

Scrubbers' Bulletin

MONTANE SCRUB ACTION GROUP

Scrubbers' Bulletin - No. 3, June 2000.

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The Montane Scrub Action Group.

The steering group meets 2 or 3 times a year. Another change in membership has occurred since Bulletin No. 2. We were pleased to welcome Alison Hester of MLURI who will participate in the steering group when her mainstream commitments allow. The steering group at present includes:-

Michael Scott, Plantlife (Chair)

Angus MacDonald, SNH

Diana Gilbert, Highland Birchwoods (Sec.)

Rob Soutar, FE

Tim Clifford, Caledonian Partnership

Brian Staines

David Mardon, NTS

Alison Hester

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Since Bulletin No. 2, work has progressed towards the publication of an illustrated booklet on 'Montane Scrub'. This will be published by SNH during this year. The text was written by Michael Scott, with contributions by other members of the group, and illustrations by group members and others. We hope, therefore, that this will be concluded before another bulletin is issued. Copies will be available from SNH, Publications Section, Battleby, Redgorton, PERTH, PH1 3EW.

Ben Wyvis NNR: Baseline survey of *Betula nana*

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Ben Wyvis is a National Nature Reserve and candidate Special Area of Conservation for a range of upland communities. Much of the lower ground supports the dwarf birch (*Betula nana*) variant of the shrub rich blanket bog community, M19i. On the north facing slopes of the mountain above Loch Glass there are remnants of downy birch (*Betula pubescens*) woodland (W4), and on the cliffs in Coire Lochain (and other corries) small areas of downy willow (*Salix lapponum*) scrub. In between these two there are extensive areas of blanket bog with dwarf birch present. This situation presents an interesting opportunity to re-establish a continuum of woody habitats from the loch shore uphill into the Coire, spanning an altitudinal range of 630 m, starting at 220m above sea level (asl).

SNH is restoring the birch woodland using exclosures, the most recent and most westerly one of which was erected in 1991 and includes an area of dwarf birch. Within the Coire itself an exclosure was completed in 1997 to facilitate the recovery of part of the montane willow scrub. This latter work is part of the Montane Scrub Restoration project which has been reported on in earlier issues of this Bulletin. In August 1998 SNH, in collaboration with Highland Birchwoods, surveyed the extent and condition of dwarf birch on the blanket bog area in order to inform decisions about how best to recreate the woodland continuum.

The objective of the survey work undertaken was to complete a base-line inventory of the dwarf birch which occurs within the area shown on the map below.

Survey work was undertaken by walking seventy-five parallel transects of 10m width (up to 800m in length) over an area of approximately 75 hectares between 375 and 530 asl. When dwarf birch or any other scrub species was located on the transect, the immediate area, i.e. 10m square, was searched for further plants. This method was adopted as, from previous experience, it was known that where one dwarf birch plant is found there are often others growing close by. Abundance and condition were recorded, and the plants' distribution mapped.

Results:

On eleven of the transects no records were made, and on two transects other scrub species only were recorded, therefore out of 75 transects 62 did support dwarf birch. Individual dwarf birch plants numbered 1649 which, over the 75 ha, represents an average density of 22 plants per hectare. Six other non-ericoid woody species were recorded: downy birch (61 plants), silver birch (*B. pendula*) (2 plants), rowan (*Sorbus aucuparia*) (27 plants), eared-willow (*Salix aurita*) (5 plants) and Scots pine (*Pinus sylvestris*) (1 plant).

Many dwarf birch plants showed signs of previous heavy browsing, including a thickened stem out of proportion with the height of the plant, and heavy branching. However the number of plants which showed *no evidence* of recent browsing: 1239 (75%); was much higher than the number which had been recently browsed: 410 (25%).

The number of dwarf birch plants which were fruiting was small: 19 plants, equivalent to 1.1% of the population as recorded. Fruiting plants were scattered throughout the distribution and followed no particular pattern as regards size, age, etc. The seeds appeared to be well-developed.

Conclusions:

Previous observations had indicated that there were very few dwarf birch plants in the area. However, this systematic survey has shown that it is considerably more frequent than first thought and has given a far better understanding of the situation.

The total number of dwarf birch plants recorded would appear to be quite high at 1649 individuals. However, it should be borne in mind that it is both difficult and time-consuming to accurately separate plants in the field when they are spreading through heather or growing through moss and the figure should be treated with caution.

The majority of plants were recorded in the northern half of the site, between the two burns. Five scrub species were recorded in addition to dwarf birch. As expected, these tended to occur within or close to the burn gullies, where, lower down the slope, mature birch and rowan provide a seed source. However one or two young downy birch and eared-willow were recorded on open ground near the southern edge of the area recorded. None of these plants were significantly taller than the surrounding vegetation (with the exception of one or two rowan seedlings growing on the edge of the burn) and most had been browsed in the past. None appeared to be mature enough to produce flowers or fruit.

The low incidence of flowering of dwarf birch (1.1%) is of some interest. It would be useful to compare this figure with that recorded from other populations, and to ascertain whether the seeds which are produced are viable.

The reason behind the recorded low incidence of recent browsing of dwarf birch (75% of plants *unbrowsed*) is not clear. Deer, sheep, hares and grouse are all present in the coire, albeit the deer and sheep were seen only on the headwall and it is not known how much impact hares and grouse have on dwarf birch. It seems likely that the plants will experience the heaviest browsing pressure in autumn and winter when deer move onto the lower coire slopes. In autumn the bright colour of the deciduous leaves may attract browsers' attention. The winter range for beasts has been reduced by fencing sizeable exclosures for regeneration and so it might be expected that browsing pressure will increase in intensity on ground which remains open to deer.

This survey has fulfilled its objective by providing valuable information on which to base future restoration work. It has also suggested a number of new avenues for useful investigation into dwarf birch scrub. As opportunities arise these will be discussed by SNH.

Recent Studies of Dwarf Birch (*Betula nana*) at Blargie Craig.

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In Britain populations of *Betula nana* are found between 250 and 650m and are associated with M19c *Calluna vulgaris* – *Eriophorum angustifolium* blanket mire, *Vaccinium vitis-idaea* – *Hylocomium splendens* sub-community, *Betula nana* variant (Rodwell, 1991). Although it is a scarce species in Britain, much of the ecological information about *Betula nana* comes from studies in Canada, Alaska and Scandinavia (de Groot *et al.*, 1997). This article reports some preliminary results of studies on the ecology of *Betula nana* within an exclosure at Blargie Craig in Scotland (G.R. 595959) which was erected by Scottish Natural Heritage in the summer of 1995.

Published observations from tundra environments hypothesise that *Betula nana* distribution may be driven partly by nutrient availability but they are not supported by experimental data. Chapin III and Shaver (1985) observed dwarf birch to be most abundant under conditions of localized fertility such as groundwater seepage while Whittaker (1993) observed that on glacier foredunes it tends to occupy damp conditions on a micro-topographic gradient. Chapin III and Shaver (1985) were able to increase *Betula nana* productivity by artificial fertilisation of experimental plots.

Within the Blargie Craig enclosure nine sample points have been established along two transects: three sites within and six sites outwith a stand of *Betula nana*. At each site soil watertable depths are being monitored using WALRAGS. In addition dipwells have been located at 0.1m, 0.2m, and 0.3m depths for soil water sampling. This will be analyzed in the laboratory for pH and the important plant nutrients of phosphate, nitrate, potassium, calcium and magnesium. The soil water chemistry and watertable depth data will be analysed to determine whether *Betula nana* favours sites with seepage and/or enhanced nutrient availability.

Elsewhere in the enclosure the effect of burning is being investigated. Blargie Craig is used for sheep grazing and grouse shooting and hence regular muir-burn is carried out over the rest of the hillside. One of the stands included in the enclosure when it was established in summer 1995 had been accidentally burnt during the previous winter (1994/95). This provided an opportunity to compare an unburnt and ungrazed stand with one which was ungrazed but had been recently burnt. It has been suggested that the distribution of *Betula nana* in Britain is a reflection of the cumulative effects of grazing and/or burning, from which blanket bogs may offer some refuge (Hester, 1995) but there is no published data of the effect of burning on this species in Britain. Studies in Norway by Phillips *et al.* (1992) and in Alaska by Fletcher *et al.* (1984) provide some support for the view that burning has an adverse effect on dwarf birch. The former study found that even 10 years after burning *Betula nana* cover was still less in burnt than unburnt plots while the burnt tundra populations of Fletcher *et al.* (1984) still had significantly less production than the unburnt even after 13 years.

By July 1997 both the burnt and unburnt stand had been protected from grazing by sheep for at least one growing season. However the destructive sampling techniques employed by authors working in countries where *Betula nana* is more common were not appropriate at Blargie Craig. Therefore a way had to be devised to measure productivity which would allow comparisons to be made between the unburnt and burnt stands but which would not damage the plants. There was also extensive layering of *Betula nana* into the *Sphagnum* of the moss layer. An "individual plant" was thus defined as a stem that emerged above the moss layer, following the practice of Chapin III and Shaver (1985) and Whittaker (1993). The "individual plant" at Blargie Craig is thus smaller than the genetic individual. All "individuals" within the burnt and unburnt stands were sampled and stem diameter was measured in two places (horizontally and vertically) to take account of the fact that stems rarely emerged at an upright angle from the moss layer. The number of shoots, their length and the number of leaves per shoot were recorded.

According to the 1997 results there were 31 "individuals" in the unburnt stand and 30 "individuals" in the burnt stand with diameters ranging from 1.1-7.3mm and 1.1-6.7mm in the unburnt stand and in the burnt stand diameters ranged from 1.4-6.8mm and 1.3-6.7mm. There was a significant difference in the mean shoot length ($p=0.0022$) with the mean shoot length 63mm in the unburnt and 75mm in the burnt. The mean number of leaves per mm of shoot was 0.28 in the unburnt and 0.24 in the burnt stand ($p=0.0034$).

Both stands were revisited on the same date in 1998 and once again all the "individuals" in each stand were sampled but only the *current year's* shoot growth was measured in 1998. This ranged from 3-65mm in the unburnt stand and from 2-150mm in the burnt stand. There was a significant difference ($p < 0.0000$) in the mean current shoot growth and a significant difference ($p < 0.0000$) in the mean number of leaves per mm of the current shoot growth. The unburnt mean was 0.46 leaves per mm and the burnt mean was 0.27 leaves per mm of the current year's growth. The most interesting feature of the 1998 data however, was the increase in the number of "individuals" in the burnt stand from 30 in 1997 to 92 in 1998 while in the unburnt stand there were 33 "individuals" in 1998 compared to 31 in 1997. The increase in the number of "individuals" in the burnt stand can be accounted for by an increase in plants up to 4.9mm in diameter (see Figure 1). This is presumably the result of layering of *Betula nana* stems into the moss layer. Rylkov (1996) has noted that forest fires in the Eastern Trans-Baikal region have resulted in an increase in the extent of *Betula nana* at the expense of larch seedlings.

While these are only early results and longer-term monitoring is required there are implications for the management of *Betula nana* populations. Firstly they show that one fire is not necessarily destructive though as yet nothing is known about the effects of repeated fires or the effect of burning in combination with grazing. Secondly they raise the possibility that fire could actually be used in some situations as a management tool to stimulate regeneration of stands by layering. However this is only likely to work if the resulting young shoots can be protected from grazing pressure until they have become fully established. Further experimental work is necessary to produce clear guidelines.

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We are grateful to Angus MacDonald for drawing Hilary Kirkpatrick's attention to this site and to Mr. D. Wilson and Mr. H. Morrison for access. Mr. Stuart Bradley provided technical support. Thanks are also due to several students from the Conservation Management degree programme who helped carry WALRAGS and dipwells to the field site.

The Tarmachan habitat restoration and improvement project: update.

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The plans for this project were described in Bulletin no. 1, when many details were still to be specified and the availability of necessary funds was uncertain. After considering the options, and extensive consultation, it was finally decided that fencing was necessary at 4 separate sites identified for woodland or scrub restoration, while the land in between will remain open to deer and any sheep that may stray in. An electric fence of relatively low profile and without rylock is being used, to minimize both bird strikes and visibility, and to aid the repairs that will be necessary. On the basis of the project plan developed we have been fortunate in obtaining funding from EAGGF, MFS, SNH and FC (WGS). From 1st November 1998, Andrew Warwick, our long-term seasonal Ranger Naturalist, has been employed on a 3-year contract largely devoted to setting up this project, aided in summer by a seasonal ranger.

At the time of writing the fencing is about half built, with only one large and one small compartment fenced. The high altitude work at Creag an Lochain has been suspended over the winter, and delays in removing the conifer plantation constrain progress on that compartment. A large part of the effort involved is required for the lower, submontane woodland elements of this project. The terms of the grants awarded require the planting of over 100,000 trees by spring 2,001. The deadlines imposed for this have the effect of temporarily diverting some of our efforts away from the montane scrub. However, the severe shortage of supply of seed of montane species such as *Salix lapponum* will inevitably result in a longer time scale for this element of the project. We envisage the planting work required to restore viability to the montane shrub species continuing for another decade or two, depending on the necessary staff being employed.

Juniper Biodiversity Action Plan

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Rather buried in a thick volume of Biodiversity Action Plans for fungi, lichens, liverworts, mosses and stoneworts, action plans for four distinctively Scottish vascular plants were published in February 1999. One of these was an action plan for juniper *Juniperus communis*, covering both subspecies (sspp *communis* and *nana*). The action plan was originally drafted by Plantlife, under a contract from Scottish Natural Heritage, and we were delighted to be named as 'lead partner' to take the action plan forward, with the Forestry Commission as the main governmental 'contact point'.

The criteria by which species are selected for the 'honour' of an action plan are very specific:-

- threatened endemic and other globally threatened species;
- species for which the UK has more than 25% of the world or appropriate biogeographical population;
- species where numbers or range have declined by more than 25% in the last 25 years;
- in some instances, species that are found in fewer than 15 ten-kilometre squares in the UK; or
- species which are listed in the EC Birds or Habitats Directive, the Bern, Bonn or CITES Conventions, or in UK domestic legislation.

It may seem surprising initially that juniper qualifies under any of these criteria, but a glance at the distribution map that accompanies the action plan shows why its selection is appropriate. The map is based on juniper records compiled by the Biological Records Centre, the Joint Nature Conservation Committee and from three recent Welsh sources, and it immediately and graphically shows an apparent steep decline in the species' distribution. More than half of the ten-kilometre squares on the map have records from before 1970 but not subsequently. A considerably smaller number of squares have records dating from 1970 to 1986, and the number of post-1987 squares is alarmingly small.

In fact, in compiling the action plan, it was immediately apparent to us that there are serious problems with the juniper records, arising partly from a computer glitch a few years ago as a result of which a significant number of juniper records disappeared into 'cyberspace'. The caption to the action map recognises these problems, and states: "The frequency of pre-1970 records may represent under-recording [in more recent years], rather than genuine decline, and the distribution of juniper is currently being updated as part of the *Atlas 2000* project." Certainly more recent juniper records are urgently required to update the obvious holes in the published map, which suggests that large areas of the Highlands now lack juniper. Even more alarmingly, it includes no records at all for the Northern Isles, although I know the isolated remaining plants there were in serious trouble even ten years ago.

Elsewhere, there is more than enough anecdotal evidence that juniper is in trouble to justify action for its survival. You only need to visit many Highland glens to see a few plants of juniper hanging on as senile, leggy skeletons, with masses of gnarled wood and hardly a sprig of living needles. Thanks to the work of the Borders Forest Trust, and of the indefatigable Lena Ward, we also have some rather firmer evidence of the state of juniper. A survey in Northumberland between 1973 and 1995 showed an overall population decline in the area of 30%, with 54% of colonies showing a decline in numbers and 16% of the colonies dying out completely.

The senility of our surviving native pinewoods has long since set alarm bells ringing and triggered an imaginative restoration programme. Now it seems entirely appropriate to turn our attention to Scotland's second native conifer (if we accept yew as an introduction). The action plan makes clear that the pressures on juniper are complex. Excessive grazing prevents the establishment of young bushes, but at the same time insufficient grazing reduces the area suitable for juniper regeneration and may encourage the development of a dense tree canopy and shade out adult juniper bushes. Excessive burning may destroy young regeneration and adult bushes. But perhaps the final factor listed in the action plan as causing the loss or decline of juniper is the most telling: "the low economic and cultural value attached to the species". That is also a key factor in the loss of montane scrub, in which juniper is often a component – and it was for precisely that reason that the Montane Scrub Action Group was set up.

The action plan lists a wide range of actions for the future of juniper, with the overarching – and challenging – aim of "maintaining the present range and overall population size of juniper". As well as site protection measures, it sees an important role for the Woodland Grant Scheme (WGS) and the revised Scottish agri-environment scheme in meeting this objective. Importantly, it also proposes research into possible sustainable economic uses of juniper, as a means to encourage an expansion in the area of semi-natural juniper vegetation and to enhance the management of existing areas.

Perhaps the key recommendation is for "regional surveys to assess the extent, age range and reproductive potential of juniper populations, classifying populations according to the risk of loss and potential for survival". The plan then recommends that these results should be used to "set priorities for regional action to maintain, and where necessary, restore populations". The overall cost of meeting these ambitious targets is estimated at £51,000 over the next 5 years, and £25,000 over the subsequent 5 years – and these figures exclude administration and the cost of the agri-environment schemes.

In writing the plan, it seemed to Plantlife – as a founder member of the Montane Scrub Action Group – that there was an important role for the group in securing the future of juniper. It is encouraging, therefore, the action points relating to the MSAG's work have survived the complex editing process by the Scottish and UK Biodiversity Groups. The targets include:-

- "Use the FC WGS as a means to maintain populations [of juniper] within the woodland context. This includes measures to encourage the restoration of subalpine scrub, with juniper where appropriate, as the upper limit to native woodland schemes. (ACTION: FC, SNH) (AP 5.1.1)
- Develop and issue best practice guidance to encourage the restoration of treeline scrub woodland with juniper as a component (ACTION; CCW, EN, FC, SNH) (AP 5.4.4)
- Support a publication on the significance of montane scrub woodland including juniper as a component. (ACTION: CCW, EN, FC, SNH) (P 5.6.2)

As the rest of this *Scrubber's Bulletin* makes clear, we are already making great progress towards these targets.

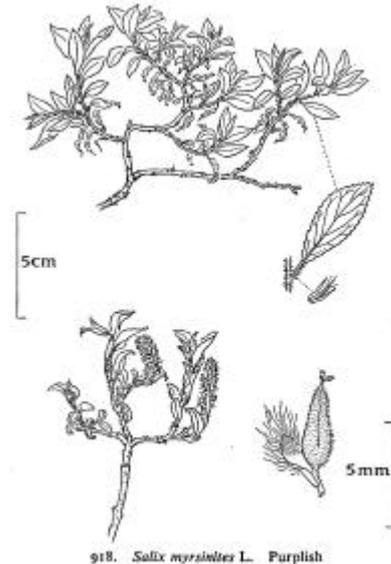
UK Biodiversity Group: Tranche 2 Action Plans: Volume III – plants and fungi is available from Information and Marketing Team, English Nature, Northminster House, Peterborough PE1 1UA (no price stated). The plans are also being published on the JNCC website at: www.jncc.gov.uk/ukbg/actnplns.htm.

Conservation of montane willows at Meall Mor: plans for the future

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Introduction

The whortle-leaved willow, *Salix myrsinites*, is a nationally scarce montane shrub that occurs in enriched moist or wet sites, ranging from 220m at Inchnadamph to 915m on Ben Alder. It occurs in 50 10km squares, all in the Scottish Highlands, except for one in the Borders (on NTS land at Grey Mare's Tail). However, the site at Meall Mor appears to be missing from the atlas in *Scarce Plants in Britain*, making 51 10km squares in all. The plant is thus defined as Nationally Scarce within the UK, but there is not enough data to say whether this species is declining expanding, or constant in extent. Globally, it is a Eurasiatic species, occurring from Scotland westwards to northeast Asia [David Mardon, *Scarce Plants in Britain* 1994].



Distribution on Meall Mor

Viv Halcrow surveyed the distribution of the willow on Meall Mor in 1995 and identified about 40 plants. There is also another outcrop where willows are present, so that there are probably about 50 in total – see the map below. These are confined to very steep, flushed, rocky outcrops with easterly aspect. About 70% are confined to the steepest outcrops between the two burns at the southern end of the site, the remaining 30% being scattered thinly to the north where the outcrops are smaller.

The willows are growing on limestone outcrops, with an associated rich flora, including the Nationally Scarce mountain avens, hair sedge, and alpine cinquefoil. Galls appear to be common on the leaves of the willow. Currently, sheep graze all over Meall Mor.

Regeneration dynamics of *Salix myrsinites*

Although the willow is known to be fertile at least at some sites in Scotland, Viv Halcrow saw no catkins in 1995. David Mardon reports [*Scarce Plants in Britain* 1994]:

“Observations at Inchnadamph NNR, where some plants are within exclosures built in 1959, suggest that vegetative spread is insignificant and that seedling establishment is constrained by the surrounding vegetation cover. Apparently fertile but immature fruits were observed in quantity. As seedlings require predominantly bare soil and freedom from competition in order to establish, few will develop under stable conditions. Presumably the areas of bare soil and freedom from competition resulting from landslips and rockfalls on montane sites provide the conditions for reproduction by seed.”

At Creag Meagaidh NNR, for over ten years sheep have been excluded and deer numbers have been kept low enough to allow birch regeneration and *Salix aurita* scrub development at lower altitudes. At higher altitudes montane willows, including *Salix myrsinites*, do occur on outcrops inaccessible to grazing animals.

However, a comprehensive search by Doug Evans starting in 1995, has failed to find any newly established plants, even though at least one of the willow species, *Salix lapponum*, does produce abundant fertile seed at the site. [Doug Evans, *Scrubbers Bulletin* No. 2 1998].

This raises the whole question of the ecological niche of the montane willow species in Scotland. They are boreal species growing in what is now a temperate oceanic climate: our oceanic climate readily results in a closed mat of vegetation unsuitable for seedling establishment, but good for grazing animals where low snow cover can allow year-round grazing. In Arctic-Alpine boreal climates there is generally a less dense mat of vegetation for regeneration, increased snow-lie which protects the plants from grazing, and less grazing animals generally.

The fundamental question is whether the current restricted distribution of these willows is a result of natural climate and soil changes, albeit exacerbated by high grazing levels in the past two centuries; or whether their current restricted distribution is due solely to this high grazing.

However, the evidence would suggest that they cannot regenerate well in closed vegetation, grazed or ungrazed; nor can they regenerate where there is open vegetation combined with significant grazing. Also, there are many ungrazed rock outcrops that do not have willows on them, so the question arises as to why they are not more common in the sites where they do occur?

Management implications

If their current distribution on rock outcrops is a relict distribution from a time when the climate was more favourable to them (and the relatively recently finished Little Ice Age could well have benefited them) then, maybe, we should accept their decline as part of a natural process of ecological change, and carry out no management. After all, they are not rare or threatened on a global scale.

On the other hand, if their decline has largely been caused by excessive grazing through man's intervention, then there is a strong case for their conservation. Following on from this are various implications:

1. If grazing is excluded from willow sites, it would appear that this does not necessarily mean increased seedling establishment; indeed the resultant closed vegetation hinders seedling establishment. However, it can result in increased vegetative growth, and so larger plants and potential for producing more seed. Generally, though, it would appear that if the aim is to increase the number of willow plants, planting will be required.
2. Additionally, if grazing animals are excluded by fencing, this, in effect, will have to remain in place in perpetuity, for both sheep and deer highly select the foliage of montane willows, and will immediately target such sites – especially if exclosures have resulted in lush growth; this is especially true of sites where willows make up a small part of the landscape. In Scotland, where more most of the bedrock is acidic, and not suitable for many of the montane willow species, this will normally be the case. Hence there are long-term cost implications in maintaining high-level fences.

Suggested course of action at Meall Mor

The author tends to subscribe to the view that montane willow sites contain relict populations from when conditions were more favourable, *i.e.* their current distribution is relatively natural or, at least, humans have merely speeded up a natural process, bringing a natural endpoint nearer.

However, this view may be wrong so, following the precautionary principle, we should do our best to conserve the relict populations in order not to close off future management options. While doing this we should try to gain a better understanding of the natural ecological niche of the willows in Scotland, and monitor closely the effect of our actions. However, in doing this, we will have to acknowledge the cost and effort involved. There is, though, money from the Millennium Forest for Scotland to erect an enclosure.

At Meall Mor, Viv Halcrow reports that erosion damage, due to the wet nature of the site, rockfalls and trampling by sheep, is severe between and below the rock outcrops. This means that, in theory, there is scope for seedling establishment at this site, certainly in the first few years after a fence is erected before the vegetation closes up.

Hence a high level fence is proposed: see attached map for location. The ground is steep and difficult, and the fence will need to be monitored on a regular basis for damage resulting from rockfalls, snow-lie, and to check there has been no ingress by sheep and deer.

It should be accepted at the outset that, apart from increased vegetative growth, there may be no expansion of the extent of the willows.

Thus the response of the willows needs to be closely monitored. If the fence is not achieving the required aims then, after about ten years, consideration will have to be given to planting out new plants from seed or cuttings collected on site. The fence will need to be maintained for the foreseeable future, *i.e.* longer than the 20-year lifetime of the fence, as the rest of Meall Mor will need to be grazed by sheep for the benefit of the rich flora. Monitoring of the response of the flora within the enclosure would also provide valuable insight into the ecological role of grazing.

Action

1. Agree fence line with contractor, and identify long-term costs of maintaining this fence.
2. Erect fence.
3. Carry out baseline survey of willows and other vegetation within the enclosure.
4. Produce a long-term monitoring strategy of both willows and other flora.
5. After 5 years, review effectiveness of enclosures in encouraging expansion of the willows.
- 6a. After 10 years, review effectiveness of enclosures in encouraging expansion of the willows.
- 6b. Relate this work to other work on montane willows in Scotland generally to gain a better understanding of their ecology and regeneration dynamics.
- 6c. Consider whether planting of willows is necessary; if so, implement a planting programme.