

# Scrubbers' Bulletin - No. 2, June 1998.

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## Editorial.

The Bulletin is the 'mouthpiece' of the **Montane Scrub Action Group**, and is produced occasionally as required, with no fixed frequency or date of issue. The secretariat and main driving force of the group is provided by Diana Gilbert at Highland Birchwoods, under the auspices of the project referred to on p.3.

The Group welcome suggestions and we are hoping for input from anyone active in the field of montane scrub. Please feel free to write to us with ideas.

The Bulletin is compiled and circulated by David Mardon, The National Trust for Scotland, Lynedoch, Main Street, KILLIN, Perthshire, FK21 8UW. (tel./fax. 01567 820988). Contributions will not be edited for content. Many thanks to all the contributors to this issue.

To facilitate production of the Bulletin it would be helpful if contributors would please submit notes or articles on 3.5" floppy disc, preferably in MS Word 6, using the format in this issue. The font is Times New Roman and headings are in 18 pt with text in 12 pt.

## The Montane Scrub Action Group.

David Mardon, The National Trust for Scotland, Lynedoch, Main Street, Killin, FK21 8UW.

The steering group meets 2 or 3 times a year. Some changes in membership have occurred since Bulletin No. 1. Sandy Payne has been unable to continue as a participating member, and we record our thanks to him for his support and contributions. We were pleased to welcome Angus MacDonald who now represents SNH on the group, from their Advisory Services Uplands Group. The steering group at present includes:-

Michael Scott, Plantlife (Chair)	David Mardon, NTS
Ian Hulbert, SAC	Angus MacDonald, SNH
Rob Soutar, FE	Tim Clifford, Caledonian Partnership
Brian Staines, ITE	Diana Gilbert, Highland Birchwoods.

The most significant landmark in the year since Bulletin No. 1 was the publication of the proceedings of the one day conference held in March 1996, as follows:-

**Gilbert, D., Horsfield, D. and Thompson, D. B. A. (Eds.) 1997. The ecology and restoration of montane and subalpine scrub habitats in Scotland. *Scottish Natural Heritage Review*, No. 83.**

Some publicity was given to the publication of the SNH Review and the action group, including various newspapers, Plantlife, New Scientist in October 1997, Tree News in Spring 1998 and the British Ecological Society Bulletin in May 1998, which described it as "an impressive array of review and information papers".

At the group's recent meetings, discussion included further promotion based on the Review, and agreement was also reached on progress towards the production of the following outputs:-

1. A promotional booklet to draw attention to the problems of montane scrub conservation. This is envisaged as a non-technical approach, targeted at a wide readership, within the range 3,000-5,000 words and with very good graphics and pictures.
2. The collation of information to establish an inventory of surviving montane scrub sites and their condition. This will require a short-term contract for which the remit is being drawn up.
3. Guidance notes on best practice and techniques for the conservation of montane scrub. Given the limited history of practical work implemented to date, this is clearly something that will require a long period of ongoing development in the light of experience.
4. A communications strategy for the group. To achieve significant progress in promoting the conservation of montane scrub, many organizations other than those currently involved with the steering group will need to be persuaded of the value of the initiative. Communication with these bodies will be planned according to progress within the group, especially in relation to the above targets.

However, although progress has been made, it has been seriously constrained by pressure of work from the mainstream duties of all members of the steering group.

## Millennium Forest for Scotland Trust Project no. 1/89 Montane Shrub Restoration Project

Diana Gilbert, Highland Birchwoods, Littleburn, Munloch, Ross-shire, IV8 8NN.

This project has two distinct elements: the Montane Scrub Action Group and a very small-scale research project. The activities of the former have been reported on by David Mardon in this bulletin, below is a brief up date on the latter.

By August 1997 fences had been erected at two sites. These are 4 strand electric fences at six feet height. The power to each fence is from a battery whose charge is maintained by a photoelectric cell. A single length of sacrificial sheep netting has been erected parallel to and above the uphill side of each fence to protect the main fence from rock fall. All fences use a mixture of wooden and metal posts. Both sites tend to collect snow and deer are not normally present in the area during the winter months.

At each site the growth of young willows along a number of fixed transects is being measured on an annual basis. Along the same transect annual searches will be made for new recruits to the population.

Site 1. is on Ben Wyvis Natural Nature Reserve which has remnant *Betula pubescens* woodland, *B. nana* scrub above on wet heath and *Salix lapponum* scrub in a coire. The opportunity at Ben Wyvis is that all these communities are in an altitudinal continuum. Although not contiguous at the present time SNH has already begun to expand the birch woodland up hill. This project has provided for the enclosure of just over 2 ha of ground including part of the willow community. The final factor, the dwarf birch, is currently the subject of an assessment survey in order to determine how its recovery can best be managed. This final jigsaw piece arose as a result of the Montane Scrub Project and is being funded by SNH.

The high level (between 600 and 700 m asl.) fence at this site encloses a number of willow plants, and an amount of open ground which is suitable for the germination and establishment of young willows. There is also some anticipation that willow will not be the only woody species to benefit from the fence. Rowan and birch are present in the vicinity and it is expected that they will regenerate naturally.

An initial assessment of the fence following the winter suggested that damage was tolerable. However, this was made before the late March snow and the situation could be less simple.

Site 2 is in the Affric Cannich hills massif on an estate which has made a commitment to reducing deer numbers substantially. There are two small enclosures on the site of less than 1 ha each. The purpose of the fences is to monitor the impact of a reduction in deer numbers across the whole estate on the willow community, which includes *Salix lapponum* and *S. phylicifolia*, in one coire. Within the enclosures the willows will show their potential recovery rate, this will provide a standard against which performance outside the fence can be measured.

These fences are between 650 and 750m on the crags of a coire. After the second winter one fence has survived with only superficial damage. The second fence has suffered significantly and discussion is underway regarding how to take this plot forward. There is an option to use this plot to learn more about deer browse habitats in relation to willow by leaving the plot open until August. The fence would then be closed until first snow fall when the wires will be dropped to ground level.

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## FC ventures above the tree line.

**Michael Scott**, Scottish Officer, Plantlife (and chair of MSAG), Strome House, North Strome, Lochcarron, Ross-shire, IV54 8YJ.

When the Forestry Commission (FC) was first established after the First World War, its only objective was the develop a strategic reserve of timber to see Britain through any national emergency. Over the years, as public perceptions and expectations have changed, the FC's remit has been progressively widened to take in landscape, recreational, conservation and biodiversity objectives, as well as (literally) straight timber production.

Even so, there must be a few old-time foresters who are turning in their sylvan graves at the latest Guidance Note from the Forestry Authority (FA) Scotland. It is a document to gladden a "scrubber's" heart because, in effect, it sees the FC embracing *krumholz* (metaphorically, if not literally). It suggests that there are circumstances in which the FA will see it as appropriate to support the expansion of woodlands above the commercial timber line using the Woodland Grant Scheme (WGS), although it emphasises that such support will be discretionary.

The Guidance Note provides (and graphically illustrates) a useful definition of the different zones up the hill. The commercial tree line (or timber line) is the point at which altitude and exposure prevent the growth of a marketable timber crop; montane scrub is a significant component of tree line woods above this altitude. Beyond that, is the natural tree line, above which only stunted, low-growing birch, rowan or pine can occur, mixed with shrub species. Higher still is the scrubline at the biological limit of tree growth. Above this only dwarf shrubs can grow, in montane heaths and grasslands.

The Guidance Note states: "It is now widely accepted that extending woodland cover 'up the hill' enhances biodiversity and can create a softer visual boundary between forests and open hill. In encouraging tree line woodlands in Scotland, the aim is to create a continuum of woodland cover which reflects climatic and edaphic gradients from the valley floor to the biological limit of tree growth."

Such tree line woodland is above the altitudinal limits and exposure levels at which trees grow tall and straight enough for the convenient mass handling in timber mills. The Montane Scrub Action Group has always argued that trees above this level have many other values. There is no reason why their timber cannot find a place in high-value handcrafting industries or as firewood, but also the profiled edge of the woodland protects lower altitude woodland from windthrow and

exposure, and the trees themselves provide shelter for gamebirds and, once established, even for hill sheep. Add the landscape and biodiversity values, and the potential hydrological benefits, and you have a powerful argument in favour of letting woodland creep back up the hill. Nevertheless, it is highly encouraging to have the FA officially recognise these merits, and it is a considerable credit to our FC colleagues on the Action Group - and in particular to Bob Dunsmore, the FA Conservator for North Scotland - that this significant policy shift has been made with so much enthusiasm.

The Guidance Note rightly identifies that "very little is known at present about the natural distribution of tree line woodlands and montane scrub in Scotland" (a key task for the Action Group), and notes that the evidence suggests that such woodland may not have been as widespread in Scotland as elsewhere. It therefore commends caution in any operations granted under WGS. Our Action Group would endorse that recommendation: there is no point rushing at the restoration of woodland above the timber line; rather, it should be allowed to mature slowly, like a good whisky!

The Note gives sound guidance to land owners and managers on how to extend new semi-natural woodlands above the timber line, how to establish new tree line woodland, how to extend the tree line in commercial plantations, and how to restore existing remnant tree line in commercial plantations, and how to restore existing remnant tree line woodlands, incorporating the latest advice on Windiness Scores - Detailed Aspect Method of Scoring (DAMS), as well as Ecological Site Classifications and the application of the National Vegetation Classification (NVC). It outlines the detailed information that will be required for assessing any application for tree line woodland under the WGS. Providing that information will be no easy task, but it is quite proper that public funding which is still intended primarily for timber production should be rigorously assessed in this way.

Perhaps what is most valuable about the Guidance Note is that it is a pragmatic document for hard-headed, commercial timber growers. Not all of it will appeal to the idealistic conservationist. For example, it suggests that "a new type of ecosystem is likely to develop above commercial tree lines, consisting of mixtures of native and non-native species". The purist conservationist would undoubtedly describe the latter as 'weeds', to be rooted out at all costs, and argue (rightly) that they actually detract from natural biodiversity. But is there not a case for pragmatism, given the low ebb of tree line woodland from which we are starting? Will the woodland grouse, the upland plants and many timber-living insects and fungi really distinguish between species that did or did not manage to cross the temporary land bridge at the end of the last Ice Age? These will be important issues to address as we develop our policies for montane scrub, and the Action Group would welcome the views of readers for the next *Scrubbers' Bulletin*.

The restoration of tree line woodlands on a semi-commercial basis will be a major contribution to the landscape of Scotland in the new millennium. Our hope is that this Guidance Note will also inspire other landowners who simply wish to restore the denuded hillsides of Scotland as a public benefit, like the farsighted planting lairds of the last century. To that end, the Action Group hopes within the next year to produce, jointly with Scottish Natural Heritage, our own inspirational booklet on the opportunities and benefits of restoring the montane scrub habitat. The Guidance Note provides valuable, down-to-earth advice on how to transform that vision into reality. It

really brings the WGS into its own as a tool for achieving the governments stated biodiversity targets.

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## Montane Willow Scrub at Creag Meagaidh

Doug Evans, Scottish Natural Heritage, Achantoul, Aviemore, PH 22 1QD.

Creag Meagaidh, midway between Laggan and Spean Bridge is probably best known to conservationists for it's National Nature Reserve and it's pioneering work in regenerating woodland without the use of fencing. However there is much more to the NNR than woodland and more of Creag Meagaidh than the NNR.

Creag Meagaidh has long been known to botanists for it's alpine plants, mostly restricted to ledges on the cliffs such as those in Coire Ardair and when the mountain was designated a SSSI by NCC in 1983 the citation as well as describing the uninterrupted sequence of semi -natural vegetation from Loch Laggan to the summit highlighted the "magnificent cliffs" and their vegetation. *Salix lapponum* was one of only 4 species which were named. The SSSI includes all of the NNR together with areas to the west, north and east, thus including a series of north facing corries which complement those in the NNR.

The presence of montane willows has been recorded for many years, the earliest record held by SNH is from Derek Ratcliffe dated 1957 who later included a description of the site in the 1977 Nature Conservation Review which mentions that "*S. lapponum* ledges are well developed in one corrie".

Surveys by the Royal Botanic Garden - Edinburgh found a few more sites and when SNH started to look for possible sites to recommend as 'Special Areas of Conservation' under the 1992 Habitats & Species Directive for Subarctic willow scrub Creag Meagaidh was an obvious candidate. Creag Meagaidh has also been proposed for Siliceous alpine & boreal grasslands.

However the only information available was a handful of records, which showed the presence of *S. lapponum* in 3 corries but little else. In 1995 I started a systematic survey of all the likely sites in the SSSI, and recorded the number and size of plants rather than just presence/absence. In subsequent years I have visited further possible sites but still have a few possible localities to visit, hopefully this summer.

This recent survey has shown that at least 2 other taxa are present, probably *S. myrsinites* and *S. arbuscula* and that montane willows, especially *S. lapponum* are widely distributed across the SSSI (see map). But with a few exceptions bushes are restricted to cliff ledges. The exceptions include a few bushes of *S. lapponum* in the middle of an area of boulder scree and some bushes growing on the steep banks of a burn. All of these sites are either inaccessible or unattractive to grazing animals such as red deer and sheep. One area on a north facing crag has a mix of birch and rowan with *S. lapponum* on a series of ledges with stunted birch woodland (almost scrub) on the open hill side some 100m further downhill. This must be close to the "natural" situation where woodland gives way to the subalpine willow scrub with increasing altitude.

On the NNR red deer have been culled for more than 10 years to a level where mainly at lower altitudes there has been widespread tree regeneration, mostly by birch. There has also been the development of *S. aurita* scrub. Much less work has been done on the impact of this change in grazing regime at higher altitudes although there do seem to be more flowering herbs in the grassy swards in Coire Ardair. If, as often assumed, montane *Salix* spp are restricted to cliff ledges due to grazing it might be expected that after 10 years some spread onto the open hill sides would be evident. Unfortunately this does not seem to be happening yet despite repeated searches for seedlings and saplings.

In 1996 Graham Sullivan studied the ecology of *S. lapponum* (see his article elsewhere in this issue) and showed that abundant fertile seed is produced in several areas. The next question is why there appears to be no establishment of new plants away from the cliff ledges. Are we searching the wrong places ? or is there a reason why no new plants are becoming established. It is possible that conditions are only suitable for germination and establishment on rare occasions when the weather and soil conditions are just right and coincide with seed production;- maybe only 1 year in 10 or 20 is suitable. Maybe seedlings are being produced but are grazed by slugs or other small animals. Better information on this establishment phase is badly needed - does anybody have any data from montane willow populations elsewhere in Scotland or further afield ?

It would be possible to test some of our ideas experimentally by planting seeds, seedlings or young plants together with small exclosures. However this would require a rethink of reserve policy which to date has been strictly no planting, and no fencing. Some discussion has started but no decisions have been taken.

Maybe we are just being impatient.

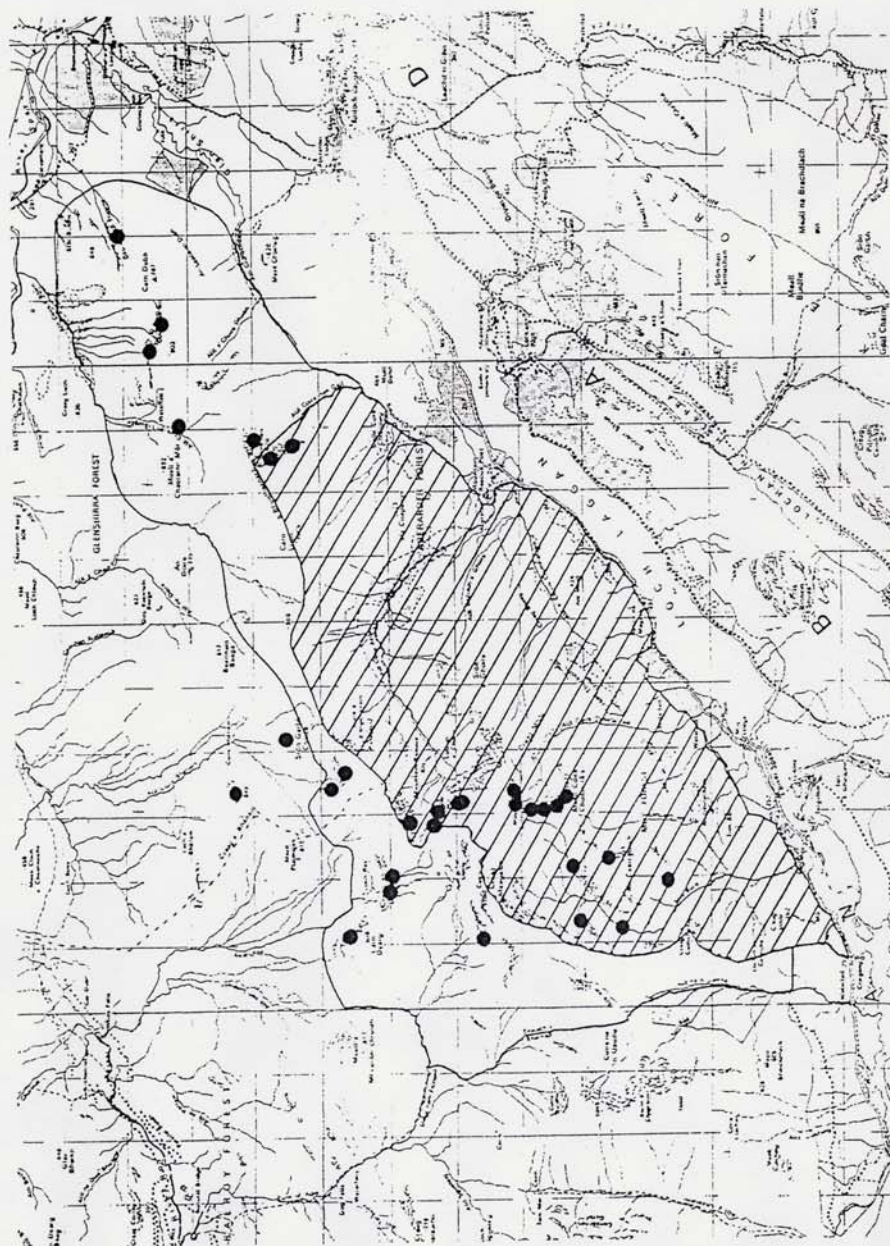
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Ratcliffe, D. A. (ed.) (1977) A Nature Conservation Review. 2 Volumes. Cambridge: Cambridge University Press.

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Recorded distribution of montane willows at Creag Meagaidh



- *S. lapponum*  
(one dot may be several nearby records)
- Creag Meagaidh SSSI
- ▨ Creag Meagaidh NNR

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## An investigation into some aspects of regeneration of *Salix lapponum* on Creag Meagaidh

Graham Sullivan, Department of Plant and Soil Science, University of Aberdeen.

*Salix lapponum* L. is the willow most commonly found in subarctic willow scrub communities in Scotland. It grows in several sites, principally in the Highlands, in base-rich soils at altitudes up to 1000m. It is generally confined to areas inaccessible to browsing mammals but vulnerable to instability. Interest in its conservation has increased in recent years, prompted in part by the designation of subarctic willow scrub in the EU Habitats and Species Directive.

In this study, a B.Sc. Honours Project conducted in 1996, regeneration of *S. lapponum* was investigated on Creag Meagaidh National Nature Reserve. Here reduction in grazing pressure has led to spectacular regeneration of birch woodland, but casual observation suggested that no similar regeneration of *S. lapponum* was occurring.

Field investigation of three representative sites found no seedlings of *S. lapponum* that had been produced in 1995 or 1996. A few small plants that had clearly grown from seed were found, in permanently wet, isolated situations, but their age could not be determined.

Comparison of sites with and without *S. lapponum* showed no differences in vegetation composition or soil characteristics between them. These analyses indicated that there are sites on Creag Meagaidh that are suitable for growth of *S. lapponum*, but from which it is currently absent.

Eighty per cent. of female plants which had catkins in spring produced seed, suggesting that sex ratios, population size, and distances between plants are not preventing pollination. Germination of collected seed averaged 75%, provided seed was wetted shortly after maturity. Seed which was stored dry for several days before germination testing exhibited dramatically reduced germination percentages.

The conclusion of the study was that regeneration from seed is not occurring on Creag Meagaidh despite the presence of suitable conditions and the production of copious amounts of viable seed. This suggests that failure of regeneration occurs at the seedling establishment stage, perhaps as a result of herbivory or soil moisture conditions at the time of seed dispersal, although investigation of these was outwith the scope of the project.

The results have implications for conservation measures, as they suggest that reduction of grazing pressure exerted by large herbivores may not by itself lead to regeneration. Greater understanding of the ecology of the *S. lapponum* will help in the development of conservation measures which may lead to regenerating and self-sustaining populations.

Thanks are due to Dr. Doug Evans, Edwin Cross, and Peter Duncan of Scottish Natural Heritage, and Dr. Sarah Woodin, University of Aberdeen, for their help and advice during this project.

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## **Carrifran Wildwood - Ecological Restoration in the Southern Uplands of Scotland**

(Modified version of an article recently published in Botanical Society of Scotland News)

**Crinan Alexander**, Royal Botanic Garden, Edinburgh, EH3 5LR.

Members of the Montane Shrub Action Group might like to know about a woodland restoration project planned in the Southern Uplands of Scotland. During the last three years, The Wildwood Group, about 40 people based largely in Peebles, has been searching for a site on which to attempt recreation of Scottish native woodland on a substantial scale. The primary criteria were that the site should comprise an entire catchment with a large range of altitude, unspoilt by commercial forestry or other conspicuous development. After a number of near misses and disappointments, an option agreement has recently been concluded for the purchase of Carrifran, a valley just southwest of the Grey Mare's Tail on the road from St Mary's Loch to Moffat. This agreement is contingent on raising the necessary funds by late 1999. Ecological planning, seed collection and propagation, and the development of a fund-raising campaign are now proceeding in parallel.

Carrifran is an entire small watershed in eastern Dumfriesshire (with a fragment in Peeblesshire), amounting to about 600 hectares (1500 acres). It seems an ideal site for the project, with altitude ranging from 180m (594ft) in Moffatdale to 820m (2706ft) at the summit of White Coomb, one of the highest points in the south of Scotland. Crags offer refuges for rare mountain plants, and the whole area is included within the Moffat Hills SSSI. In scenic terms, Carrifran is one of the finest valleys in southern Scotland; under semi-natural vegetation it could be outstanding.

At present the valley is ecologically depauperate and almost entirely treeless; the natural tree cover that was undoubtedly present in the lower part of the valley was lost long ago. A few survive as relicts in precipitous places by the burn. There seem to be no exotic trees on the site at present, though invasion from a nearby Forest Enterprise plantation might occur if grazing pressure were reduced. The lower ground now comprises heavily grazed grassland with flushes, grading into a mixture of heather and scree on the steep sides of the valley; there is some bracken, and erosion is severe in places. On the high plateau there are areas of blanket bog, with montane grassland on the summits. Apart from assemblages of montane and sub-montane species in the SSSI as a whole, additional features of biological interest include a herd of feral goats and a wide range of upland breeding birds. The area is also noted for features of geological and geomorphological interest.

A general vegetational survey of the Moffat Hills area was carried out a few years ago by the Upland Ecology team of SNH; this has been used by The Wildwood Group in a preliminary analysis of the site using GIS software. A more detailed NVC survey has recently been completed by SNH Dumfries; the results are being digitised by Borders Forest Trust and will soon be available. Detailed bench-mark botanical recording would be highly desirable before woodland restoration begins. To this end a meeting of The Botanical Society of Scotland Alpine Section will take place at Carrifran on June 28th 1998. Details can be obtained from Douglas McKean at the Royal Botanic Garden Edinburgh (0131 248 2856).

The aim of the project is to establish native woodland of the type that might be expected under the current climatic regime if human activity had been less destructive. The extent to which 'assisted natural regeneration' can be used instead of planting will be considered, and a combination of both strategies may be appropriate. Issues relating to the provenance and genetics

of relict populations are being explored, as well as the advisability of reinstating certain herbs and invertebrates now absent.

In 1990, a pre-historic yew-wood bow was found on Rotten Bottom, the high boggy plateau above Carrifran. Dating from about 4000 BC, this is the oldest known bow in the British Isles. Its discovery instigated a full analysis of fossil pollen through the deepest part of the peat at Rotten Bottom. This constitutes the longest unbroken sequence known from any upland British site, and provides a unique vegetation record back to the end of the last glaciation. The data from this record will provide valuable guidance on the mix of species to be included in the planned restoration.

To enable the project to benefit from the widest possible range of knowledge and experience, Borders Forest Trust and the Biodiversity Unit of the University of Edinburgh brought together in November 1997 nearly two hundred delegates for a one-day meeting on the theme '*Native Woodland Restoration in Southern Scotland: Principles and Practice*'. In his paper, George Peterken, formerly a senior scientist with NCC, advocated concentrating the main plantings below about 450m (1500ft), with smaller trials of appropriate species at higher elevations. He also suggested that plantings should be irregular and patchy with clusters of individual species, and emphasised the importance of open areas for natural regeneration and the avoidance of an even-age structure. The proceedings, including the minutes of a workshop on '*Restoring Montane Shrub Communities and Treeline*', are to be published as an SNH Review, and will form an important resource in the preparation of a management plan.

The intention is that after a period of intensive intervention, i.e. planting, sowing and herbivore management, a more or less self-sustaining woodland will have become established at lower elevations. The considerable range of altitude raises the possibility that a 'natural' transition from woodland through montane scrub to montane heath could develop, with the possible establishment of tree line and scrub line. It is however possible that at this latitude the tree line could technically be above 820m. As one of the principal objectives of the MSAG is the production of guidance notes for restoration (Scrubbers' Bulletin No 1), The Wildwood Group would be very grateful for any comments and advice.

The Wildwood Group is now part of Borders Forest Trust. The latter, a company limited by guarantee and registered as a charity, will be the legal owner of the Wildwood and recipient of charitable gifts. Because of the long-term nature of the project, Borders Forest Trust has recently arranged an association with The John Muir Trust; this is designed to guarantee the future of Carrifran as a wilderness area in perpetuity. Funds for land-purchase are now being actively sought from charitable trusts, industry and private sponsors. Individuals may become Founder Members of the Wildwood by sponsoring a hectare at £500 or half a hectare at £250. Further information on sponsorship and the project in general can be obtained from:-

Borders Forest Trust, Monteviot Nurseries, Ancrum, Jedburgh, TD8 6TU.

Tel. 01835 830750; Fax. 01835 830760; Email <wildwood@borderft.force9.co.uk>

Web-site <<http://www.scotweb.co.uk/environment/wildwood>>

Project Coordinator:- Philip Ashmole, Kidston Mill, Peebles, EH45 8PH. 01721 721321.

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## Veteran trees in Scotland

**Peter R. Quelch**, The Forestry Authority, Scotland, 231, Corstorphine Road, Edinburgh,  
EH12 7AR.

The first Scrubbers Bulletin demonstrates that a relatively small group of enthusiasts can significantly influence the land-use and conservation debate. During my talk at the Battleby montane scrub seminar I listed montane scrub and tree line woodlands along with a number of other 'specialised woody habitats' which fall outside the conventional seminatural woodland definition. A woody habitat that attracts me is that of Veteran Trees, either as individuals or in groves.

There are now several initiatives to promote veteran trees in GB. The Ancient Tree Forum is an interest group with a number of very knowledgeable members in the fields of fungi, lichens, invertebrates, and arboriculture. ATF organises field visits to important veteran tree sites, and come to Scotland on 19-22 May 1999. [I am looking for volunteers to help organise a tour for them, mainly in the South and Mid Scotland lowland wood pasture sites.]

English Nature have set up a Veteran Trees Initiative which carries out promotional, demonstration and advisory work. They have published a leaflet and poster and will soon publish a management handbook and advice on legal aspects of veteran trees.

In Scotland, veteran trees have featured in the seminar at Battleby organised by the Scottish Woodland History Discussion Group and published in the book 'Scottish Woodland History' edited by Prof Chris Smout. SWHDG are planning to take the subject further in a seminar on 28 August, again at Battleby. This event, which is likely to be supported by FAS and SNH, will aim to raise awareness of veteran trees and promote better management. A leaflet will be produced, and perhaps later a series of regional gazeteers of outstanding trees for the public to visit.

Borders Forest Trust are looking into the feasibility of an inventory of veteran trees in their region and will present initial results at that seminar.

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Veteran trees in Scotland can be found in 6 main situations:

1. Individuals - often named and famous, with a history, in churchyards, village centres, castles etc.
2. Parkland trees and those in designed landscapes of the 18th and 19th C
3. Lowland Wood Pasture - often in what remains of medieval deer and cattle parks, e.g. Cadzow, Lochwood.
4. Boundary trees of roadside, hedgerow, or woodbank, often pollarded.
5. Coppice stools and occasional old standard trees within ancient woodland itself.

6. Upland Wood Pasture - very old trees in unenclosed heavily grazed descendants of much earlier native woodland.

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Although all veteran trees are fun to observe and discover, it is the latter group which interests me most. They seem to represent an important remnant of genuinely native woodland, predating the more extensive oak coppices which were mainly enclosed and intensively managed in the 18/19 centuries. Upland wood-pasture can contain trees of over 300 years age in alder, birch, hazel, rowan, ash, and oak, and more rarely elm, aspen, gean etc.

Trees in these situations are invariably stunted in height by exposure and often by deliberate pollarding, thus prolonging their lives. Some pinewood remnants could also be considered a type of pasture woodland. I don't know of any precise definitions, but I distinguish between open grazed woodland where trees originated in a high forest canopy, and genuine wood pasture where trees have been grazed more or less all their lives. Surviving veteran trees will have endured the entire Scottish hill sheep ranching period. Many actually began their lives in the earlier period of summer hill cattle grazing close to the shielings.

It is possible that some upland wood pastures may have been grazed thus, in a sustainable manner, for thousands rather than hundreds of years. This hypothesis of extensive and long-term pastoral rather than woodland land-use suggests interesting new scenarios for Scottish rural history. It points to the need for much more research in both field and archive to help understand the field evidence better.

As I learn to recognise such sites, I begin to realise how extensive they may once have been. One can recognise their signs within sizeable areas of currently seminatural woodland, and no doubt large areas were converted to plantation, but they were mainly overgrazed into the treeless hill pasture that we are now so familiar with. Indeed, if this process had been complete, we would only be able to guess at their previous existence. But there are fascinating remnants out there, often right up to the current tree line, which demand a more serious appreciation of both their historical and future place in the landscape.

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**Factors Involved in the Distribution of Galls on Juniper.**

Philip F. Entwistle, Rhivra, Spinningdale, Sutherland, IV24 3AD.

In the British Isles *Juniperus communis* supports galls caused by organisms as taxonomically widely separated as insects, mites and fungi; there are probably about seven separate gall types in all. Not enough is known about the distribution of these galls (or, indeed, of the rest of the associated fauna (Bland et al., 1997) and flora of juniper) either in the sense of conventional biological survey data or in terms of juniper habitat variation or in relation to altitude. As it occurs over a remarkably extended ecological and vertical range, juniper is an especially valuable plant on which to study the detailed relationships of dependent organisms.

In northern Scotland (i.e., north of the Clyde/Forth valley system) galling of juniper appears to be restricted to two fungal species and two gall midges.

The teleutospore stage of the rust fungus *Gymnosporangium clavariiforme* causes spindle-shaped swellings, up to 30 cms or more long, on fairly well developed stems. In March and April these are vividly covered by masses of small (about 5-10 x 2 mm) lemon yellow to orange bodies, the teleutospore columns: affected stems can often be recognised at some distance. The galling is persistent and the fungus sporulates on precisely the same galls over many years. Affected stems remain foliated. The spores are thought to be insect-dispersed and give rise to very distinctive elipsoidal galls (the aecial stage) on the twigs and developing fruits of hawthorn, *Crataegus monogyna*: the cycle is completed when aecidiospores infect juniper. It seems that survival of *G. clavariiforme* depends on a rather close proximity of juniper to hawthorn, but this is by no means clear.

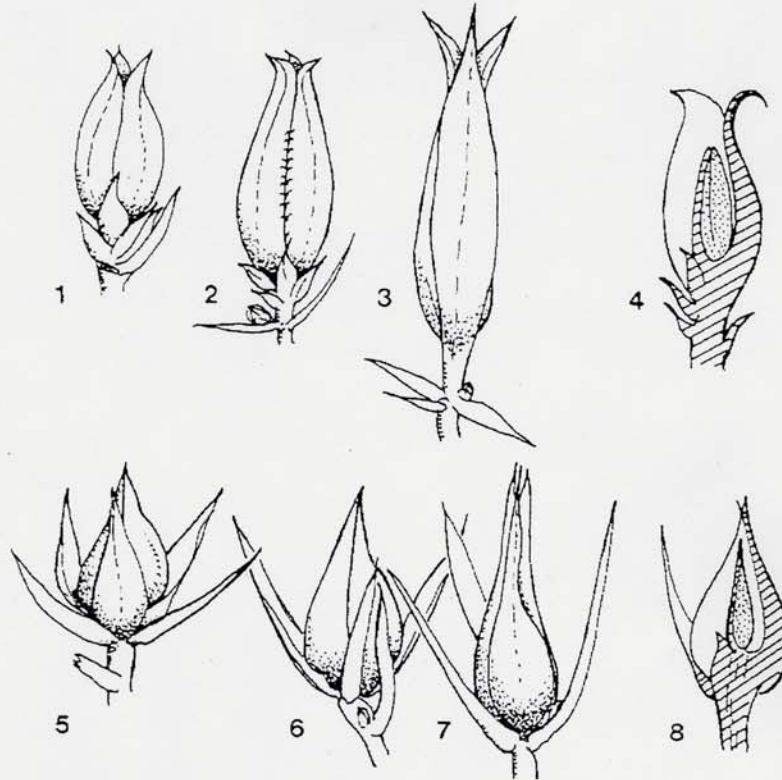
A less obvious fungal galling of juniper is caused by *Gymnosporangium cornutum* which may appear as twig thickening but more commonly simply erupts as a brown teleospore mass (fusiform, upraised 'blobs' 1-3 mm long) on needles. However, its aecial phase occurs in very familiar galls on rowan, *Sorbus aucuparia*, which appear as yellowish pustules on the upper surface of leaves with several spectacular curved horns protruding from the lower surface. The degree of proximity of rowan to juniper necessary for survival of this fungal cycle appears to be unknown though it seems highly amenable to study.

The mite (*Trisetacus quadrisetus*) gall is an enlargement of terminal buds ('berry' distortion is also possible), rather like big bud of blackcurrant but less tidy. I have not seen it north of the Lake District but as there is a single record for lowland Scotland one should be alert to the possibility of its presence further north.

The two dipterous galls positively known for Scotland extend only as far south as northern England (Ward, 1977). In view of this distribution their presence through to southern Europe is surprising. They are caused by gall midges (Diptera: Cecidomyiidae) laying eggs on new terminal shoots in May/June and the larvae seeking out and burrowing into a bud where they stay without external trace until the following spring when the gall rapidly develops. The adult fly emerges in the following year so that full development takes 24 months but is spread between three years. A fascinating aspect of this life cycle is that at any one time the population may exist as odd year (eggs laid in odd years with adults emerging in the next odd year) and even year phases. How, if at all, do these phases interact genetically? In the only other known instance of such a gall midge life cycle (*Taxomyia taxi* on yew, *Taxus baccata*) Margaret Redfern (1975) demonstrated the existence of a one year developmental phase which, though of intermittent and also quantitatively very variable expression, clearly permits gene flow between odd and even year phases. Studies are ongoing to determine if, or not, the same system operates with the juniper gall midges but as yet there is only tantalising but not definite evidence!

These galls are caused by *Oligotrophus juniperinus* and *Oligotrophus panteli* and their different morphologies are shown in the figure. There is some variability in gall form, especially in *O. juniperinus* where the extent of reflexing of the modified outer needles can be confusing. *O. panteli* may vary in squatness but doubt can usually be resolved by inspection of the inner trio of

needles (forming the developmental cell of the gall midge): these are rather truncate in *O. juniperinus* but distinctly acuminate in *O. panteli* (see Entwistle, 1995 and 1996).



Galls of *Oligotrophus* species on *Juniperus communis*. The gall is composed of two whorls each of three modified needles: the apical whorl encloses the larval chamber and is enveloped by the larger, protective, lower whorl. (A needle whorl is often referred to as a verticil). The figures indicate something of the range of variation in gall form commonly encountered.

1-4, *O. juniperinus*. 5-8, *O. panteli*. Figures 4 and 8 show galls in longitudinal section in which the larval cells are stippled. Note the truncate apex to the cell in *O. juniperinus* and the acuminate apex in *O. panteli*. Average gall length is about 10mm.

Speaking generally plant gall formation, by whatever causal agent, is almost certainly genetically controlled through the agent coding for, or otherwise influencing, plant growth factors. Some plant galls, e.g. wound-tumour galls caused by *Agrobacterium tumefaciens*, show little structural organisation and are merely an amorphous proliferation of host plant cells. Others, however, are highly structured, e.g. some of the oak galls, suggesting that control of plant growth by the causal agent is both complex and precise. The galls of the juniper *Oligotrophus* species mentioned here are also quite complex but the discovery by Ian Evans of specimens apparently intermediate between *O. juniperinus* or *O. panteli* suggests either hybridisation or that juniper itself can have some influence on gall morphogenesis albeit perhaps only at the level of minor modification. That juniper is genetically very variable and that it can grow in a wide range of ecological situations

may well offer an excellent opportunity to study the influence of host plant and environment on gall morphology and development. Such a study is contemplated but some essential information may as yet not be available. This revolves around the question of how it is possible to characterise the various juniper forms. Clearly there are morphological grounds allowing recognition of the subspecies *J. c. communis* and *J. c. alpina* (= *nana*, *sibirica*) but by what characteristics, for instance, can one clearly identify the form referred to by McVean (1984) as occurring on north-western 'quartzites and other erosion pavements'? To facilitate field studies ideally morphologic/morphometric systems would be available though forms could be characterised by DNA profiling and probably, as in many other conifers, through terpene taxonomy.

Both *Oligotrophus* galls have the capacity to occur from sea level to around 1000 metres so that it is interesting that *O. panteli* appears to be most frequent higher up and, conversely, *O. juniperinus* seems to occur at greater densities lower down. What can be the reasons for this? There is a complex of five insect parasite species (mostly chalcidoides) shared between *O. juniperinus* and *O. panteli* and it is interesting to speculate that interaction of the two host species with parasite altitude related preferences may be involved. But, in addition, there is some suggestion that *O. panteli* adult emergence may be geared to respond very rapidly to the advent of favourable climatic intervals (good weather!) which, if true, would permit exploitation of higher zones. Incidentally, the evolution of population splitting between odd and even years may be explained as a strategy to enhance the possibility of survival in extreme environments where, in any one summer, it may or may not be possible for the extremely frail and short-lived adults to mate successfully.

Whatever the reasons, altitudinal richness in the juniper gall community requires further study. In the instance of the two associated *Gymnosporangium* species, a factor determining altitudinal range may be the tolerance to montane environments of the *Sorbus* and *Crataegus* aecial hosts.

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