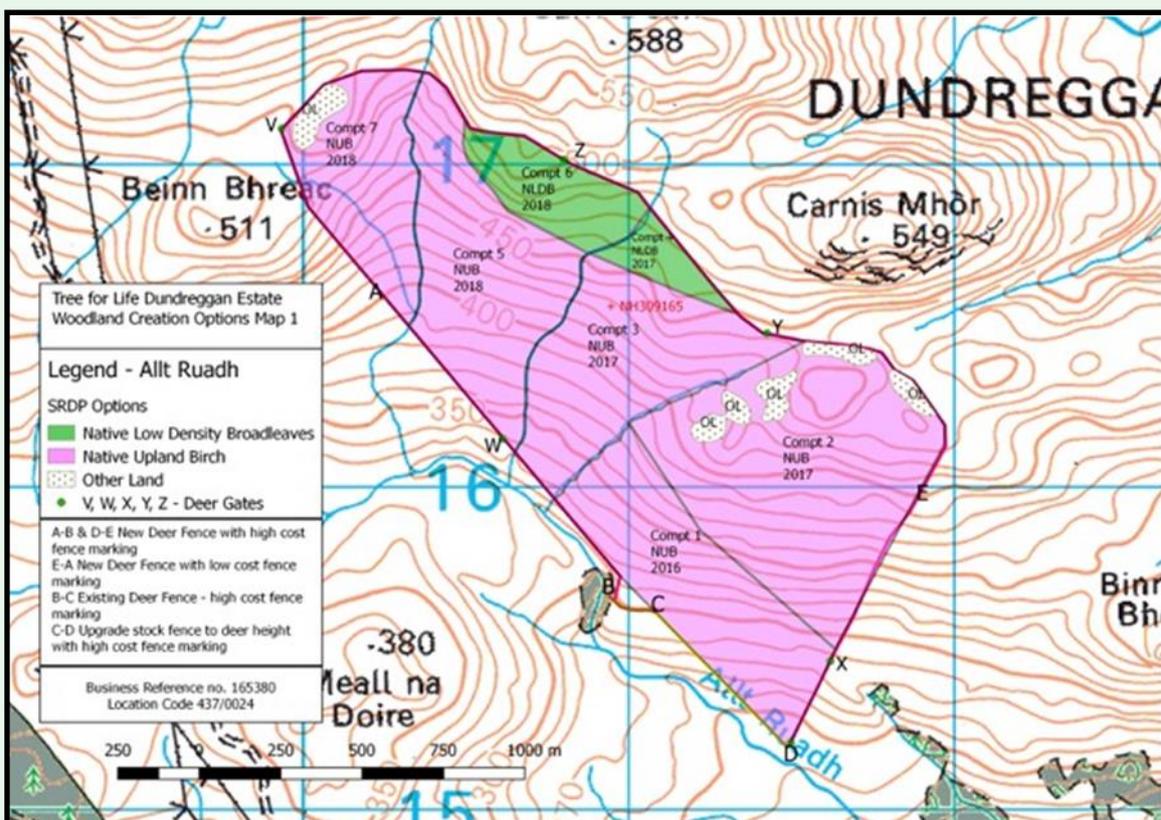
Planting grant rates are £560/ha plus 5 years maintenance at £96/ha.

Enhanced planting and maintenance grants for schemes in 'target' areas.

Important to look at scoring criteria when designing the scheme.

**NB** 'Managing Scrub of Conservation Value' under the SRDP Agri-Environment Climate Scheme, also supports the expansion of montane scrub. See <https://www.ruralpayments.org/publicsite/futures/topics/all-schemes/agri-environment-climate-scheme/management-options-and-capital-items/managing-scrub-of-conservation-value/>

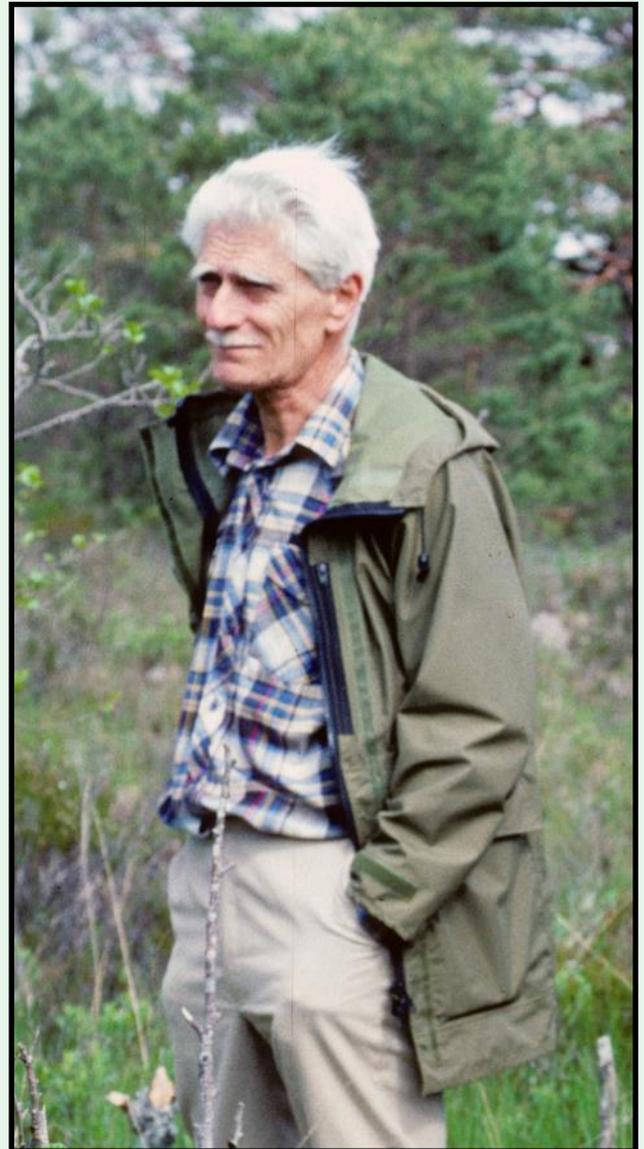
## Dundreggan Site Map for Overall Scheme



# Donald McVean (1926 – 2017) – the scrub connection

## Neil Mackenzie

Donald McVean, who died, aged 91 in May of this year, was a pioneering Scottish ecologist who began his career with the newly formed Nature Conservancy in the early 1950s. His name will be familiar to many plant ecologists for his monumental work, with Derek Ratcliffe, on the classification of upland vegetation in the Highlands of Scotland. This work culminated in the 1962 book “Plant Communities of the Scottish Highlands” a benchmark in our understanding of vegetation communities and their habitats<sup>1</sup>. Donald was a brilliant field botanist but his interests were nonetheless wide ranging, though they always included mosses and lichens. He studied vegetation, including woodland and scrub, in Scotland, Iceland, Finland, Norway and Australasia. His alpine vegetation studies in the Snowy Mountains (Australia) and on Mt. Wilhelm (Papua New Guinea) were published in the *Journal of Ecology* and in books produced by the Australian National University where he was a senior research fellow during the 1960s<sup>2,3</sup>. He was also interested in climate and wrote about the climate of Mt. Wilhelm, and how snow cover determined the pattern of mountain vegetation in the Cairngorms<sup>4,5</sup>. In Australia while attached to the Commonwealth Scientific, Industrial and Research Organisation (CSIRO) he studied the ecology of the invasive skeleton weed, a serious pest of wheat fields<sup>6</sup>. Later in his career he became an environmental and land use consultant and worked on various projects in the Middle East, India, Malaysia, Chile and in Africa. He retired to Argyll, helped to set up the local Scottish Wildlife Trust group and became involved in the management of the SWT’s Balachuan hazel wood reserve. He also carried out an eight-year study on the natural and land use history of the Ardentallen peninsula<sup>7</sup>, and of course he maintained his enthusiasm for mosses and lichens everywhere.



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<sup>1</sup>McVean, D.N. & Ratcliffe, D.A 1962. *Plant communities of the Scottish Highlands*. Nature Conservancy Monographs No. 1. HMSO

<sup>2</sup>McVean, D.N. 1969. Alpine vegetation of the Central Snowy Mountains of New South Wales. *J. Ecol.* 13, 23-86.

<sup>3</sup>Wade, L.K. & McVean, D.N. 1972. *Mt. Wilhelm studies. 7. The Alpine and sub-alpine vegetation*. Australian National University Press, Canberra.

<sup>4</sup>Hnatiuk, R.J., Smith, J.M.B. & McVean, D.N 1976. *The Climate of Mt. Wilhelm*. Australian National University Press, Canberra.

<sup>5</sup>McVean, D.N. 1958. Snow Cover and Vegetation in the Scottish Highlands. *Weather* 79(2), 753-200.

<sup>6</sup>McVean, D.N. 1966. Ecology of *Chondrilla juncea* L. in south-eastern Australia. *J. Ecol.* 10, 901-365.

<sup>7</sup>McVean, D.N. 1996. Ardentallen. The Natural and Land Use History of an Argyll Peninsula. *The Scottish Naturalist*. 108, 3-105.

Following the completion of his PhD on the 'Ecology of *Alnus glutinosa*' Donald became a Scientific Officer (later Senior SO) with the Nature Conservancy (NC) from 1953 until 1959. Part of the NC's programme of botanical research in Scotland focused on the establishment and management of vegetation for soil protection and habitat restoration. In those early days NC staff were able to work on a subject of their choosing and they were allowed to undertake research as well as management duties on the new National Nature Reserves. Donald was closely involved with the management and restoration of the pinewoods of Beinn Eighe and as part of his work programme established a series of direct seed sowing trials and planting experiments involving Scots pine, alder, birch, juniper, holly and montane willows. In some of the experimental areas sowing of the seed was simply not enough, as physical and chemical deterioration of the soil had taken place over a long period of time. The trials therefore had to involve different forms of cultivation and phosphate application while he also experimented with mycorrhiza, which proved to be the key to successful tree growth. It was quickly discovered though that there were huge losses to deer, which were attracted to the fertilizer and a programme of enclosures were established. The first of the fenced areas was the 1954 enclosure at Coille na Glas Leitir, but the quality of the fencing was poor and, to Donald's consternation, deer were able to break in, causing significant damage to the experimental sowings and regenerating trees. Subsequent enclosures were of better construction and the experiments were largely successful. One of the conclusions was that direct seed sowing worked well for species such as alder and bog myrtle, which do not require fertilizer and will readily establish on wet sites without ground treatment. However, on the degraded soils at Beinn Eighe other species required fertilizer and some form of ground preparation if growth was to be successful. Consequently, the use of transplants proved to be a more economical method of establishment on such sites. The enclosure trials went on for many years and, in order to provide a regular supply of trees and shrubs, Donald created the nursery at Beinn Eighe, which still exists today.



Globeflower (cage erected 1955, photo taken 1962)

Donald's experimental enclosure above the treeline was also exhibiting promising results. In 1957 a small enclosure was erected at about 430 metres altitude over an area of lime-rich rock outcrops at Creagan Ruadh on the eastern slopes of Beinn Eighe. The recovery of the tall herbs within the fenced area was rapid. Soon there was an impressive array of flowering globeflowers *Trollius europaeus*, contrasting with the complete absence of flowers outside the fence. This was an interesting experiment, and one of the first of its kind in Scotland, as there was some debate over whether the plants would recover and whether coarse grasses would eventually dominate. The grasses did

not and the experiment was a success. An earlier experiment in 1955 using wire netted cages over the globeflower was also successful. By 1962 six of the seven introduced transplants of rock whitebeam, *Sorbus rupicola* were well established. All of these experiments and enclosure trials were designed not just to learn how to propagate rare species of trees and shrubs, but to show, by example, how certain types of vegetation that have been virtually eliminated by present day land use can be restored.

Donald's experiments at Beinn Eighe and in the Cairngorms ended in 1963 and the results of his work were published as a series of papers in a number of scientific journals, for example 'The Journal of Ecology' and 'Scottish Forestry'<sup>8,9</sup>. Restoration of the woodlands at Beinn Eighe has continued using a

<sup>8</sup>McVean, D.N. 1963. Ecology of Scots pine in the Scottish Highlands. *J Ecol.* 17, 237-686.

<sup>9</sup>McVean, D.N. 1966. Establishment of native trees and shrubs on Scottish nature reserves by direct seed sowing. *Scot. For.* 20(1), 26-36.

combination of perimeter fencing (the enclosures were subsequently removed) and increased deer control. Today much of the pinewood, and especially Coille na Glas Leitir, is far more diverse than it was in 1952 when Donald made his first appraisal. At that time he had predicted that the restoration would be a long drawn out process and would take many years. Over the next 60 years the original aims of restoration and expansion of Coille na Glas Leitir has largely been achieved. Donald's 1953 histogram of the pinewood age structure clearly showed a woodland composed mostly of mature trees while a similar histogram from 1990 illustrates the classic reverse J curve of a healthy pinewood dominated by young trees<sup>10,11</sup>. The treeline, scrub and tall herb communities above the existing woodland have not yet been fully restored and it may take many more years and changes in deer management across a wider area before that particular part of the woodland achieves a semblance of naturalness.

Further work on montane scrub developed from his collaboration in the early 1950s with his friend and NC colleague Duncan Poore on a new description of mountain vegetation<sup>12</sup>. This was the start of the Highland Vegetation Survey, a major project initiated by the NC, which had the aim of describing and classifying the vegetation types in the Highlands, including a comparison with the vegetation of north-west Europe. In 1954, they decided to visit Norway and meet with Professor Rolf Nordhagen and Donald's friend Eilif Dahl in Oslo in order to learn more about the Norwegian system of classifying and surveying vegetation, in particular the *quadrat-method*. After the preliminary work Poore left the NC and Derek Ratcliffe was employed to continue the project with Donald. The Highland Vegetation Survey began in earnest in 1956 and over the course of the next three years the two botanists completed this wide-ranging and monumental project. Donald remembered his time in the hills as being very free and easy. He never asked permission from the landowners and rarely saw a keeper or stalker. Nobody seemed to care what he was doing and probably thought he was a hiker anyway. Both men tended to work independently in different parts of the country, Derek (no driving license) travelling by bicycle and Donald in a van that he often slept the night in. They spent the whole field season from spring to autumn working on the survey returning to Edinburgh for the winter to write up their results. Occasionally, they would spend a day together to discuss any issues and plan the next phase of the survey. Donald was particularly interested in alpine vegetation, lichens, mosses and native woodland fragments, but also liked to climb to the summits in search of rarities. Derek recollected a day at the back of Loch Maree when they had to carry Donald's collapsible canoe across a treeless moor to reach a remote loch. Donald was



On board the fisheries protection vessel "Brenda" en route to North Rona (Donald on right; John Morton Boyd 2nd right; Derek Ratcliffe on left)

interested in the wooded islands, which he considered were as near natural as one could get in an otherwise treeless landscape. Later on he would publish a short paper on the vegetated islands of freshwater lochs<sup>13</sup>. In 1957, when the RAF established a missile-tracking station on St. Kilda, and which soon after was declared a National Nature Reserve, the opportunity was taken to include the islands in the vegetation survey. Donald, along with Derek Ratcliffe and Morton Boyd, travelled to St. Kilda and to North Rona in the summer of 1958 to undertake plant surveys and to make observations of the fauna. St. Kilda had been without people for 27 years, and only the resident Soay sheep had remained following the evacuation in 1930. The

<sup>10</sup> McVean, D.N. 1953. Coille na Glas Leitir investigations. *Reserve Record* 21. Nature Conservancy, Edinburgh.

<sup>11</sup> Clifford, T. & Forster, A. 1997. Beinn Eithe National Nature Reserve: woodland management policy and practice 1944-94. In: *Scottish Woodland History*, ed. T.C. Smout (Scottish Cultural Press, Edinburgh), pages 190-206.

<sup>12</sup> Poore, M.E.D. & McVean, D.N. 1957. A new approach to Scottish mountain vegetation. *J. Ecol.* 45, 401-439.

<sup>13</sup> McVean, D.N. 1958. Island Vegetation of some West Highland Freshwater Lochs. *Trans. Bot. Soc. Edinb.* 37(3), 200-208.

main change in the vegetation since then was the increase of *Calluna* on the main island of Hirta, while the prostrate *Calluna* on the upper ridge slopes was also notable for the high component of creeping willow, *Salix repens*. Otherwise there is no low alpine scrub on the islands and, although birch and hazel scrub were present about 4000 years ago, the present vegetation communities reflect the cooler, wetter and windier conditions of the present climatic period<sup>14</sup>.

Donald made several trips to Norway as well as Iceland and Finland to study the vegetation and became familiar with both the differences and with the many similarities of oceanic areas of Scandinavia and the Scottish Highlands. He did, however, note that oceanic in south-west Norway was not quite the same as oceanic in Scotland. He quickly realised too that the contrast between Norway and the Scottish Highland scrub communities was not always due to climatic or edaphic differences but to how the land was used. The rarity of the willows and their usual restriction to cliff sites, despite the proximity of suitable soils away from the cliffs, clearly pointed to the impacts of grazing. He also became aware that with such small and scattered populations and widely separated sexes the process of rejuvenation and expansion would be a lengthy one. There were, however, a few areas of relict willow scrub that formed more extensive populations. One of those was at Inchnadamph where whortle-leaved willow, *Salix myrsinites*, along with some *S. repens*, eared-willow, *S. aurita* and hybrids grow among the limestone pavement scattered across an area of about 120 ha. Donald considered this scrub to be a secondary vegetation type but an important relict nevertheless.



Donald surveying willow scrub in Rondane, Norway, 1955

During the early 1950s he erected two enclosures around the *myrsinites* and some experimental planting was also undertaken. *Salix* seed was collected and some was broadcast sown on the substrate within the enclosure while some was sown in pots and grown in a greenhouse in the garden of the NC office at Hope Terrace in Edinburgh for two years before planting around suitable limestone outcrops lacking the willow. The transplants were found to be more successful than the broadcast seed. In later years former SNH warden Alex Scott concluded that birch and rowan regeneration within the enclosures



Donald on limestone outcrop with *Salix myrsinites* at Inchnadamph 1954

would gradually shade out the *myrsinites* thus confirming Donald's earlier view that the scrub had developed as a result of past land management.

Field trips to Norway to look at the vegetation stimulated Donald to investigate further why species such as dwarf birch *Betula nana* only grew on blanket bog and remained largely a low growing plant in

<sup>14</sup> McVean, D.N. 1961. Flora and vegetation of the islands of St. Kilda and North Rona in 1958. *J. Ecol.* 49, 39-54.

Scotland. In Norway and Finland the species is a constant on well-drained low alpine shrub heaths, lichen heaths and *Vaccinium* snow bed communities and occasionally in some bog associations, some of which may be similar to

Scottish bogs. Donald considered two factors that might explain why dwarf birch does not occur on the drier heath types in Scotland as it does elsewhere. Firstly, dwarf birch is a shallow rooted species and will suffer dieback if growing on waterlogged soils as it lacks the adaptations found in species such as alder. It survives in the saturated conditions of blanket bog because it grows on the well-aerated surface mat of sphagnum or other mosses which never be-



Eilif Dahl in *Salix lanata* scrub, Rondane, Norway 1955

come waterlogged for long. In Norway dwarf birch on bogs that are waterlogged in winter survive and thrive because they are almost immediately frozen and survive the winter preserved in ice. Donald's cultivation experiments here in Scotland showed that dwarf birch grows best in well-drained and humified acid peat. The second factor was because it has probably been eliminated from drier heaths by moor burning over the past two thousand years. The same process also affected the sub-alpine and low alpine willows and it is only the tall and the prostrate juniper scrub that has survived, albeit at reduced levels and still subject to fire and to deer browsing. In Norway moor burning is a rarely used land management tool<sup>15</sup>.

In 1959 Donald left the NC to work as an ecologist on a survey of vegetation, land use and soil erosion as part of a major irrigation project in Pakistan. He rejoined the NC in 1962 and was based at the Speyside Research Station at Achantoul where he resumed some of his old research programme on the restoration of pine woods, which included his long term experiments on direct seed sowing and planting trials. Particular emphasis was on the climatological side and included investigations on seed setting, regeneration, tree height, wind velocity profile, air temperature and snow lie. He was also studying the altitudinal limit of pine forest at the near natural limit at Creag Fhiaclach and Cadha Mor. In 1961 Donald collected cones from the treeline pines at Creag Fhiaclach in order to compare seed viability with the main forest zone below. He found that the viability of the seeds from the treeline pines was half to two thirds that of the Rothiemurchus and Inshriach pines. An examination of the seed cones indicated that lower viability was due to a failure to ripen rather than any problems with pollination or fertilization. Reduction of viability also occurs on high level pines at Beinn Eighe, especially in poor cone years. Such information was of course very valuable when designing a restoration plan for treeline woodlands.

Donald and his colleague Duncan Poore had previously made early assessments of what the natural treeline in the Highlands might have looked like in the absence of overgrazing and burning. They

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<sup>15</sup> McVean, D.N. undated. Dwarf birch as a vegetation component in Scotland and Norway. Unpublished note to Nature Conservancy, Edinburgh.

suggested that a zone of juniper scrub succeeded the forest zone in the east and central Highlands, while willows and dwarf juniper, depending on soils and wetness, occurred in the west. Creag Fhiaclach in the western Cairngorms and parts of the Monadhliath provide some remnant examples of this type of forest to scrub zonation, at least for juniper. Studies on the forest history of Beinn Eighe have shown that the core woodland has been present on the site since Boreal times but had gradually diminished in extent as a result of forest fires. Although there is remnant juniper within the wood, and scattered across moorland above the wood, but still within the potential forest zone, much of the original juniper scrub had been overwhelmed by peat formation or destroyed by fire. The extreme soil degradation above the

present woodland is largely a result of repeated fires over several centuries. The only remaining scrub habitat in the low alpine zone that still survives today is the extensive prostrate juniper between 460m and 610m altitude on the Cambrian quartzite moraine below Beinn Eighe<sup>16</sup>. Poore and McVean considered this *Juniperus – Arctostaphylos* scrub to be of great antiquity and a likely remnant of a once more widespread community across many areas of quartzite in the north-west Highlands. Its rarity is partly due to the frequent historical fires that devastated the lower slopes of hill ground throughout the region. Donald made observations between



Donald McVean during Nature Conservancy years circa 1961

1953 and 1990 and carried out some simple experiments on junipers from various locations. One of the experiments involved collecting berries from the prostrate plants above the treeline at Beinn Eighe. Seedlings grown in a sheltered garden at sea level subsequently produced mainly prostrate plants but also included a small proportion of upright stems. His conclusion was that the prostrate juniper, was not the pure form of *Ssp nana* but represented an intermediate type. Here, at Beinn Eighe was potential evidence of an 'altitudinally continuous population', albeit of a fragmented nature, from tree juniper in the pinewoods to the prostrate form at higher altitudes<sup>17</sup>. The island in Loch an Eoin in Wester Ross contains a stand of juniper that Donald considered was further evidence (based on exposure and altitude) of the transition from juniper-pine and birch wood to low alpine juniper heath.

Donald had a particular interest in snow cover and its role in determining the pattern of mountain vegetation. McVean and Poore were the first in Britain to explore the effects of unequal snow lie on vegetation at high altitudes. Donald and other NC staff made numerous snow depth measurements on certain vegetation communities over several winters in the Cairngorms and on Ben Lawers<sup>18</sup>. Some plant species, for example frost sensitive ferns, common in the milder west, at the higher altitudes probably could not survive without a cover of snow and while it was not known how much snow cover was present on the ledges where mountain willows occurred they considered that the unreliability of snow on ledges could lead to increased frost exposure, thereby limiting the spread of the willows at these sites.

Donald McVean's work on treelines and scrub was undertaken over 50 years ago but the results and deliberations still have value today as the basis for present and future work on the species and their

<sup>16</sup> Durno, S.E. & McVean, D.N. 1959. Forest history of the Beinn Eighe Nature Reserve. *New Phytol.* 58, 228-236.

<sup>17</sup> McVean, D.N. 1992. Notes of some forms of the common juniper in Scotland. *Scot. For.* 46(2) 145-147.

<sup>18</sup> McVean, D.N. 1963. Snow cover in the Cairngorms, 1961-62. *Weather* 18, 339-342.

habitats. Despite valuable regeneration schemes for montane willow, dwarf birch and juniper at a number of upland locations throughout Scotland there is still no landscape scale restoration that has truly succeeded, at least without fencing. There is nothing that resembles the fully developed natural ecotone between the sub-alpine zone and the low alpine zone, which is common to so many other mountain areas of the world. The pressures of grazing, burning and upland soil erosion as described by Donald McVean and Jim Lockie in their 1969 book 'Ecology and Land Use in the Uplands of Scotland' remain as prevalent today as they were half a century ago<sup>19</sup>.



Plate 1: Reindeer moving through young upland woodland at Glenmore c550 m asl (NH97440635), January 2017.

## Forests on The Move

*Giles Drake-Brockman, Environment Forester, Forest Enterprise*

### Introduction

The case for allowing a wooded habitat to develop in the British uplands has been well made by many advocates and arguments of whether it is possible, natural, or desirable have rumbled around the hills for a long time. So, the purpose of this article is not to add to that speculative debate, but to present one case study that demonstrates that this habitat is already developing in one part of Scotland, at scale. And over a reasonable timescale and cost.

### Demonstrating the Change

Glenmore forest, in the Scottish Cairngorm National Park, is the focus of this case study. Many observers have been aware of the potential for upland woodland expansion for the last 30 years. After sheep grazing was removed from the Kincardine Hills in the 1970s, the woodland above the north-western flank of Ryvoan pass (NH995106) began to develop regeneration and the straight top edge of the plantation began to move up the contours. So much so that it was already being pointed out to the author in his student days in the mid-1980s.

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<sup>19</sup> McVean, D.N. & Lockie, J.D. 1969. *Ecology and Land Use in Upland Scotland*. Edinburgh University Press.

In area, Glenmore forest and the Rothiemurchus Pinewood extend to 5900 ha and of this almost 1800 ha are classed as upland open habitat. Management started to move Glenmore into a programme for native woodland restoration in the early 1990s and, as non-native conifers were removed deer management was prioritised to protect regeneration within the forest.

But people also had an eye on the potential for this protection to work up the hill as well as down.

Studies were run as early as 2001<sup>i</sup>, with work investigating methodologies to predict future development of woodland up the hill. Later, in 2008 a survey of regeneration was the first piece of work to explore the extent of regeneration in the southern hill ground of Glenmore forest, between Meall a' Bhuachaille (810m) Ryvoan and round to Castle Hill (728m).

For various reasons there was a long gap between the field work and the study being analysed. But once that was done it was found that the study highlighted that there was potential for c120 ha of woodland expansion. Because of the time gap since the original study, this work was repeated in 2016, but this time it included the full extent of the hill ground on the National Forest Estate at Glenmore, including the slopes north to Craiggowrie (686m). On this occasion the hill ground above the Rothiemurchus pinewood (c277ha) was not included in this visit.

The purpose of the survey was to identify the presence and condition of woody tree and shrub species and included estimation of height, number of stems, estimated age and browsing damage. Data on vegetation type was limited to a broad identification of wet/dry heath.

The methodology used in the 2016 survey was based on 0.01 ha plots (5.6m radius) set at 100m spacing on a grid formation, effectively returning a sample of 1% of the total area. Survey points were pre-set using a grid programme in Arcview GIS and the surveyors then walked to each plot destination, guided by GPS coordinates.

## **Survey & Results**

The survey work was completed during the early winter of 2017. After a small number of plots were excluded, either because they fell in an existing fully wooded edge, or on a rocky, scree location that made access hazardous, a total 2026 plots were surveyed. Of these 1468 were recorded as open and 558 returned counts with tree and shrub species.

So that the management team could both report and record the extent of change, this data needed to be described in a way that would provide a spatial representation of the woodland expansion. This was done in two stages. Firstly the data was analysed using heat mapping and point density tools within the Arcview GIS software. This allowed results to be grouped by selected categories and pointed to where clusters of results suggested that distinct areas of woodland might be developing.

In addition to the plot measurements, the surveyors were also asked to record their visual observations of how the plots sat in the landscape in order to give a better impression of what this survey of one percent actually looked like in the wider landscape. Whilst the surveyors did complete this task, it transpired that their description and the potential extent of regeneration zones were too broad.

Local forest staff verified the mapping analysis by site visits. Referring to the survey outputs from the point density analysis, the boundaries of viable groupings of tree and shrub growth were checked and confirmed as distinct areas of developing woodland. As a result of this a total of 570 ha out of the original 1800 ha were mapped as developing woodland.

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<sup>i</sup> French D. D. 2001 *Predicting Tree-line Development in the Cairngorms*, Centre for Ecology and Hydrology.

It is fair to present this as a conservative figure. The survey results actually identified trees over a much wider area than was finally mapped. Some of those plots represent very low density, isolated pockets of trees that do not yet form part of tenable woodland cover, so they were excluded from the area claimed on this occasion. All things being equal, with deer management remaining a critical management input, these areas will continue to develop and the woodland will continue to expand.

Location	Area (ha)	Nos Plots	Av Height (m)	Stem Density (stems/ha)	Age		Species Distribution									
					Av. Age	Oldest	Scots Pine		Juniper		Spruces (NS/SS)		Birch		Open	
							%	ha	%	ha	%	ha	%	ha	%	ha
1	49	51	0.92	274	2004	1984	48%	23.52	12%	5.88	8%	3.92	2%	0.98	30%	14.7
2	10	11	0.43	230	2011	2006	20%	2		0	50%	5		0	30%	3
3	23	21	0.3	112	2008	2001	26%	5.98	14%	3.22	22%	5.06		0	38%	8.74
4	40	39	0.72	600	2004	1987	48%	19.2	45%	18	2%	0.8		0	5%	2
5	42	44	0.65	254	2004	1984	24%	10.08	24%	10.08	28%	11.76		0	24%	10.08
6	5	4	0.35	382	2007	2001	25%	1.25	75%	3.75		0		0	0%	0
7	8	8	1	150	2005	1992	50%	4	25%	2	12%	0.96		0	13%	1.04
8	51	50	1.26	321	2001	1984	22%	11.22	20%	10.2		0	6%	3.06	52%	26.52
9	5	4	2.25	233	2000	2000	35%	1.75	15%	0.75		0		0	50%	2.5
10	46	45	0.63	164	2004	1989	31%	14.26	16%	7.36	4%	1.84	2%	0.92	47%	21.62
11	17	45	0.47	479	2008	1994	55%	9.35	3%	0.51		0		0	42%	7.14
12	23	28	0.37	100	2005	2001	41%	9.43	7%	1.61		0	11%	2.53	41%	9.43
13	33	28	1.49	177	2010	2000	41%	13.53	7%	2.31		0	11%	3.63	41%	13.53
14	97	167	1.1	157	2006	1995	44%	42.68	5%	4.85		0	2%	1.94	49%	47.53
15	56	52	1.06	451	2006	1995	34%	19.04	39%	21.84		0		0	27%	15.12
16	65	65	1.1	260	2006	1995	61%	39.65	6%	3.9	0%	0	2%	1.3	31%	20.15
Total area (ha)	570	662														

**Table 1:** Summary of New Woodland Colonisation Zones at Glenmore

Scots pine (*Pinus sylvestris*) is by far and away the largest component of the developing woodland. Unexpectedly, juniper (*Juniperus communis L. subsp. communis*) came in a very strong second place. Juniper is not only present, but the indications are that it is still being recruited. Sitka spruce (*Picea sitchensis*) is also present, being a legacy of the non-native conifer plantation on the lower slopes. Lodge-pole pine (*Pinus contorta*) is also present on the hill, although it was not recorded in the plots. Given the conservation status of Glenmore forest and its upland habitat, there will need to be a follow up operation to remove these species from the regeneration bank in the near future.

Native broadleaved species were not strongly represented in the results. This could reflect the availability of a seed source, as birch (*Betula pubescens/pendula*) is still largely confined to the perimeter of Loch Morlich, the main riparian zones, and Ryvoan. It is not clear why birch has been relatively scarce in Glenmore, but perhaps land use history and browsing are the most likely reasons. It is certainly expanding, but at an apparently slow rate. Equally rowan (*Sorbus aucuparia*) is notable by its rarity here.

Herbivore impacts were recorded in categories of high (20%), medium (40%) and low (40%). In 2015 the deer population in Glenmore was measured to be between 9.5/100 ha for Red and Roe deer combined<sup>ii</sup>. The population of Reindeer was excluded from this study. Deer fences were removed from Glenmore back in 1999 and today deer fencing only remains around the reindeer enclosure on the slopes of Airgiod-meall (NH97540701), to the south of Loch Morlich. So the regeneration has developed largely under the protection of culling alone.

<sup>ii</sup> Strath Caulaidh, 2016. *Patterns of wild deer occupancy and impacts in Speyside and interactions with capercaillie*. A report for Forest Enterprise Scotland.

## Future considerations

In the UK the idea of natural processes is established in conservation manager's minds, but it is still being proven on the ground. Largely this is because browsing pressure is still high across Scotland and the rate of any response from the habitat to change is slow. This survey demonstrates that woodland expansion by natural colonisation is possible at considerable scale where conditions permit it; where the seed source and browsing herbivore populations are at appropriate levels.

This upland woodland zone is a new habitat - a missing habitat – for Scotland that its land managers have little experience of working with and it provides an opportunity to study and observe how nature deals with its changing circumstances.

Opportunities are opening up in the wider landscape. As browsing pressure reduces regeneration should naturally start to appear around existing woodlands. Willow is slowly becoming more evident on some hill sides such as to the north of Dalwhinnie, at Crubenmore (NN66968966), or at Gleann Udalain, South Strome in Kyle of Lochalsh (NG86312947). Although it is uncertain whether this change is by design or good fortune, it should be welcomed nonetheless.

There is still the potential for conflict of interest with other land uses. Grouse moor management practices annually burn off regeneration in this zone, holding back upland woodland development where it should be fulfilling a critical part of society's natural key carbon, water management and biodiversity strategies.

However, there are also conflicts of interest within conservation interests that are perhaps one of the most interesting debates to watch. The conversation typically revolves around speculation as to whether this new habitat will completely supplant existing ones, or complement and add value to them. Will we simply see new categories in the national vegetation classification (NVC) develop and watch in wonder how the fauna and fauna adapt to utilise them? As this zone develops towards a woodland habitat what will that look like and how will its structure alter in relation to climate, altitude and geology. Experience from Scandinavia and Europe already points the way, but is important that resident conservation managers work with this and learn as they go.

A large proportion of Glenmore is designated under the Habitats Directive as a Special Area of Conservation (Cairngorms SAC 8217<sup>iii</sup>). This includes habitats such as alpine and subalpine heaths, juniper on heaths, and wet heathland with cross-leaved heath and montane willow scrub.

Happily in this case, Scottish Natural Heritage started to address this conundrum in 2010, and published a recommendation for Scottish Government to approve an expansion of up to 4900 ha of Annex 1 priority habitats<sup>iv</sup> (Caledonian forest and bog woodland) on to other habitats, primarily wet and dry heath. Interestingly the SNH assessment was written in the expectation that fences might be needed to facilitate the woodland expansion as the impact on capercaillie was highlighted as a possible threat.

We assume that upland woodland expansion will be beneficial for the environment and society as a whole. Research work is certainly pointing the way to some benefits, such as the improvement in the abundance in bird species<sup>v</sup>. Without doubt, Glenmore and the wider Strathspey forest network present an excellent learning resource for observing and learning about habitat change, biodiversity indices, soil protection and carbon storage.

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<sup>iii</sup> [www.gateway.snh.gov.uk/sitelink/](http://www.gateway.snh.gov.uk/sitelink/)

<sup>iv</sup> Scottish Natural Heritage, 2010, *Habitat change in the Cairngorms SAC, Favouring Caledonian forest and bog woodland habitat expansion over other qualifying interests*. SNH proposal to Scottish Government

<sup>v</sup> Calladine, J., Bielinski, A., & Shaw, G., 2013. Effects on bird abundance and species richness of edge restructuring to include shrubs at the interface between conifer plantations and moorland, *Bird Study*, 60:3, 345-356.

## Policy

As a habitat type, upland woodland does have a place in Scotland's policy landscape.

In the document, *2020 Challenge for Scotland's Biodiversity*<sup>vi</sup>, the Scottish Government recognises the value of woodland expansion and makes the link between woodland, montane scrub and near-natural treelines, especially "where these have been suppressed or eliminated by grazing and burning."

In 2016, Forestry Commission Scotland introduced a new category within the woodland creation funding package for native low-density broadleaves. This was specifically designed for any scheme that aims to create an edge habitat, especially in the transitional zone between plantation and open hill. The scheme recognises tree-line woodlands, juniper and other forms of scrub woodland. Upland woodland expansion by natural colonisation/regeneration is not yet recognised for grant support, but that could change if case studies can demonstrate that it is possible and would deliver social benefits equal to or surpassing planted alternatives.

Where site types are conducive to natural regeneration and there are adequate seed sources, it seems to come down to how private land owners are encouraged to engage more positively with this habitat. Given the altitudes and soil types involved, the principal land use competitors are those of grazing for sheep and sporting interests for deer and grouse.



Plate 2. Natural regeneration of Scots pine c620 m asl above Badaguish, January 2017 (NH95971296).

These concerns are not new, but the potential benefits of change for society are becoming more tangible; tourism, economy, carbon storage, soil stabilisation, water management and biodiversity. Sporting land owners are concerned that they will lose deer. Grouse moors worry about losing land to woodland and an increase in predators, hares

and ticks. Graziers are still concerned about the loss of land for cattle and sheep.

But a changing landscape does not mean no sporting or grazing, it just means a move away from an unsustainable, polarised industrial style model to something more sustainable and compatible with the multiple objectives society needs for the future.

That is something conservation land managers also need to continue to learn about, alongside our commercial counterparts, because we are all trying to get useful benefits from the same piece of land.

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<sup>vi</sup> Scottish Government, 2013. *2020 Challenge for Scotland's Biodiversity*. ISBN: 978-1-78256-586-4.

# Mardale Mountain Meadows

Restoring Lakeland alpine plant communities  
to create opportunity for demonstration,  
education and advocacy.



*David Morris, Senior Reserves Ecologist, RSPB*  
*Lee Schofield, Site Manager, RSPB Haweswater*

## **An Introduction to RSPB Haweswater**

RSPB Haweswater sits within the Eastern Edge of the Lake District National Park in Cumbria. This 3,000+ hectare upland farmed estate is managed in partnership with our landlords, United Utilities. In 2012 we took on the tenancies of two large farms, attaining the full management control of an area that constitutes a large chunk of United Utilities' substantial Cumbrian land holding. Iconic, and famed for many years as the last remaining site for breeding Golden Eagle in England, RSPB Haweswater sits within the eastern Cumbrian High Fells and is home to a range of important upland and montane habitats and associated species. Our site boasts ancient Juniper scrub, Atlantic Oak woodland, bogs, species-rich upland hay meadows and rocky cliffs and screes that are home to important alpine plant communities. Its range of fauna is equally diverse with Red Squirrel, Ring Ouzel, woodland birds such as Pied Flycatcher and Wood Warbler as well as Mountain Ringlet butterfly.

Our vision for the site is to provide an inspirational approach to sustainable farming in the uplands, delivering a broad range of benefits to both people and nature conservation. Our management is spread over the two farms of Naddle and Swindale and their associated areas of common grazing land. On these sites we deliver varied grazing options, habitat management and restoration and woodland creation. All of our holding is rigorously monitored and reported on annually in order to assess how key species and habitats are faring in relation to our land management and conservation activities. All of the land is managed in partnership with Natural England through the government's Higher Level Stewardship scheme. The HLS scheme forms part of our extensive management plan, which also includes a public facing summary (available online <https://goo.gl/DmMdpu>).

Much of our holding forms the catchment of Haweswater reservoir which supplies two million people across the north-west with clean drinking water. With the issue of water quality and natural flood alleviation close to the hearts of the RSPB and United Utilities, our location and land management are paramount to positively influencing these two issues. Current projects on site with this regard include the re-naturalisation and re-meandering of a large section of the Swindale Beck along with associated natural flood storage and habitat restoration.

Our work to conserve nature within the wider Cumbria High Fells sees us working closely with a range of partners including Natural England, United Utilities, The National Trust and The Lake District National Park Authority.

## The Importance of Haweswater for Alpine Flora

Years of sustained and heavy grazing, combined with other detrimental land uses, has seen the widespread removal of some of our most important native upland plant communities across the Lake District and broader English uplands. Numerous areas of the Cumbrian High Fells historically supported diverse dwarf shrub heaths, montane scrub, species-rich upland meadows, alpine grasslands, alpine heaths and floristic siliceous screes, many of which are now reduced to species poor Mat-grass, *Nardus stricta*, dominated swards. A large transient red deer population across the area brings an additional challenge at Haweswater, as heavy deer browsing of these plant communities can result in further vegetation suppression. Since taking on the land management of Haweswater in 2012 it has been our aim to see the historically denuded mountain habitats within the estate return to more natural vegetation communities with a full complement of characteristic plant species.

RSPB Haweswater includes many well-known peaks such as High Street (828m), Harter Fell (787m) and High Raise (802m). The site is of particular importance as it is one of the few in England to hold the last vestiges of our native upland alpine plant communities. Like many prevailing Lakeland alpine communities, the key species cling on as chasmophytic vegetation, perched on the rocky crags and ledges out of the reach of grazing animals. The far western part



of the site constitutes the 'Water's Heft', a high altitude area of Mardale Common that includes Blea Water and Small Water tarns and the Blea Water Site of Special Scientific Interest. Within this unit are the north and east facing crags of Harter Fell, which together with the cliffs around Blea Water contain at least a fifth of the English resource of the U17 (*Luzula sylvatica* – *Geum rivale*) tall-herb community. These crags are one of a handful of English sites for Holly Fern, *Polystichum lonchitis* which, despite being in good abundance, remains restricted to the inaccessible ledges. Good quantities of species such as *Saxifraga azoides*, *Saxifraga hypnoides*, *Saxifraga stellaris*, *Rhodiola rosea*, *Alchemilla alpina*, *Solidago virgaurea* and *Trollius europaeus* adorn the cliffs, although botanising here requires a strong head for heights! In various exposed locations scattered shrubs of Dwarf Willow, *Salix herbacea*, still cling on.



Various conservation initiatives have shown that important alpine plant communities, once restricted to cliff and ledge refuges, can be recovered if appropriate management is put in place. Sites such as Cwm Idwal in Snowdonia, Ben Lawers in the Scottish Highlands and Carrifran in the Southern Uplands have all shown remarkable recovery of alpine and tall herb communities from ledges back into upland swards within 10-15 years of commencing restoration. Additionally, the cultivation and reintroduction of key plants with local genetic stock has helped restore lost species and further

advance the recovery of these restricted habitats. Since revising our grazing management at Haweswater from 2012, along with previous reductions in grazing pressure under agri-environment, we have seen some small but positive changes in the Water's Heft; however, we believe this could go further. With an amalgam of extensive grazing units, many of which fall within commons where we have varied levels of



Figure 1 – location of the Mardale Mountain Meadow at the head of Haweswater Reservoir.

rights and control, we still face challenges in achieving our ecological objectives. Many of these areas remain unfenced and with the legislation and farming traditions affecting commons, the path toward meaningful habitat restoration may be protracted. Despite minimal stocking levels of our own within the Water's Heft, the ingress of sheep from neighbouring commons, along with herds of red deer, combine to effect a grazing pressure that can hamper vegetation recovery. However, there is at present significantly less sheep grazing in this unit, due in part to wider agri-environment schemes having off-wintering and to our farming contractor and their shepherds conducting trespassing sheep out of our unit.

### **Alpine Flora Recovery and the 'Mardale Mountain Meadow'**

The RSPB, in partnership with United Utilities, the Alpine Garden Society and Natural England, formulated the development of an area at Mardale Head in order to display the diversity of upland Lake District flora and demonstrate its recovery. In so doing, we aim to raise the profile of native alpine plant communities, show restoration can be achieved within a fully livestock controlled area and provide a vision for what could be achieved in the adjacent Water's Heft. We identified an area, already relatively botanically rich, that has been fenced to exclude livestock and deer in order to encourage greater botanical diversity. Additionally, we have started to introduce a range of native tree, shrub and herb species propagated using seeds and cuttings from local providence stock.

Nearby Harter Fell is a crag well-known for having a diverse mountain flora, however the many wonderful and colourful species that grow here are out of sight of the general public, often in locations that are beyond the reach of all but the most adventurous. By creating an enclosure akin to the excellent examples at Ben Lawers, we can create a varied walk through the habitat, which alongside interpretation, will be able to show a range of visitors, decision makers, professionals, politicians and other stakeholders what areas of our uplands could look like if nature conservation was given higher priority. There is no equivalent of this type of approach to upland flora recovery in the Lake District. Over time, our intention

is that the area at the head Haweswater will develop into a place where visitors can come to appreciate the diverse and beautiful suite of species that were once so much more widespread. We hope that this positive advocacy model in the Cumbria fells can be a visual catalyst for change, and precipitate the recovery of similarly restricted habitats in other parts of the English uplands.

## Livestock exclusion

Deer and livestock exclusion is necessary to effect meaningful habitat recovery. Deer management rights are not within our tenancy and as such, given the concentrated effort of species introduction to the area, we feel it is essential to use a combination of deer fencing and top wiring of walls to exclude both natural and domesticated herbivores.

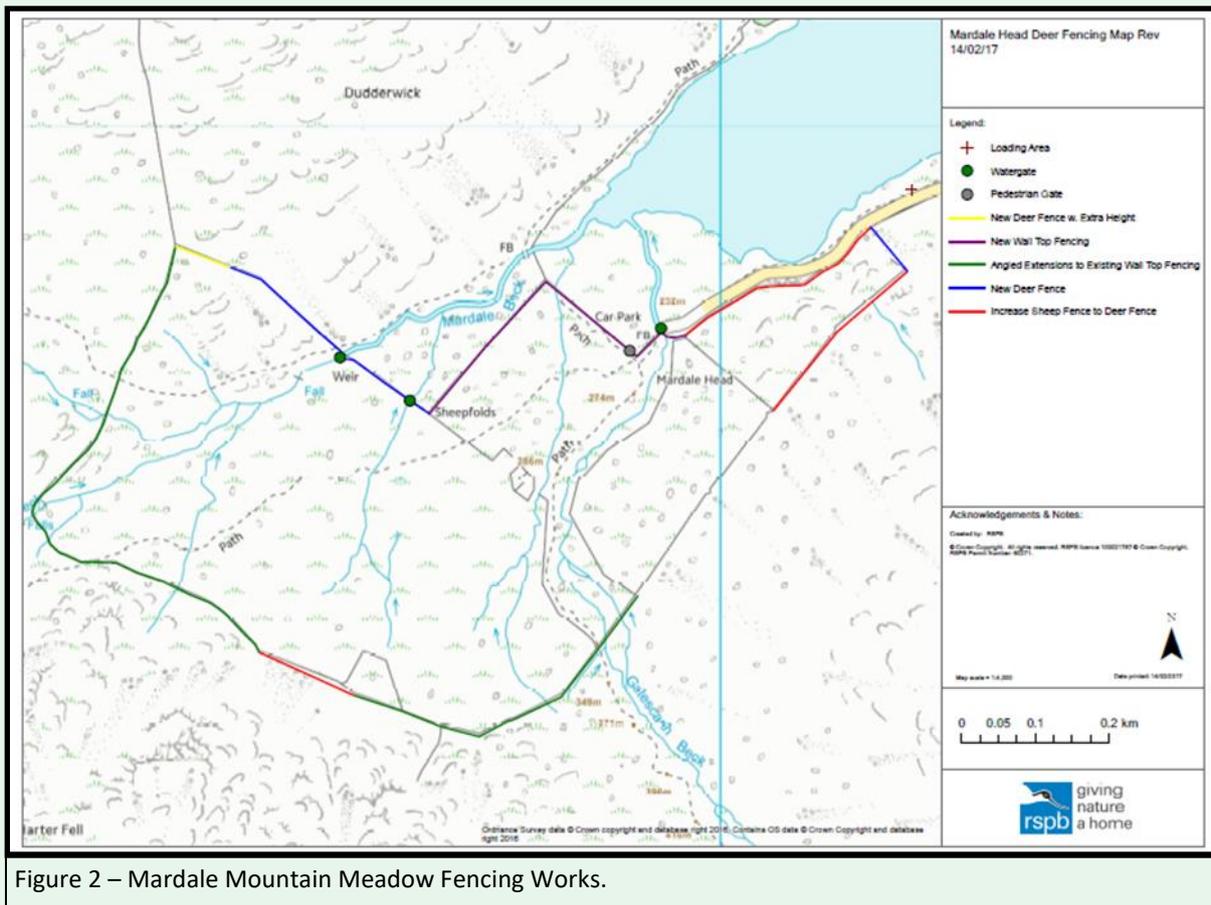


Figure 2 – Mardale Mountain Meadow Fencing Works.

The Alpine Garden Society generously provided funds to carry out these fencing works to the specification shown on the map below. All of these works took place within RSPB tenanted land and have no impact on the surrounding common land or on public access. Virtually all of this fencing follows existing boundary routes in order to minimise the visual impact.

## Species introduction and propagation

In addition to seeing colonisation and recovery from natural seed banks, we aim to cultivate material from key species in order to facilitate their reintroduction into the area. The RSPB has been engaged in similar processes over the last few years. Our own Haweswater nursery has been producing large quantities of Juniper, *Juniperus communis*, as well as other shrub and tree species for introduction onto the estate and for wider conservation projects across the Lake District. The nursery is run by RSPB Haweswater staff and volunteers. The emphasis of our work on Juniper cultivation and introduction is easing off as we enter our next phase of species cultivation. Our next step is the cultivation of particular montane *Salix* species that were historically more widely represented on site, along with a range of indicator herb and alpine species. Additional cultivation of herb and shrub material is being carried out by David Morris (RSPB reserves ecologist) and Simon Webb of Natural England, however the scale of this work needs to be augmented.

Following a visit to the montane willow nursery and restoration project at the National Trust for Scotland, Ben Lawers estate, we have made a few upgrades to our Haweswater nursery setup with the intention of increasing production of *Salix* plants from seeds and cuttings.

## A Future Vision of Alpine Flora at RSPB Haweswater

The Mardale Mountain Meadow is a relatively small area in the context of the Haweswater reserve, and we hope that it will be only the beginning of a significantly larger project. We are developing plans for further, more extensive livestock enclosures, including some at higher altitude where there will be more emphasis on restoration of montane scrub. Working closely with the NE staff involved in the restoration on Hellvellyn, the only remaining locality for downy willow in England, we also hope to integrate this species with our project at Haweswater.

Appreciating the wealth of knowledge and experience of the Montane Scrub Action Group, we would greatly value becoming more involved. Working in partnership will allow for the best informed future management of RSPB Haweswater, help us develop techniques of montane scrub restoration to forward our project and propagate knowledge that can then be applied to the wider Lake District.

For more information please contact: Lee Schofield 01931 713376 / [lee.schofield@rspb.org.uk](mailto:lee.schofield@rspb.org.uk)

# Montane Scrub Action Group

## Updates

It has been a busy year since the last issue of Scrubbers'! The Heritage Lottery Funded **Mountain Woodland project** is coming to an end and by the time you read this will have held its final conference at Dynamic Earth in Edinburgh. As a consequence of the project there are now new mountain woodlands, including treeline and montane scrub, developing on a number of Estates from the borders to the north coast of Scotland.



The project produced an opportunity to combine the knowledge and experience of MSAG members in a new suite of Best Practice Guides that will lead anyone contemplating restoration or new establishment schemes through the process, from sourcing the young plants to the many issues to be addressed in schemes at high altitude. These will be available on the publications section of the [MSAG website](#)

We are delighted that there is now the low density option of the Woodland Creation Scheme is available for use at higher altitudes and hope many more applicants will take the opportunity to extend woodland establishment higher.

MSAG members are currently working with partners, particularly in the Cairngorms and north of the Great Glen, to develop seed orchards of montane willows that bring together genetic material from widely fragmented and disparate populations within defined geographic units to ensure restoration and establishment schemes have access to plants grown from a strong genetic base.

Forestry Commission have just completed a consultation on whether montane willows and a range of other less common species should be included under the Forest Materials Regulation.

We will be reviewing our role early in 2018, but members are also involved in organising a joint Symposium with the Norwegian Ecological Society and BES to explore the dynamics of treelines, see next page (21).....

# TREELINES: WHERE NEXT?

**A meeting across two cities: Bergen, Norway & Perth, Scotland  
3 – 4 September 2018**

Across the boreal zone the altitudinal treeline ecotone shares many plant and animal species. It can be one of the most biologically diverse transition zones due to its highly variable structure. How have the markedly different land use histories in Scandinavia and the UK affected the flora and fauna, both above and below ground, and their function in these ecotones? What are the implications for rural policy and land use of the current heightened dynamic flux in both climate and politics?

There appears to be an upward trend in the movement of tree and shrub species in Scandinavia while in the UK treeline habitats are very rare and there is conservation concern associated with many montane scrub species. In addition, the land use differences, across the countries, have fostered very different attitudes to this ecotone and its role in supporting (or not) the interests of extensive agriculture or hunting practice, and wider recreational activity.

Join us for one and a half days in Bergen, Norway for an examination of the science exploring these issues with leading scientists from across Europe. Then join the debate between rural policy makers, land users and other key stakeholders, about the impact that land use and rural policy have on the biodiversity and the delivery of ecosystem services. This discussion will be web-linked live between Bergen and Perth, a first for the BES, enabling direct comparisons between the two countries. The indoor meeting will be followed by a chance to visit a treeline ecotone site in either country.

**Want to participate? Prepare a poster showcasing your contribution to our understanding of treeline zone dynamics.**

For further information, please contact BES Events Manager, Amy Everard: [amy@britishecologicalsociety.org](mailto:amy@britishecologicalsociety.org)

