

**MONTANE
SCRUB
ACTION
GROUP**



Scrubbers' Bulletin 7



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

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We thank Adam Powell for his contributions to the group activities over recent years, and welcome Mick Drury as the new member representing Trees for Life.

Welcome to issue number 7 of the Scrubber's Bulletin, compiled by David Mardon, The National Trust for Scotland, Lynedoch, Main Street, Killin, FK21 8UW, dmardon@nts.org.uk

We are most grateful to the authors for their contributions to this issue: the biggest issue yet and the first with a report of progress in England. The range of active projects reported here is a most encouraging development. Earlier issues of the Bulletin may be read at www.highlandbirchwoods.co.uk

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Montane scrub and treeline woodland restoration at Ben Lawers NNR: a progress report to 2007

David Mardon, the National Trust for Scotland

The stimulus for this programme was a series of observations, from 1983, of well-established montane willow and juniper plants falling from their cliff-ledge refuges, to their demise. The observations suggested the possibility of a long-term decline in these relict populations, further indicated by a lack of evidence of regeneration for most of the species concerned. After consideration of the issues, and the management objectives for the NNR (Mardon, 1990), a series of practical measures was begun in 1987 to test ideas and proceed in steps of increasing scale and complexity, based on the experience acquired. Reports of earlier stages of the programme were published (Mardon 1997, 2003).

Trials with small, seasonally-operated fenced exclosures established at Creag an Lochain in 1987 showed that a dramatic regeneration of tall herbs could be achieved within 6 years, adjacent to the cliffs, but developing more slowly at greater distances. However, browsing in winter was sufficient to prevent significant growth of trees and shrubs. Meanwhile, progress was being made with two permanently-fenced exclosures on the Ben Lawers range, built in 1989 & 1990, where scrub and submontane woodland was re-established by planting.

However, grazing rights limited these areas, to a total of 30ha, 5 and 25 respectively. Planting in both these areas was virtually complete by 1998, resulting in successful establishment of trees and shrubs of eight species, now undergoing ongoing development and production of seeds. Details of the montane willow scrub component are given by Mardon (2003), including the rationale based on a working hypothesis on the condition of relict willow populations. This has subsequently had partial corroboration, and no refutation, by the Scottish Montane Willow Research Group (2005), (reported in Scrubbers' bulletin No 6).



Downy willow scrub established by planting, with wood cranesbill

The final and by far the largest phase of the programme was established in the years 1998-2000, as the Tarmachan Habitat Restoration and Improvement Project (THRIP), on the Meall nan Tarmachan section of the National Nature Reserve, land acquired by the Trust in 1996. Brief reports of the planning and establishment phases were given in Scrubbers' Bulletins 1 & 3. Of the three large exclosures established there, two are adjacent to the head dyke (which traverses the hillside at altitudes of 300-400m) and are now developing submontane woodland and scrub, after planting. The scrub referred to here is *Salix aurita* and *Myrica gale*, of which only the eared willow has been planted, although some plants were already present but heavily browsed.

The largest exclosure spans the altitude range 520-920 metres, and covers an area of about 190 ha. It thus includes the theoretical treeline, and vestiges of herb-rich birchwood on the cliff ledges indicate that it may be floristically the most diverse in the Highlands (Raven & Walters, 1956). The whole of the complex crag system Creag an Lochain is included, with areas of surrounding, less steep ground. The site is subject to the dynamic processes characteristic of mountain cliffs and slopes: rock falls, landslip, frost heave and solifluction, attributes that we believe will facilitate change, including regeneration,

especially of willows. However, these processes also wreck any fences in their way (Mardon, 2002), so the route of the fence was chosen to minimise the risk and has been largely successful in doing so.



Creag an Lochain, entirely enclosed in 2000 for restoration of treeline woodland, montane scrub and tall herbs.

The site includes the biggest concentration of native trees on the NNR, especially birch, (excluding that in the Morenish Burn gorge, below 400m altitude), all on cliff ledges. It is also probably the best site in Scotland for mountain willow, *Salix arbuscula* L., which grows in large numbers both on the cliff and in the surrounding sward. Its apparent tolerance of browsing is thought to be the result of its predominantly procumbent habit (Mardon, 2003): lateral growth survives while upright shoots are destroyed. Many

plants accumulate such upright growth when protected. Other willow species, downy willow, *S. lapponum* and dark-leaved willow, *S. myrsinifolia* survived in much smaller numbers on cliff faces, while eared willow was also present in small numbers, some occurring in the sward but very heavily browsed to stump-like, procumbent form. These three species have been planted to create seed-producing populations that might be viable in the future. The site was selected for management to overcome the problems of small scale that might apply to previous exclosures (e.g. seeds may disperse outwith the fences, in areas that are currently heavily grazed), and to exploit the tendency to landslips that create the bare ground needed for seedling establishment.

Planting to date, for the whole exclosure, has included the following species and numbers: downy willow 24,622; dark-leaved willow 7,930; eared willow 4,870; woolly willow 60; goat willow 46; juniper 1,290; birch 6,800; alder 816; hazel 150; rowan 10. Rowan has regenerated quite well in our older exclosures, without planting. Work is now concentrating on the woolly willow, *Salix lanata* and juniper. Survival rates are not known, but losses have resulted from vole predation and landslips. Some regeneration in landslip areas has been observed.



Willows and globeflower within the Creag an Lochain exclosure, 2007

The rate of growth on many of the willows, especially dark-leaved, is impressive, with apical shoots achieving annual increments of up to 40cm. Planting of downy willow has concentrated on the upper levels of the site, with, as expected, lower growth rates. The regeneration of tall herbs is also impressive, with a wide range of species progressively increasing over considerable areas. Some areas have maintained the pre-existing dominance by robust grasses such as tufted hair grass, *Deschampsia cespitosa*.

The project has received some favourable reporting by conservationists (e.g. Scott, 2000, 2005), but has also been criticised for the intrusive impact of the fencing on the landscape, eroding the wild land appeal of the area (D. Jarman, personal communication). We think the need to find ways of conserving the habitats and species to maintain the diversity of the reserve for the future was justification for the use of fencing, in spite of the admitted disadvantages, but some will inevitably disagree with these priorities. The dilemma of fencing and the question of its longevity in the uncertain future of current land use, and the long timescale needed for such projects, represent the most difficult issues for montane scrub conservation. The lessons learned at Ben Lawers are available to other conservationists who may consider similar projects (Mardon 2002, 2007; Webb 2008). We hope that the results of the projects will be widely used to demonstrate the potential of conservation of treeline vegetation by control of herbivory and other interventions if necessary; one cannot fail to be impressed by the results already achieved at Ben Lawers NNR. Ultimate success may follow in time.

Acknowledgement

I am grateful to my NTS colleagues for continuing support for this project. Since 1998, the practical management has depended on the full-time dedication of Andrew Warwick.

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White Coomb's Willows

Dan Watson, the National Trust for Scotland

The Moffat Hills are the most important area in southern Scotland for montane plants, and the crags on White Coomb hold a very important population of willows. The main species is *Salix lapponum*, the only other sites south of the Highlands being the Merrick in the Galloway Hills and Helvellyn in Cumbria. Other species include *S. myrsinifolia*, *S. herbacea* and *S. myrsinites*, the latter just hanging on. Rod Corner also recently recorded *S. aurita x lapponum* at its most southerly known location.



Most of these grow in locations accessible to sheep and feral goats, so that the majority of shrubs have adopted a prostrate growth form, in response to many years of browsing. Only three downy willows grow in places where they can attain full height, and these are vulnerable due to the possibility of landslips. Catkins are uncommon, and it was assumed that without intervention the willows would gradually die out.

To this end, in 2005 the National Trust for Scotland produced an Options Paper, which went out for consultation to a wide range of stakeholders and interested parties. This paper was produced as it was recognised that the property was popular with hill-walkers, had important cultural features, was part of a viable hill-sheep farm and of course, had a population of feral goats which were liked by many in the local community. In other words, willows were not the only interests here and we were keen to ensure that people understood the key issues relating to the willows whilst



being reassured that NTS was going to try and consider all other interests in finding a way forward to conserve the willows. From feedback, many appreciated our openness on this issue. The options included doing nothing, a range of enclosure options and a reduction in grazing levels. The latter would be hard to achieve as the NTS does not hold the grazing rights over this area.

In 2006 it was decided to build a small experimental enclosure around the main crag on White Coomb. The enclosure is approximately one hectare in area and was funded by NTS and SNH. This proved to be a difficult undertaking, as it was on very steep, craggy and flushed ground. The work was carried out by Trust rangers and volunteers, and was eventually finished in summer 2007. In addition to this, in partnership with Borders Forest Trust, a small number of cuttings of *S. lapponum* have been taken. These are currently in the care of the RBGE, but a small nursery will be established at Carrifran to supply willows for planting out there at suitable sites between about 500m and 750m.

Within the enclosure most of the willows have been tagged, and each year monitoring is carried out to determine the level of browsing and the amount of catkin production. It will be interesting to see how these change now large herbivores have been excluded. In addition to this, new monitoring was started this year. This includes five fixed transects which traverse the enclosure, three of which extend beyond the fence-line as a control. Two fixed quadrats have been established, one outwith the enclosure on a similar area of ground. The purpose of this is to see how the growth of other species changes in response to grazing being removed, as we are anticipating an increase in the number of tall herbs. Next year's monitoring results are eagerly awaited!



The main willow crag showing approximate outline of enclosure

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Andrew Warwick
working on fence,
April 2007



Factors Influencing the Effective Regeneration of *Salix myrsinites* on Meall Mor and Recommendations for Management.

A BSc Honours Dissertation by Jon Watkins.

During the academic year of 2006/2007, I undertook my dissertation as part of my BSc Honours in Environment and Heritage studies through the UHI Millennium Institute, based at Lochaber College. I intended to find an area of research that would not only allow me to complete my degree, but would also be of benefit to others after I had finished studying. Having spent the summer of 2006 volunteering with The National Trust for Scotland in Glencoe, I became aware of the lack of information that was available with regard to the rare *Salix myrsinites* (Whortle leaved willow) on its property. I therefore decided to provide them with some up to date research on these rare plants and use this as the basis of my dissertation.



After an initial site visit to the eastern slopes of Meall Mor, just behind the NTS visitor centre in Glencoe, I realised that surveying of the plants would be a difficult prospect due to the steepness of the slope and the unstable nature of the base rich cliffs. During this visit I also observed 2 stags within the fenced enclosure which had previously been erected to protect the montane willow scrub from being grazed.

This visit was followed by an extensive literature review, which started with an introduction to montane scrub and in particular willow scrub and *Salix myrsinites*. It covered the main factors that limit populations of willow scrub, such as herbivory, the unstable landscape these plants grow in, the genetic diversity and taxonomy, mycology and climate change. The management issues were then reviewed and evaluated, which included legislation, herbivory, fencing, grazing reduction, scarification, planting and climate change. A variety of different monitoring methods were looked at and the review concluded with a look at Meall Mor and the previous research that had been done at this site prior to my study.

The literature review led me to decide on the following three objectives for the rest of my study:

1. Create an accurate baseline record of the numbers and health of *Salix myrsinites* plants on Meall Mor.
2. Plot grid references on a GIS with hyperlinks to photographs to make repeated monitoring easier.
3. Recommend management methods to improve the health and the size of the population.

I undertook three days of surveying on Meall Mor, using a GPS, a digital dictaphone and a digital camera. This included a day recording the exact location and condition of the fence, a day recording and measuring the plants outside the enclosure on the northern cliffs, and a final day measuring and recording the plants within the fenced enclosure. All the data collected was recorded in a database which was used to create GIS maps which could show the exact location of each plant, its size in 3 dimensions and how severe any grazing damage was. These maps also showed the location of the fenced enclosure and the areas of damage where grazers could enter or exit the area.

The results showed that there was significant damage to the fence, evidence of grazing damage to the plants which could be accessed by sheep or deer, very limited regeneration and fungus on many leaves of some plants. The implications of these findings were that the fence needs repairing and that much more regular monitoring is necessary in order to create the most ideal management plan to protect and hopefully regenerate the *Salix myrsinites* on Meall Mor. This led to the following suggestions being put forward:

- Fence needs repairing
 - Should be monitored regularly, e.g. monthly, with necessary repairs carried out as soon as possible after discovery
- More frequent plant monitoring is needed
 - During flowering season (Summer)
 - Annually after baseline survey (Autumn)
 - Monitor winter landscape damage after snow melt (Spring)
- Results will enable a decision for future management
 - Current suggestions:
 - Install a deer fence
 - Reduce grazers in surrounding area
 - Set up a planting scheme within enclosure
 - Scarification on land above highest cliffs within enclosure
 - All of the above
- Continue regular monitoring of fence and plants after any of the above suggestions have been implemented in order to record any success.

With regard to the objectives that I initially set, I successfully created an accurate record of the fenced enclosure and the montane willow on Meall Mor, which will enable future monitoring to be done more efficiently and comparison of results to be done with greater ease. I recommended a selection of management methods which would enable the health and size of the population to be increased within various budget limitations. With regard to the plotting results on to GIS maps there was some success, but several problems were identified. Due to the steepness of the slope and cliff faces where Whortle leaved willow prefers to grow, GPS references were often recorded with up to 15 metres deviance. This may mean that some plants will be difficult to relocate. It was for this reason that in-depth

photographic monitoring was also used. This involved photographing individual plants, then again within their immediate context and then a third time within the context of the entire cliff face. These were then digitally labelled so that individual plants can clearly be seen along with their locality and relation to neighbouring plants.

Other difficulties that were encountered were the accessibility of the site and the high risk factor that was encountered while trying to reach and measure certain plants. Adding to the difficulties with the GPS recording, which inevitably leads to some inaccuracy with the GIS maps, there were also time and access restriction to this software, which restricted the opportunity to edit some of the hyperlinks on the maps and include the labelled photographs. There were also considerable time constraints and unfortunately due to the delay of some experts in responding to requests for information, the latest research into management of montane scrub plants was not referred to within the study.

If I were to do this study again with unlimited time and resources I would do the following things differently:

- Time of year of surveying
 - This would be done during the time that plants are producing seeds – June/July
- More time
 - Would do multiple surveys and compare results to show changes over time
- Monitor entire enclosure and surrounding cliffs
 - Some plants may have been missed as the surveying only covered the cliffs and the immediate ground around them, not the entire hillside
- Rearrange the layout of the results section and GIS maps
 - Show context photographs first, followed by individual plants
 - Maps should show location of context photos

After submitting my dissertation to the UHI, I also sent copies to many of the people who helped me by providing their expertise and resources. This included the Fort William SNH office and the NTS rangers at Glencoe. Together these organisations have visited the site and started to act on my recommendations.

For more information on this project or a copy, please contact Jon Watkins – jon@cullis.co.uk.

Monitoring Montane willows

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Introduction

Monitoring montane willows is not easy. The reasons for this can be summarised as follows:

1. There is often a long walk in which reduces the time available.
2. Good weather is required.
3. There is a perceived difficulty in identification.
4. The season is relatively short between snow melt /leaf emergence and the start of the stalking season.
5. Previous records relied on people being able to give accurate grid refs (at best accurate to 100m). These were often only intended for use on 10km dot maps. Numbers of plants given were not necessarily exhaustive counts, just what was seen in the course of other botanising.
6. Previous photos were often taken as a sort of “trophy” and not designed for relocation purposes.
7. When the work is sponsored the time allowed is often inadequate for the work to be done.
8. As montane willows are often on crags the three dimensional nature of the ground is very important, i.e. a plant can be both behind another one and below it, and only visible from certain vantage points.
9. Access to such vantage points is often both difficult and seriously hazardous.

This article attempts to deal with some of these problems using the experience gained during survey work on *Salix lanata*. This was carried out as a voluntary contribution to the work of the *Salix lanata* Biodiversity Action Plan Steering Group.

There has been a great change recently in what is available to us to make surveying easier and more accurate. My first attempts were in 1994 when I attempted to survey all the *Salix lanata* in Scotland in one season (impossible in retrospect even if some was delegated – but funding was only annual). In those days I took 35mm slides, projected them on to a sheet of paper and drew round the significant features and marked the bushes on the silhouette produced (I had a photographer’s inhibition to draw on an actual print!). Grid references were judged by eye on 1:50 000 or 1:25 000 maps and altitudes were done by altimeter.

In this 1994 survey two colonies were delegated to others. One group produced an excellent report (Watson and Boddington, 1994), although they had no time to check out two crags, but reported that others had found no *Salix lanata* on them in 1989. One of these crags has later proved to have about 25 bushes. The other group recorded 6 *Salix lanata* in their site, yet this corrie later proved to have 50 bushes in 5 well spaced colonies, (with a possible sixth colony that was only visible across the corrie at a distance such that *lanata* and *lapponum* could not be distinguished).

Now that we have digital photography and good GPS, life has become much easier and potentially more accurate. Two-way radios are now more affordable and I have found them to be another very useful tool.

Method

The method that has evolved is as follows:

(1) A first visit is made in good weather for the base line photographs of the corrie. This should include all crags, even if one doesn't know the species is there. Locations of colonies (not bushes) can be recorded on prints of these first photos, and then digitised.

The ability to "photomerge" for panoramic views to locate widely separated colonies is another useful aid. On this visit as many crags should be looked at as possible, using binoculars (and maybe telescope), looking up crags as well as down crags.

(2) The area where willows are found is divided into numbered colonies or crags and then photographs are taken of each colony/ crag. It is important that these photographs are of maximum quality – it affects the accuracy of later digital circling of the bushes on the computer. It is also amazing what one can see when zooming into a good photograph on the computer. (I have used a Nikon Coolpix 8-megapixel, 35 -350mm zoom).

(3) The second and subsequent visits require a companion and prints of the photographs (preferably at A4 – a landscape "weatherwriter" is particularly useful). The general method is for one person (the "finder") to go as close to the crags or even on them, and with a stick point to each bush in turn which the second person (the "recorder") then marks on the print, numbering the bushes as they go. While sometimes it is possible to shout, this is where two way radios are so useful. One crag we recorded was so vast that by the time I had got to my place as "finder", my "recorder" could not locate me. The next visit I wore a fluorescent cycling tabard!

(4) When both are happy that the bush has been located on the print, the "finder" takes a portrait photograph (sometimes <4 bushes). The best way I have found to record the number was to use a white plastic triangle bulldog clipped to a stick, with the numbers written on with a permanent felt tip pen and then wiped off with a rag and meths. Otherwise it is very easy to lose touch of numbers in a series of portraits in the camera.

(5) For each bush a GPS grid reference & altitude is recorded, and the accuracy level given also recorded, as it can vary from 3 to 33m! I think that it is also useful to record with an altimeter if available – subsequent surveyors can see how different methods give different results and judge their usefulness.

(6) The next thing to record is a description of where the plant is, e.g. bush number 12 is "2m N of bush 11" or "below the triangular rock". Beware recording "left" or "right" unless it is clear where viewed from.

(7) There are difficult decisions as to what else to record. Obviously the sex of bush is important, though there may be a bias against male bushes if one delays surveying too late. I have recorded length X breadth for each bush rather than height, as this can be difficult to judge for a bush leaning over a cliff. However, there should be no inhibitions about recording extra data. It can always be deleted! I have found myself starting to record notes about condition, e.g. "straggly" meaning bare branches with leaves only near the end. Catkins with seed should definitely be recorded. Incidentally, flower buds can be dissected (by about September) to tell the sex of a bush, although one is reluctant to do this if there are few buds.



Viewed from NO 20433 80025 8m accuracy @ 762m alt

photo DSCN0064

Glen Callater *Salix lanata* colony 5, nos 43-55



'Portrait' photo, Glen Callater



Glas Tuleachan. Heather McHaffie as 'recorder', Richard Marriott as 'finder'

Colony 7 Steep wet rocks beside burn and inaccessible to browsing, but deer seen on surrounding grassy areas. A small group of *Salix lanata* with one isolated plant growing at the lowest altitude in the Corrie at the confluence of two burns.

No.	Sex	Altitude by altimeter in metres	Description (approx length x width)	Map ref by GPS	Accuracy of GPS (m)	Altitude by GPS (m)
93		665	50cm x 40cm	NO 20504 80239	8	680
94		670	2 bits: 5cm x 20cm 20cm x 30cm the second bit below the first which is below a large rock	NO 20504 80225	8	683
95		670	3 bits: each of 2/3 leaves separated, below 94	NO 20504 80225	8	683
96	♀	670	50cm x 40cm, to the right of 95 from opposite bank of burn. §	NO 20504 80225	8	683

§ 1 catkin, sawfly damage 26/7/05

Discussion

No method of recording is infallible and I feel strongly that if one records GPS grid ref, altitude, location photo and location description, then the combination should make up for deficiencies in any single parameter, and make relocation more likely.

While GPS unit readings are a vast improvement on previous methods such as estimating 6 figure grid refs from a 1: 50 000 Ordnance Survey map, we must not exaggerate their accuracy. In an interesting study of the rare English endemic *Sorbus bristolensis* in the Avon Gorge, Houston et al (2008) looked at the reliability of GPS readings using similar Garmin Etrex to the present survey. They recorded the position of trees with an accuracy averaging 8.6m (range \pm 6-12m). Readings for the same trees, made on different days by different Garmin units (n = 12, mean reported accuracy \pm 15.4m), varied by an average of 20m east-west and 17m north-south. They concluded that while GPS units are a great improvement on traditional methods of recording position "Basic GPS readings of this level of accuracy are unlikely to be of significant use for monitoring individual trees in clustered populations, where other means of localising and identification may also be needed."

My hope is that recording along the lines described above should make it possible not only to record a loss (or gain) of say, 5 bushes, but to say which bushes they were. Otherwise if two surveyors 5 years apart record a discrepancy in numbers what does this mean? I would suggest it may mean nothing. The first survey has to be thorough and time allowed for it. Subsequent surveys should be a lot quicker using location photos and other data.

Estimating the time to allow is not easy, especially if the survey is being commissioned and being paid for according to the time allowed. If the only previous record for a site is of 25

bushes and one or two six figure grid references given, for example, then how much time should it take?

In one case I know of, the records said there were 30 bushes in this corrie. I had not done this site in 1994, and on a quick recce in 1997 again recorded 30 bushes – by going to the given grid ref. and looking down the crags. A recent commissioned survey also recorded 30 bushes. However, when I finally got round to doing a survey in 2005-6, I went on 7 occasions and took a companion on 5 of these. These 12 man days produced **125** bushes!

One of the problems in this corrie, as in some others, is that when walking below the upper cliffs one cannot see the lower crags; they blend into the background. It is an effort to walk down the corrie and up the other side to get a vantage point where one can see the whole face of the corrie. Even doing this and looking at all the places we thought likely, we still came across a small colony unexpectedly, down on the floor of the corrie beside the burn.

The method does not work so well in the two largest sites for *Salix lanata* where there can be an almost continuous cover for several square metres. However, there, one can adapt and take photographs and quantify in other ways, e.g. estimate the number of square metres. Sometimes one cannot discriminate individual plants and I have simply used the word “clumps” to indicate this. Photographs with rocks in are very useful, but one has to be aware of change. On one crag I was telling to my “recorder” over the radio that a bush was “beside the white hour glass-shaped rock in the photo”. From his vantage point below he was puzzled. The lower half of this significant rock had fallen off since the previous year when the photograph had been taken!

The purpose of all this monitoring is to record any changes that occur, and it requires reproducible results. It may not be possible to record every bush at some sites, but if some sub sites/colonies/crags can be done accurately we will be able to record any change in a convincing manner.

I should also say that with respect to the 12 man days referred to above, I was attempting to record the plant species in an imaginary 2mx2m square around each *Salix lanata* bush and this obviously increased the time taken. Taking a real quadrat would have proved impossible on many crags. It didn't qualify as a true NVC survey, but I hope that such accumulated data may provide guidance if restoration planting takes place. It would also be nice to think we could eventually produce the subdivisions of NVC W20 *Salix lapponum* –*Luzula sylvatica* scrub.

When I went to Coire Garbhlach in 1994, I recorded 30 bushes. A second surveyor in 2000 recorded 12. As the altitudes given didn't go as high as mine, I suspected that some were missed. However, when I returned in 2007, meaning to sort this out, I found that the way up on to part of the crags didn't look safe in the wet conditions – or maybe I was older and less inclined to take risks! Because it had been wet the leaves of the *Salix lanata* had lost their grey-green colour and it was not possible to do a binocular or telescope survey either.

I hope it goes without saying that the “finder” should only go where they feel safe and within their competence; a lot can be done with binoculars and telephoto lenses. The “recorder” may need warm clothing as it can be cold sitting in a north facing corrie, while the “finder” scrabbles about!

I do not claim the method described is infallible, or to be a perfect practitioner – I still haven't got portraits of all 125 bushes in the above example! I offer these ideas as an aid

to making best use of our time on survey work. Only when we have confidence with the numbers can we be sure of trends.

The final proof of such a survey is to go there with the final digitised version of the location photos and descriptions (preferably laminated or on waterproof paper) and then give them to another person and see if they can relocate the willows.

Conclusion

When monitoring montane willows it is important to decide if a survey is a baseline survey or a repeat of a well documented one. If the former, then it is vital to allow plenty of time for checking all crags and not just checking previous grid refs. Good weather is essential, especially for the initial photographs and telescope/ binocular work. A companion is also essential for recording location of bushes on photographs. The use of digital images, GPS and altimeter readings and location descriptions should allow a repeat survey to say where new bushes have grown or old ones have been lost. Only if this can be done can we be sure that a higher or lower count indicates a true change.

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Plans and progress for woolly willow recovery under SNH's Species Action Framework.

Chris Sydes, SNH

The woolly willow, *Salix lanata*, was proposed for the SAF not only because of its fragile status but because action for this species should benefit a habitat largely lost from Britain, montane willow scrub. In other parts of the world the scrub zone above the treeline supports a rich diversity of animals and plants. There are only about 2000 plants of woolly willow remaining in Scotland (see Table 1) and before remedial conservation work began, some of the populations were reduced to single plants.

The Species Action Framework plan attempts to turn the targets of the Biodiversity Action Plan (see Annex 1) into reality with two practical outcomes.

Outcome 1: To achieve suitable conditions for the re-establishment of self-sustaining sub-arctic willow scrub containing woolly willow at four mountain sites in Scotland by 2010. (Suitable conditions are defined as 1: a density of large herbivores sufficient to allow abundant flowering of palatable herbs; 2: the presence of willows as a seed stock; 3: both to be achieved on ground normally accessible to large herbivores where losses of willows to erosion and other catastrophes are at sustainable levels.)

Outcome 2: To urgently increase the size of all threatened, ie. small and isolated, populations ideally by creating the conditions appropriate for natural regeneration. If necessary, as a stop-gap measure, this will be achieved by planting native stock within fenced enclosures.

The 2nd outcome is the modest supplementation of the most threatened populations – a sticking plaster to buy time given that we cannot realistically achieve everything at once. We have defined small as less than 50 plants. The sites that fall into that category are Glas Tulaichean, Coire Garbhlach, Ben Lawers and Caenlochan (see Table 1). In reality we have reluctantly come to the conclusion that natural regeneration, although it can occur in the wild in Scotland, is too erratic to be relied on so planting will be carried out at all these sites.

This work was pioneered by Dave Mardon at Ben Lawers and is well advanced. Early planting was also carried out at Glas Tulaichean, in this case by RBGE and SNH. This site now needs a slightly more ambitious phase 2 using a small fenced enclosure. At Caenlochan, if the owner agrees, the approach will be to test the results of the considerable reductions in deer density by planting out unprotected saplings. Coire Gharblach is being dealt with under target 1.

Target 1 has a broader, more sustainable vision. Planting, with or without fencing, is no long-term solution to the survival of the woolly willow. At present the woolly willow steering group has identified that there is potential for recreating this habitat on three sites: Meall na Samhna; Coire Sharroch; and Coire Garbhlach. The aim is to re-establish the conditions that permit the willow to survive without assistance. Doing this will have the incidental effect of starting to re-create a habitat that is almost lost from Britain – the herb-rich willow scrub that elsewhere in the world is widespread above the tree-line. We aim to acknowledge that the woolly willow is part of this community by kick-starting the other willows by planting them at the same time as the woolly willow. Whether we will introduce some of the other lost plants such as alpine blue-sow-thistle *Cicerbita alpina* and whorled Solomon's seal *Polygonatum verticillatum* will probably depend on a shift in mainstream botanical conservation towards the use of such positive conservation techniques.

These plans were agreed by the Steering Group for the Biodiversity Action Plan, in response to the opportunity presented by the SNH Species Action Framework. The practical actions are being carried out by members of the group and their colleagues.

What has been achieved so far? Seed has been collected from some of the sites and seedlings are growing. However we need to collect more seed, including the other species of willow, and some sites, e.g. Coire Gharblach, have not been covered at all. In an attempt to be uncontroversial we are aiming to plant out only genotypes derived from the site, although there is an argument for mixing genotypes where populations have fallen to very low numbers.

SNH Area staff will lead the negotiation with landowners and managers to achieve agreement to this remedial management on private land. Only Coire Sharroch is on a nature reserve with greater freedom of action. SNH staff were planning to approach owners on the other sites as part of wider packages of improvements to the conservation – all are designated as SSSI or SAC – under SNH's Natural Care scheme. However, this has now been swept away by reforms being introduced in Scotland. In future land managers will apply for funding from a common pot which will cover agriculture, business development, forestry and biodiversity improvements. The outline of this new scheme is being agreed between the various government bodies involved. It is too early to be at all sure whether or not it will provide the encouragement necessary for land managers to

agree to this programme but encouragingly species listed on SAF are criteria for acceptance of schemes under the SRDP.

There is also the possibility that interested landowners will permit these improvements to the conservation of their sites to take place without government incentives. In this respect we are fortunate that this local change in management is not just about the woolly willow but about a suite of plants and, indeed, a lost habitat which we know is rich in animal diversity. I regret its loss every time I climb a Scottish mountain.

Annex 1 Targets of the Biodiversity Action Plan for the woolly willow.

T1: Increase population size to over 2000 plants by 2010.

T2: Ensure that populations are stable or increasing at all sites by 2015.

T3: Increase the 'range' of the species by ensuring that populations at four sites can expand by 2015.

Table 1: Remaining populations of woolly willow in the UK

Site	Current estimate	Added plants	SSSI	SAC	Outcome
Ben Lawers	35	34*	Y	Y	2
Meall nan Tarmachan	61	60*	Y	Y	
Meall na Samhna	102		Y	Y	1
Glas Tulaichean	7	30	Y		2
Coire Kander	50		Y		
Glen Callater	123		Y		
Caenlochan	38		Y	Y	2
Craigie Doubs	4				
Monega Hill	6		Y	Y	
Little Glas Maol	28		Y	Y	
Coire Sharroch	251		Y	Y	1
Corrie Fiagh	2		Y	Y	
Corrie Kilbo	2		Y	Y	
Craig Maud	4		Y	Y	
Coire Garbhlach	30		Y	Y	1/2
Tigh Mor na Seilge	106				
Sgurr nan Conbhairean	101				
Carn Ghluasaid	57				
Geall Charn (Coire Cheap)	982		Y	Y	
Scottish total	2091				
Dubious sites					
Coire a Bheinn,	0		Y	Y	
Coire Ardair	0		Y	Y	
Meall Ghaordie	0		Y	Y	
Coire Chais	0				
Ben Oss (Ben Lui)	0				
Yorkshire site		1			

* This is the number planted: the survival rate will be reduced, perhaps 30% . DKM.

Restoration of downy willow in England

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There is montane scrub in England!

In the Lake District we have the highest oak woodland in the UK (at 500m), abundant Juniper scrub, gill woodlands creeping up the fell sides and, on one site, a tiny population of downy willow.

Following inspiration and advice from David Mardon and other members of the Montane Scrub Action Group we have put in place a recovery programme and made our first tentative steps towards restoring the English downy willow population.

Downy willow (*Salix lapponum*) occurs in three of the eastern coves [corries] of Helvellyn, where it was first found by J. Backhouse in 1872. The site (an SSSI and SAC) holds the most significant populations of arctic alpines in England. No historical records are known to exist of the willow population size or its exact distribution and there is no evidence of the plant occurring on any other sites within England.

Derek Ratcliffe in the Lakeland New Naturalist (2002) describes the population as “about ten small bushes” whilst a 1997 survey found 14 bushes growing at 5 separate locations in the three coves.

Work started on Helvellyn in 2002 when management agreements that reduced grazing over the 7000Ha of the whole massif were secured by English Nature. These agreements, currently being renewed by Natural England, have had a huge positive impact on the

structure and richness of upland vegetation in a large part of the Lake District. In total they cover some 56,000 hectares (560km²) and have been individually tailored to reflect the type and condition of vegetation on the fellside and to fit in with the individual graziers involved.

In some locations, such as Helvellyn, active shepherding is undertaken to flush sheep away from grazing-sensitive vegetation such as tall herb ledges, arctic alpines and willow bushes.

The agreements have changed the outlook for the Helvellyn willows. The reduced stock numbers mean that any new recruits to the willow population are less likely to be grazed out by sheep and the agreements allow our future efforts to be directed more towards restoring upland woodland and rare plants.



Downy willow growing on an inaccessible ledge in the cliffs above Red Tarn, Helvellyn. This location is typical for the species in England: small ledges inaccessible to grazing stock.

Ledges vary between distinctly acidic and heathy ones (such as in this photograph) and more lime-rich and flushed ledges, more typical of downy willow sites in Ben Lawers or Glen Clova.

A re-survey and sex-profile of the Helvellyn Willows

The first steps were to locate the existing bushes and see whether they were capable of reproduction or whether material from Scotland would be needed to supplement the population. The outlook was not good Ratcliffe described the willows as all female and the locations are scattered across a mile of cliff making pollination unlikely.

We were aware of the RBGE willows research discussed on the MSAG visit to Glen Clova. In particular, the suggestion that large bushes could be many individual plants growing in close proximity (rather than clones or suckers from the same bush) excited me. Perhaps the Helvellyn population was bigger than we thought and a male bush was lurking undiscovered.

An inspiring trip to the Merrick, kindly hosted by Rob Soutar, showed me the difference between male and female catkins and also highlighted a slight temporal difference between male and female catkin ripening.



Male (left) and female downy willow catkins

Back on Helvellyn we looked at our willows and concluded that we had 22 plants. It was not possible to sex all of the plants but 8 or 9 were female, 1 to 3 were male and 3 showed androgynous catkins

This was fantastic news. We had both male and female plants and reproduction was therefore possible. Male bushes were only found in one location meaning that the populations in two of the coves were not currently viable.

We were confused when we found catkins with both male and female structures. This occurrence is known as androgyny. A query to Desmond Meikle confirmed that this does occur in willows but has not previously been described from this species. He also thought that the androgynous catkins could successfully function as reproductive organs as a *Salix cinerea* growing at Kew showing androgyny, was fertile and produced seed. Whether these androgynous catkins are self-compatible is a different question but it seems unlikely.



Androgynous catkin. Male and female structures are clearly visible

Restoring the Helvellyn population

During the visit in May 2006 a decision was made to take cuttings from 8 plants so that the catkins could fully develop and then be sexed. This method was not particularly effective in sexing plants as the catkins only continued to develop for a few days after the cuttings were taken. However all 8 cuttings are successfully rooted and have grown significantly. After advice from David Mardon we decided to keep these plants captive and take cuttings from them in future years to return to the site. In spring 2008 the plants are almost big enough to start this.

David convinced us that that propagation from seed is the only effective method in restoring the big population of mixed sex willows needed on site.

David and Andrew Warwick demonstrated their methodology for growing stock from seeds at Ben Lawers. It became apparent that an organic approach was not possible and a large order of fungicide and wine weevil control was secured. The recipe was carefully followed and within days of sowing the seed hundreds of seed leaves were emerging.

We now have 100 seedlings in root trainers growing on for planting in summer of 2008. The size of some of the seedlings has surprised me. They have grown from a tiny seed about 0.1mm across into a healthy seedling more than 6cms high in one growing season.



Helvellyn seedlings in late 2007

We shall be planting in 2008 but only in positions where there is some degree of shelter from grazing. We have very low grazing pressures but not zero. We are confident that we can find steep ground and flushed ledges which will be suitable for willows. This is a compromise as I think that the cove [corrie] floors are the ecological locations where the willows would thrive and expand freely. Perhaps they will do so in future years if grazing pressures are lower still.

Our aim on Helvellyn has to been to rescue the tiny population from extinction and I think that we have been successful in achieving this without bringing in material from elsewhere. Our objectives have now moved on to establishing a strong population on both the ledges and slopes of the mountain. This will require a population of many hundreds or thousands of plants that can regularly set seed and expand into new areas.



I am grateful for guidance and inspiration from the MSAG which has made a big difference to the future of the only English population of downy willow.

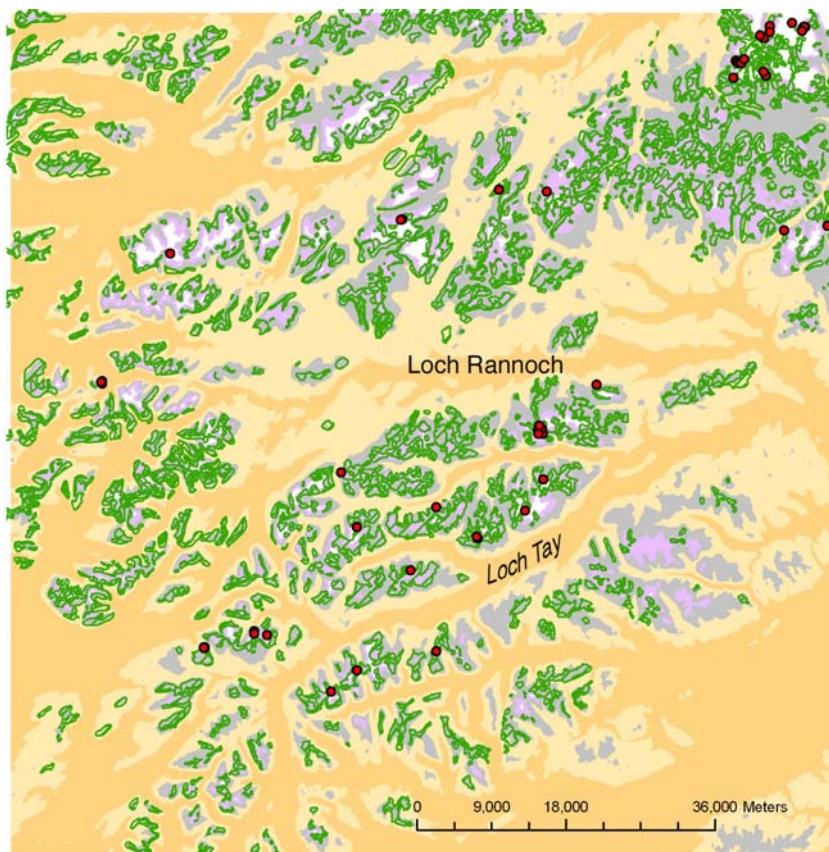
Where will Montane Scrub Grow?

A PhD research project by Diana Gilbert¹

Background:

Following centuries of human use of the uplands, montane scrub is rare and is of conservation concern. With the current changing climate there is a desire to establish robust, resilient populations. This requires a sound knowledge of the factors affecting their dynamics. Dwarf Birch (*Betula nana* L.), Whortle-leaved willow (*Salix myrsinites* L.) and Juniper (*Juniperus communis* L.) are being used in this research as representatives of key montane scrub vegetation types.

The Native Woodland Model (ref) predicts areas which are considered biophysically suitable for the growth of montane scrub []. The majority of current locations for montane scrub are known but their distribution only partially overlaps the appropriate areas in the model, as shown in this example of *Salix myrsinites* distribution [] and NWM willow scrub areas in OS square NN: Why is this?



To understand these differences between actual and predicted locations, we need more information about site conditions. These are currently incomplete and highly variable in the existing site information. The aim through examination of climatic and other datasets, manipulative experiments and new field survey is to identify and define parameters controlling the current distribution of the representative species in order to refine predictions of site suitability.

What factors characterise existing sites?

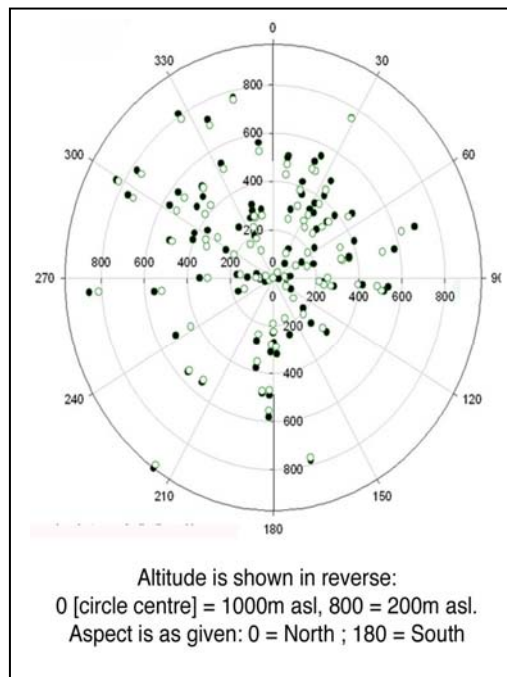
Existing information from the current distribution is being used to find the range of parameters existing sites. For example this polar graph sets out the distribution of *Salix myrsinites* site aspect according to altitude range. In addition to topographical information, national climatic, soil and land cover data are also being assessed.

How do site conditions differ between existing sites and predicted areas?

Three different datasets have been identified where:

- existing sites coincide with predicted,
- predictions do not currently have any scrub,
- existing sites were not predicted by the model.

New data on soil, herbivore use, land management, and vegetation cover will be collected both in the field and remotely (from Scottish datasets) for each dataset and compared - the results, informed by the results of the experiments below, will then be used to refine the prediction models for montane scrub.



Is origin important?

Two manipulative experiments have been set up, see below. The young plants, of all three species, used in these experiments have been successfully propagated from cuttings. In order to test the influence of origin, material was collected from east, central and western sites and cuttings were distributed evenly across the experiments. This work (and that of organisations such as NTS at Ben Lawers and Forest Research) has demonstrated that establishing young plants from cuttings and from seed for restoration work is a viable proposition.

Interactions with herbivore impacts - e.g. does browsing exacerbate wind effects?



Three sites on Meall Corranaich, Ben Lawers NNR, were selected for high, medium and low wind exposure. Paired single-species cages, one open to wind, the other sheltered (control), were set up at each site. Each houses 15 plants randomly treated with one of 5 combinations of browsing timing and intensity (plus controls). Tatter flags are being used to compare the wind at each site. Anemometers are being used to compare wind speeds inside the cages and to calibrate the tatter flag results with wind at the height of the plants.

Is snow lie critical?

Cages have been set up around the Cairngorm ski area in pairs, one cage in a snow bank created by the snow fences and the other in a more exposed location but on similar vegetation types. This first winter has demonstrated that the predictions on snow bank development have been successful and a number of cages have remained buried since the December snow fall.

The final outputs of this PhD research will aim to provide an indication of suitable areas on which to promote the expansion and establishment of montane scrub for use in strategic planning.



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Action for Mountain Woodlands Update

Billy Bodles

Since the last Scrubbers' Bulletin update announcing the successful bid for HLF funding, work on the AMWood project has started in earnest. We've been busy developing a project identity through the designing of a logo, project posters, leaflets and are in the process of building a project website for dissemination of the project to a wider audience. We are also ready to launch the first phase of the AMWood Montane scrub survey this will include postcard identification cards distributed to the general public through outdoor magazines, branch offices and outdoor shops. At each of the project sites work has continued to develop:

At the Glentool site in Dumfries and Galloway they've been forging ahead and have



carried out six montane scrub surveys involving a total of 33 man days of time of which 28 man days were from volunteers. The 4 most productive surveys have demonstrated hundreds of new records. It is heartening to report that completely new populations of aspen, Burnet rose (*Rosa pimpinifolia*), juniper, creeping willow and downy willow were found at high elevations and known populations of juniper found to be far more populace than originally thought. Many of the newly confirmed high elevation scrub sites were accompanied

by tall herbs. Rowan and eared willow were found extensively at about 500m-550m in what appears to be climatically restricted stature, confirming a natural tree line much lower than expected. The montane scrub seems to start in some places at 500m with procumbent juniper and extends to 750m with *Salix lapponum* (and to the top of the Merrick if we include *Salix herbacea*), again starting much lower than expected. Four hundred cuttings of *Salix lapponum* were collected from the Merrick cliffs and 300 juniper berries. However survival in the nursery is poorer than expected so further collections may be needed of these two species. Only 90 cuttings of 30 clones of the *Salix lapponum* have survived and the juniper seed is yet to germinate (this will extend over many years). The Glentool staff and volunteers participated in a very successful specialist training day at Ben Lawers, the NTS staff on hand provided excellent specialist plant identification knowledge.





At the Cample Burn site in the Clyde Muirshiel Regional Park staff and volunteers have battled against the recent weather conditions and have completed the fencing protecting the restoration site. This was a difficult task that involved mechanical breakdowns and some traditional Scottish winter weather. Earlier in 2007 600 Juniper cuttings were collected from within the park and these are transferred to the Lochwinnoch Community Garden and Forest Research, those that grow on successfully will be replanted in the Cample Burn site in the spring of 2008.

CairnGorm Mountain had a busy summer in 2007 with the employment of a Mountain Garden gardener. I would like to take this opportunity to welcome Slavomira Zlacka to the project and thank her for her hard work over the summer period. During the summer the garden had the existing path network repaired, steps built and walls erected and several environmental zones were also created in the garden, existing trees and plants were moved in order to develop a bog zone and a summit plateau terrace. In September for 3 days CairnGorm organised tree planting events for children from surrounding area. In total 3000 trees were planted by the children in the ski area, they included: *Betula nana*, *Pinus sylvestris* var *Scotia*, *Betula pubescens*, *Alnus glutinosa*, *Populus tremula*, *Sorbus aucuparia*, *Salix repens*, *Salix lapponum*, *Salix aurita* and *Salix cinerea*.



The non-native seedling removal work at the Glenmore site continues to progress well with the FCS staff continuing to promote montane scrub through their Rangers' walks programme.

Work on the outdoor sections of the project was difficult over the winter but with the official project launch scheduled for the early summer, I can only say watch this space.

