

**MONTANE
SCRUB
ACTION
GROUP**



Scrubbers' Bulletin 10



Cover photo: Vapourer moth, *Orgyia antiqua* (L.) eggs,
on dark-leaved willow, *Salix myrsinifolia* Salisb., Ben Lawers NNR, alt. 580m.
photo D.K. Mardon

Scrubbers' Bulletin No. 10.

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

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Welcome to issue number 10 of the Scrubber's Bulletin,

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Earlier issues of the Bulletin may be read at www.mountainwoodlands.org

We are most grateful to the authors for their contributions to this issue, as follows:

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Scrubber's Bulletin 10th (Anniversary) issue: Group Report

Diana Gilbert, Chair MSAG

I am writing following a good humoured but robust and very noisy Montane Scrub Action Group meeting. Although we only meet twice a year the content of the meetings is solid and the discussion intense, always leading to a list of action points. The first of the key topics exercising members at the moment is the new Scottish Rural Development Programme. We are delighted at the prospect of a Treeline planting model being included in the woodland creation option. However, we are concerned that there is still some difference between how we would like to see schemes develop, and what is deemed accountable in terms of public spend. Further discussion is required and some innovative thinking in order to find solutions that are workable within the current auditing systems. We are also keen to develop a wider monitoring protocol (which might be part of the solution needed for accountability) that is flexible enough to cover the expanding range of interest in treelines / montane scrub but will nonetheless provide useful data on which Scotland-wide assessments of habitat condition might be based. This debate may be timely as the Biological Recording Centre (now at the University of Bath) is celebrating 50 years of biological recording with a look at, among other things, the role of biological recording in promoting and making the case for biodiversity-encompassing environmental policy, and there are proposals for a symposium on long term monitoring. Both these topics are in tune with the interests of MSAG and are instruments that might reduce some of the large gaps in our knowledge of these plants and their habitats. But what data is it realistic to expect to be reliably collected by volunteers from a range of backgrounds, and how can it be effectively collated and stored? These questions are not new but there are many different groups now collecting data through their members. We would like to ensure that volunteer effort, particularly when focussed on the shrubs of the treeline, is widely valuable and will contribute to the broader promotion of montane scrub.

Scottish Natural Heritage's Species Action Framework has come to an end and the woolly willow species action group have reported on their activity. The survey of woolly willow populations was completed and three have subsequently been enhanced through planting to ensure the number of individuals will remain above the minimum of 50 deemed necessary for viability in the long term. We are wondering how SNH will now ensure that the effort invested was not wasted due to a lack of follow-up care and maintenance. In addition we are concerned at the lack of integration between biodiversity specific action and wider land use policy, particularly in the uplands. While there is no serious policy-level determination to tackle the high deer numbers across the whole of the uplands all montane shrub populations must remain at risk and are certainly constrained from expanding. Although MSAG has never been a 'campaigning' group we are keen now to lend as much support as we're able by highlighting the consequences of the increasing deer numbers for montane scrub to those in a position to influence policy in this area. It makes little sense to spend increasingly valuable resources on activities that have no long-term hope of success due to a lack of integration across upland land use policies.

At its last meeting the group had great pleasure in acknowledging and congratulating Dr Heather McHaffie of RBGE, who was made a Member of the British Empire in the New Year honours for her services to the conservation of rare plants in Scotland. Regrettably, at the same time as congratulating Heather we must also thank her for her brief but valuable contribution to the group and say good-bye. Although her retirement from RBGE will not see the loss of her expertise to plant conservation as her intention is to focus on ferns and we wish her every good fortune in her endeavours.

Phytophthora austrocedrae: an emerging threat to juniper.

Sarah Green, Forest Research, Northern Research Station, Roslin, Midlothian, EH25 9SY.

With the furore over ash dieback behind us, and while we're all waiting for the next new tree disease to appear, there's time to ponder an emerging pathogen that didn't quite make it to the front pages. This is *Phytophthora austrocedrae*, a fungal-like organism fast turning out to be a significant threat to our native juniper; itself a priority species in the UK Biodiversity Action Plan due to a decline in its distribution, population viability and regeneration.

But first a little background on the genus. The word *Phytophthora* literally means 'plant destroyer' (from Greek *phytón*, "plant" and *phthorá*, "destruction"), a well deserved name because species of *Phytophthora* are among the world's most destructive plant pathogens, causing damage to trees, shrubs and important food crops, most famously potatoes. Although they look and behave like fungi, *Phytophthoras* are in fact more closely related to algae and produce swimming spores (zoospores), which are formed in spore sacs known as sporangia.

Phytophthoras are microscopic and generally live in roots, soil or water. Many *Phytophthoras* also produce resting spores called chlamydospores that are very resilient, enabling the pathogen to survive in plant residues and soils for years once it has become established on a site. This makes the diseases particularly difficult to control in the natural environment.

Until 2002 about six species of *Phytophthora* were recognised as common causes of disease in woody plants in Britain (Brasier, 1999), attacking the roots and root collar of their hosts leading to symptoms of lower stem bleeding and crown dieback. In 1995 a notable new species was identified, the hybrid *Phytophthora alni*, which almost exclusively attacks alders (Brasier et al., 1995). Since 2002, however, at least four more species of *Phytophthora* have been detected in Britain; *P. ramorum*, *P. kernoviae*, *P. lateralis* and *P. austrocedrae*, all of which have the potential to be highly damaging to trees across a range of different habitats and environments.

Phytophthora austrocedrae was unknown until 2007 when it was described associated with widespread dieback and mortality of *Austrocedrus chilensis* (Cupressaceae) in southern Argentina and Chile, a disease associated with poorly drained sites in Patagonia (Greslebin et al., 2007; Greslebin and Hansen, 2010). In March 2011, mortality of two Nootka cypress (*Chamaecyparis nootkatensis*) trees were observed in a public park in East Renfrewshire and *P. austrocedrae* was isolated from a basal lesion on one of these trees. Around the same time *P. austrocedrae* was also isolated from an aerial lesion on the stem of a hedgerow Lawson cypress planted in a residential garden north of Glasgow (Green and MacAskill, unpublished). These were the first confirmed findings of *P. austrocedrae* outside Argentina. Since then, there have been no further records of the pathogen on Lawson or Nootka cypress in Britain.

Over the last eighteen months, however, severe decline of upland native juniper (*Juniperus communis*) has been investigated at numerous sites in northern Britain. The first two sites to be examined were the Upper Teesdale National Nature Reserve in northern England (Fig. 1) and Glen Artney, Perthshire, both of which contain a large number of dead and dying juniper, concentrated mainly in areas of wet, flat ground but also extending outwards across drier slopes. At both sites symptomatic juniper trees were found to be infected with

P. austrocedrae (Green et al., 2012). This is the first finding worldwide of *P. austrocedrae* on a juniper species. Photographic records from these two sites show extensive dieback and mortality of juniper already occurring in the mid 2000s, which suggests that the pathogen has been present on the sites for at least ten years, and probably longer. In the light of these findings, further surveys have been initiated to determine the distribution of the pathogen on juniper in Britain. These surveys, although only in the initial stages, have so far revealed the presence of *P. austrocedrae* on juniper at three more geographically disparate sites in Scotland, one in the Black Isle and two in the Grampian Region (Green and Britton, unpublished), and seven more sites in northern England, all of which are located in the Lake District (Food and Environment Research Agency [FERA] data). At the majority of infected sites the disease appears to be causing extensive mortality of the juniper.

In addition to these field outbreaks, *P. austrocedrae* has recently been identified in a small number of diseased juniper plants located in nurseries, garden centres or private gardens in Britain by advisory bodies such as the Royal Horticultural Society at Wisley (Denton et al., 2010; B. Henricot, personal communication), Science and Advice for Scottish Agriculture (A. Schlenzig, personal communication) and FERA. The geographical origin and global distribution of *P. austrocedrae* is currently unknown.



Fig. 1. Teesdale infected juniper



Fig. 2. *P. austrocedrae* lesion on juniper

Phytophthora austrocedrae infects the root systems of its hosts and symptomatic trees show foliage discolouration from slight bronzing to reddening and browning over all or most of the crown (Fig 1) indicative of root or root collar infections. However, *P. austrocedrae* has also been isolated from dying branches of Lawson cypress and juniper in Britain (Green et al, 2012; Green and MacAskill, unpublished), although it is not yet clear whether such infections are the result of true aerial dispersal of the pathogen, or due to inoculum splash from ground level. Juniper trees of all ages appear to be susceptible to *P. austrocedrae* which attacks the roots, stem collar or branches forming orange-brown coloured lesions in the phloem (Fig 2). Many lesions have resin pockets and a diffuse yellow colouration of the healthy phloem in advance of the lesion margin (Fig. 2). A factsheet describing the symptoms of *P. austrocedrae* on juniper and how to collect and send samples for diagnostic analysis is available on the Forest Research website

[http://www.forestry.gov.uk/pdf/phytophthora_austrocedrae_juniper_factsheet.pdf/\\$file/phytophthora_austrocedrae_juniper_factsheet.pdf](http://www.forestry.gov.uk/pdf/phytophthora_austrocedrae_juniper_factsheet.pdf/$file/phytophthora_austrocedrae_juniper_factsheet.pdf)).

Since *P. austrocedrae* has only recently been described, there is currently very little biological information on the pathogen. It is known to grow best in culture at cool temperatures (10-20 °C), with optimum growth at 17.5 °C (Greslebin et al., 2007). To date all reported hosts (*A. chilensis*, *C. lawsoniana*, *C. nootkatensis* and *J. communis*) reside within the Cupressaceae, and Forest Research scientists are currently undertaking studies to determine the potential host range within this family. The pathogen's main mode of spread is almost certainly via zoospores in water, and poorly drained sites with wet soils are most at risk of the disease establishing if introduced. Thus the cool, wet climatic conditions prevalent in many parts of Britain could be very suitable for *P. austrocedrae*. In Argentina, *P. austrocedrae* has been isolated from forest soils and therefore has the potential to be spread from one location to another in movement of soil (Greslebin and Hansen, 2010). It is important to bear this in mind when visiting juniper sites, for example boots, tools and vehicles should be thoroughly cleaned of any soil or plant debris before leaving the area to prevent the inadvertent spread of the disease. Although *P. austrocedrae* is not a statutory listed organism, the outbreaks on juniper are being contained by application of biosecurity measures at the sites, and the infected Nootka and Lawson cypress trees in the Glasgow area have been destroyed. Unfortunately there is no treatment available in the UK for use in the natural environment to counter these *Phytophthora* outbreaks.

It is currently assumed that *P. austrocedrae* has been introduced into Britain relatively recently (i.e. within the last twenty years) although a pathway of entry for the pathogen into this country has not yet been ascertained. Questions remain as to how the disease became established at such geographically dispersed sites from the Black Isle to the Pennines given the absence of any obvious factor linking these sites. One putative source of the pathogen at the sites might have been the out-planting of young juniper raised from local berries by commercial plant nurseries, although this pathway has never been proven, and several infected sites have never been subject to supplementary planting. However, since *P. austrocedrae* has been found in nurseries, it would be prudent to avoid planting commercially raised juniper at any site where mature healthy juniper populations exist until more information becomes available on the distribution of the pathogen and the conditions which it requires for infection and dispersal.

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List of Figures

Figure 1. Symptoms of juniper decline at a site in northern England where trees were found to be infected with *Phytophthora austrocedrae*.

Figure 2. Phloem lesion caused by *P. austrocedrae* at the stem base of a naturally infected juniper tree.

Footnote. This article was received in March 2013, long before the other contributions were available. We apologise if any of the content has become outdated. Ed.

Plantlife Scotland's Flora Guardian provides valuable monitoring on Dwarf birch (*Betula nana*) at Ben Wyvis to SNH

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Speaking up for wild plants

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Plantlife Scotland's Flora Guardians are conservation volunteers who survey sites local to them, once or twice a year, to keep an eye on priority plants and habitats and help ensure their long-term survival. Our activities are focussed on Important Plant Areas (IPAs): areas of international importance for plant diversity and threatened plants and habitats. The UK up signed up to conserve our Important Plant Areas through Target 5 of the Global Strategy for Plant Conservation, which states that:

“At least 75 per cent of the most important areas for plant diversity of each ecological region protected with effective management in place for conserving plants and their genetic

diversity” (Tenth meeting of the Conference of the Parties to the Convention on Biological Diversity, October 2010, Nagoya, Japan).

Plantlife’s work is contributing to meeting this target in Scotland.

We have developed a simple general monitoring methodology based on parallel transects to measure and compare growth response in a representative sample of the target plant each year, in order to track changes in growth. This is a substitute for an absolute census of an area, which would have been too time-consuming.

Putting theory into practice.

In 2011 Scottish Natural Heritage implemented a deer management programme on the southern slopes of Ben Wyvis NNR and was interested to see how the *Betula nana* responded to the management. This is where Plantlife was able to step in and help. Ben Wyvis is an IPA, recognised as being internationally important for alpine and boreal heath habitats and blanket bog, with a rich assemblage of artic/alpine plant species. Monitoring the impacts of land management can be challenging when large expanses of hillside are involved: How does one focus in on the key elements to demonstrate effective management on a mountain for biodiversity? Original surveys of *B. nana* in 1991 involved a small group of surveyors plotting the distribution of shrubs across the whole of the NNR, with general notes on height and abundance. This would be difficult to replicate on an annual basis to record the response of *B. nana* to reduced browsing, and would also be very expensive.

Dwarf birch *Betula nana* is a lovely little shrub, occasionally encountered in the uplands of Scotland where it nestles in the shallow slopes of blanket bog. The rarity status of this dwarf shrub is Nationally Scarce in Britain, and with 99% of the population occurring in Scotland it is valued rather highly as a key component of certain upland vegetation communities. And fortunately Plantlife Scotland had a volunteer in Inverness wanting to help out, and who wasn’t at all put out by going half-way up a mountain to do it! So Peter Duncan, SNH Reserves Manager, Francis Williams, Plantlife Flora Guardian, and myself met on the side of Ben Wyvis in mid-2012 to scope the scale of the task and to chew over what needed to be done to track changes in *B. nana* growth, and what was achievable in a day by a fit volunteer.

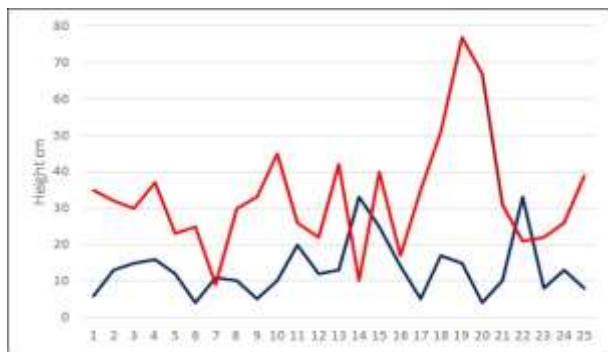
Our key questions were:

Is the dwarf birch gaining height compared to the surrounding vegetation and hence surviving current levels of grazing pressure? Are plants flowering and setting seed? Are new seedlings germinating? And are plants still being damaged by deer?

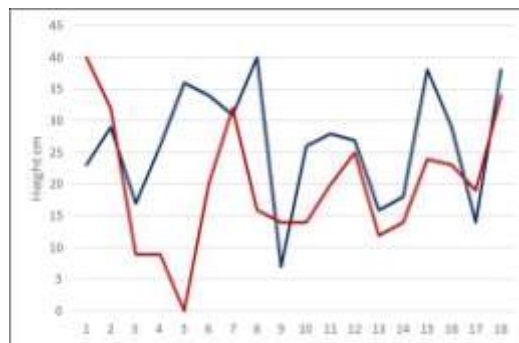
Using existing survey data, we chose a 1 km square where the *B. nana* was fairly abundant, and was relatively easily accessible from the forestry plantation below it. We noticed that it was plentiful near to the forest fence, but thinned out rather quickly going upslope.

Along the transect clumps of dwarf birch would be recorded by 10-figure gps grid references and photographs, and measurements of height of *B. nana*, height of surrounding vegetation, type of vegetation, age class of the plant (new, established or mature), presence of catkins and any deer damage.

This approach was trialled over 2012 & 2013 to test ease of doing it, whether it was repeatable, and was the data produced useful. A meeting was held in late summer 2013 to discuss the outcomes and what next. Diana Gilbert, MSAG, attended to offer objective expert advice. The following graphs provide a summary of the findings.



Graph 1. Survey results August 2012 showing the maximum height of the *B. nana* plants in blue and maximum height of the surrounding vegetation in red.



Graph 2. Survey results August 2013 showing the maximum height of the *B. nana* plants in blue and maximum height of the surrounding vegetation in red.

So what do we know from two seasons' observations?

There is a suggestion from the graphs above that in one year the *B. nana* responded positively to a reduction in browsing, leaping up above the surrounding heather and cotton-grass. But appearances can be deceptive! Francis confirmed that the plants measured in 2013 were not necessarily the same as those measured in 2012. The categorisation of 'new' plants was also discussed as *B. nana* is prone to expanding through horizontal stems which subsequently produce vertical shoots, and the roots readily sucker. Catkins were present in both years.

Collecting DNA material in a plot



Photo by Peter Duncan, SNH.

This exercise was very useful to SNH, it appears to show that the deer management is having the right effect and it has proved do-able from the perspective of the Flora Guardian, Francis, and is very important to keep him on board. However, it was agreed that to answer the questions originally posed it was necessary to be able to return to the same plants each year.

As a result of this meeting Peter, Francis, Diana and John Urquhart, a conservation contractor, met on site and set out a 500 m permanent transect with fence posts every 50 m. It runs across the slope, roughly east – west through the main part of the population. Along the transect four 2 x 2 m plots were built, three fenced with rabbit-proof mesh, two of which contain at least part of a *B. nana* plant, one without a plant. The fourth plot is unfenced and does not contain any *B. nana* plants. During the visit the opportunity was taken to collect material from the population to pass on to James Borrell at Queen Mary's College University of London, for inclusion in his PhD research into *B. nana* genetics.

This project will now continue with Francis recording the plants in relation to the permanent transect including those in the small control enclosures and a measure of the impact of browsing will be determined over the next few years to guide whether additional restoration action is required.

So if anyone would like to find out more and maybe get involved in monitoring dwarf birch or other montane species including juniper, please do get in touch with me at the Plantlife Scotland office.

Cree Valley Community Woodlands Trust – Involvement in mountain woodlands and woodland fringe

Peter Robinson

Cree Valley Community Woodlands Trust (CVCWT) evolved from Forest Environment Panel discussions in 1998. The management of a mosaic of habitats involving woodlands from “source to sea” was set on course by community meetings, a feasibility study and the appointment of a Project Manager and an Administrator.



CVCWT is a registered charity and forms partnerships between Dumfries and Galloway Council, Forestry Commission Scotland, Scottish Natural Heritage, Scottish Environment Protection Agency, Freshfield Foundation, Galloway Estates, Royal Society for the Protection of Birds, Galloway Fisheries Trust, Community Councils and private landowners with representatives of these organisations in its steering group.

The Cree Valley in the south-west of Scotland contains remnants of the formerly extensive ancient broad-leaved woodlands. Once important in local industries, the woodland remnants are today recognised for their value in contributing to tourism, recreation and biodiversity. CVCWT presently manages over 2000 hectares of woodlands including remnant ancient semi-natural woodlands (ASNW), plantations on ancient woodland sites (PAWS), riparian woodlands, recent clear-felled sites and woodland fringe habitats. The woodlands are not owned by CVCWT but are managed on 25 year management agreements with the landowners. The aim is to join-up these wooded areas employing natural regeneration and planting to create a native broad-leaved woodland of national importance and high conservation and landscape value, through a community partnership which, together with landowners, the community and local agencies, will focus on improving the social, ecological and economic value of the Cree valley through the promotion of native woodlands.



Glentroll oakwoods

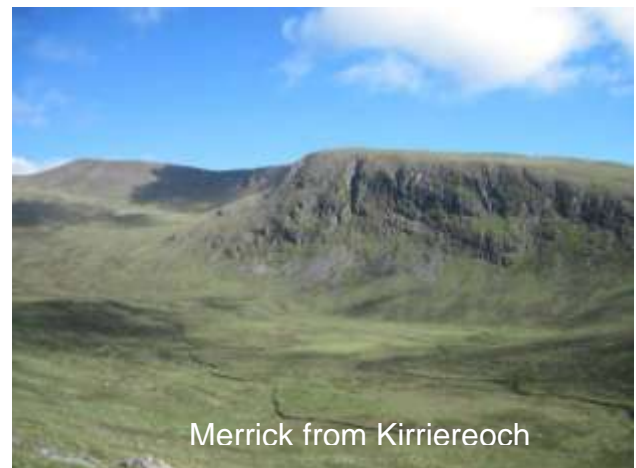
CVCWT also work closely with Galloway Fisheries Trust to enhance the fishery by investigating improvements to riparian management and the aquatic habitat. The extension of public access by exploring and developing the potential for new routes particularly linking to the Southern Upland Way, where appropriate and compatible with other objectives is also important. In its latest 3 year Cree Valley Woodland Heritage Project funded by Heritage Lottery Fund (HLF), apart from the usual woodland management work, CVCWT has also been investigating the



archaeological and social history of some of their sites.

The extension of the project areas not only follows down the valley, but is also looking to extend up the valley sides to higher altitudes. In the Action for Mountain Woodlands project, CVCWT were very much involved in promoting the little known or recognised montane habitats. A demonstration garden in the car park area at the Forestry Commission's Glentool Visitor Centre was designed, constructed and planted by CVCWT volunteers, and now it has matured, and along with interpretation panels, gives the public a flavour of the different plant communities and habitats found on the Galloway Hills and other mountain woodland areas in Scotland.

Volunteers and CVCWT staff also participated in surveys of the flora and fauna on the hills. Accessibility and ground conditions are challenging in these habitats, but a few of us mad souls did manage to get out there and benefit from the magnificent views and fantastic remnants of rich flora on isolated crags. The surveys were particularly designed to locate woody species ie trees, dwarf willows and juniper. Where a tree was found, and it often was on an individual basis, the ground flora was recorded for a notional 2m around the tree. CVCWT volunteers were also very much involved in the planting of burn-side areas on the Merrick hill path tree-line woodland demonstration area.



Merrick from Kirriereoch

Another CVCWT 3 year project which ran from 2009-2012, the Upper Cree Project, although primarily a riparian woodland restoration project, followed some of the river Cree's tributary burns, beyond the source of the Cree at Loch Moan, into the foothills of South Ayrshire up to altitudes of over 500m. Here management included the removal of regenerating Sitka Spruce (*Picea sitchensis*) and the planting of the valley sides and hill fringes.

Although Galloway is not included in the new Mountain Woodland project, CVCWT and FCS have paired up to carry out a new project based on the Bennan north of Loch Trool in the Galloway Forest Park. This is part of the 'woodland fringe' habitat discussed by Rob Soutar in issue number 9 of the Scrubbers' Bulletin. The project will create new native woodland at the Bennan, Loch Trool on an area of 260 ha. The area lies outwith and to the south of the Merrick Kells SSSI and within the buffer area of the Galloway and Southern Ayrshire Biosphere. Extensive surveys and consultation have taken place to set-up this project. The woodland will be open in character and be planted to reflect the landform and soil characteristics with a canopy cover between 20% and 50% in a matrix of open ground. No planting will take place on the adjacent designated site or areas noted as important or valuable within the open ground habitat surveys such as deep peat blanket bog and wetter hollows. The surface vegetation has been heavily modified through years of overgrazing and fires resulting in an extensive area of degraded acid grassland, heath and damaged blanket bog. The planned change will retain the most valuable areas of open habitat whilst delivering the ecological benefits of new native woodland. CVCWT will carry out surveys to establish the best areas to plant in the "montane" area, the highest and rocky areas of Bennan Hill. These will be hand planted with discrete blocks of Juniper (*Juniperus communis communis*) and Downy Willow (*Salix lapponum*). Because of the risk of

Phytophthora austrocedrae, batches of Juniper will be planted in excess of 100m apart and in excess of 1,000 metres from the parent material. NB At the time of writing new planting



Juniper raised from seed

of Juniper has been suspended and stocks of juniper will have to be carefully monitored until the suspension is ended. The steeper and better drained stream-sides have limited areas of shallow mineral soil and small, localised areas of mineral soils have developed close to rocky outcrops. These areas will be hand screeded and hand planted, including the gullies along the Whiteland and Pulnageshel Burn. This more exacting planting will be carried out by CVCWT volunteers. To mimic the natural tree-line, overall planting densities will be higher on better, lower soils and wider spaced at higher elevations.

The majority of all planted species will be site native and of local provenance wherever possible. Since 2010, CVCWT have been running their own local provenance tree nursery. The nursery was set up during a Leader funded project and has been extended in the present HLF funded project. Although on a relatively small scale, CVCWT are collecting seed locally and growing these on in two, 18 x 36 feet polytunnels using predominantly root trainers. The trees are grown on to a size ready to plant out. A range of species are being grown but the plan is to concentrate on species which are not grown widely commercially and species for which finding local provenance stock is a problem such as Sessile Oak (*Quercus petraea*). One of the main successes at the nursery has been the production of Downy Willow from cuttings. These are being taken from a full genetic base from a local source to retain viability and genetic vigour. FCS are also growing cuttings from this clone bank. CVCWT will therefore be an important cog in supplying tree stock for this project.



The core planting matrix will be Rowan (*Sorbus aucuparia*) and Downy Birch (*Betula pubescens*), supplemented with less common species including Aspen (*Populus tremula*), Downy Willow, Eared Willow (*Salix aurita*) and Tea-Leaved Willow (*Salix phylicifolia*). Juniper will be used, when permitted, in key locations, particularly on rocky bluffs and ledges amongst the higher crags. At lower altitudes in well drained gullies with better soils species such as Sessile Oak, Hazel (*Corylus avellana*), Rowan, Goat Willow (*Salix caprea*), Hawthorn (*Crataegus monogyna*), Holly (*Ilex aquifolium*), and Bird Cherry (*Prunus padus*) will be used. Occasional Scots Pine (*Pinus sylvestris*) will be planted to benefit Black Grouse. Recent trials of using locally cut setts of Eared Willow has proven successful to date and will be used on the lower slopes.

The new native woodland will benefit biodiversity and landscape and contribute to the woodland cover target for Scotland. Dappled shade will be created along stream-sides to benefit freshwater habitats and a substantial area of permanent forest habitat network created that links to and extends the existing resource of mixed broadleaved woodlands in the Cree Valley to high elevation Montane Scrub on the higher slopes of the Bennan Hill.

Because of the requirement to access the site to facilitate planting, maintenance and controlling deer, construction of a permanent, good quality ATV access track is required.

The birds that use the area include Red and Black Grouse, Wheatear, Meadow Pipit, Snipe and Woodcock. Buzzards and Peregrine Falcon use the area for hunting. The creation of open native broadleaved woodland will benefit all species apart from Wheatear which may be displaced from the lower denser areas of woodland. As the habitat develops woodland bird species will move in, particularly warblers and other passerines as seen in the adjacent woodland fringe areas. These habitat improvements should greatly increase the mixture of species using the area and could really benefit some of our struggling species such as Black Grouse and possibly encourage the return of species such as the Ring Ouzel.

Bennan Hill is situated between Loch Trool and Kirriedarroch Design Plans. Some areas of existing conifers on the upper tree-line of both plans have already been felled and have been converted to woodland fringe using the same native species mix. Additional areas will be restocked at the same time to further strengthen this linkage. Sheep and deer incursion is a continuous problem and currently restrict establishment of native trees. A new, temporary deer fence will be erected to permanently exclude stock and deer from the area and will be marked to minimise the risk of Black Grouse strikes. Small exclosures have already been established to test the efficacy of planting Willow setts and Willow and Juniper transplants at higher elevations. CVCWT have supplied plants and planters (volunteers) for this trial.



Planting in exclosures

Apart from this major project there is a desire from Kirkcudbrightshire's County plant recorder, David Hawker, to obtain plant records from upland FCS sites. Some species have not been recorded for decades and there are potentially new vice-county records to be found. These records do not merely increase the list of species and species at altitudes found (some healthy competition for the highest altitude record for a species is to be encouraged) but help us to see the changes developing over time and with changing management. CVCWT volunteers will be involved in these surveys.

At the beginning of September 2013 a willing mini bus load of CVCWT volunteers and staff traveled up to Ben Lawers to attend a 2 day training course held by Highland Birchwoods with experts David Mardon who initiated and led the restoration project at Ben Lawers for NTS; Les Tucker, formerly Dundee University; Ben Davies of Highland Birchwoods; and Andrew Warwick from NTS. The two days consisted of indoor presentations by David and field excursions, with a look at the nursery at Killin. It was excellent to see an established project and to learn about the management and the upland plant species found there, the list of willows of which greatly exceeds the Galloway Hills, although the Galloway Hills can certainly



The group at Ben Lawers NNR

rival the richness of the herb flora in parts, and Kirriereoch is surely one of the best sites for the prostrate form of juniper in Scotland. The biggest benefit of the trip is probably to have the opportunity to time-travel to see a landscape transformed and to be able to visualise parts of the Galloway Hills looking this way in the future.



The Freshfield Foundation



Mountain Woodland Project



William Bodles Highland Birchwoods

Project Mission Statement. Mountain Woodland will no longer be a special element of the landscape in need of conservation but will become a standard day to day part of an estate's forestry management plan to be enjoyed by all.



Introduction

In 2011 Highland Birchwoods developed a 2.8 million pound restoration and conservation project focused on mountain woodland, part financed through the Heritage Lottery Memorial Fund (HLF), SNH, Woodland Trust, Montane Scrub Action Group, John Muir Trust (JMT), private land owners and Toyota Fund for a Better Tomorrow (McRae and Dick). It is an ambitious project that has 3 main overarching aims:

- to conserve the UK's diverse heritage and biodiversity for present and future generations to experience and enjoy through conservation and expansion (planting 500,000 native trees across Scotland) of the declining Mountain woodland habitat
- to help more people, and a wider range of people, to take an active part in and make decisions about their heritage through the involvement of community led survey, landscape scale planting and nursery initiatives
- to help people to learn about their own and other peoples heritage through the development of adult training courses and rural skills, youth focused extracurricular education courses and a best practice guidelines booklet for land managers

Within the project partnership are a wide range of estates, including Alladale Reserve, Scatwell, Glenmarksie, Dundreggan and Glenlude Estates. At each site there is a focused work programme specifically tailored to each site's needs. We are continuing to look for partner sites to further our geographic spread, so if you think you might have a suitable candidate please let us know (info@mountainwoodlands.org).

Progress to date:

Since the project started in late 2011, we've been working very hard towards achieving our tree planting goal. Through the hard work of our partners and our volunteers we have nearly reached our target figure of 500,000. To date through the project and its partners 395,990 mountain woodland trees have been planted. This is an excellent achievement; congratulations to our tree planters.

Our second and third aims are to help people get more involved in decisions and to learn more about their environment. Through the development of a 2 day training course in mountain woodland tree id and mountain woodland creation, single day seminars in tree nursery establishment and ongoing survey and planting events we have helped a total of 264 people become more involved with their mountain forests. Giving them the knowledge to look at the hills and appreciate that this rare and valuable habitat is often completely missing and importantly enabling them to be able to do something about it.

In the coming years we have plans to substantially increase this number by continuing to run these events and by partnership working with Alladale Reserve and their "Alladale Challenge" programme. This programme involves local young people coming out in to the middle of the estate and camping out for a week, during which they undertake a number of ecological projects, focused around mountain woodland and how it fits into to the whole ecosystem, and experience the wildness and majesty of the north of Scotland. As a precursor to this we planted 1100 dwarf birch on the site with youth groups during June 2013. We are very excited about the potential of this programme to engage with the local young people and through them educate the older generations about the true state of our mountain woodlands.

If you are interested in getting involved or wish to get in contact please visit our webpage: www.mountainwoodlands.org or email us at info@mountainwoodlands.org
We look forward to seeing you on one of our events!



Project Update: Ecological and Genomic research to optimize the conservation of Dwarf Birch in Scotland

James Borrell, Queen Mary, University of London

This three-year NERC funded research project aims to combine both traditional ecology based techniques with recent advances in genomic technology to understand the decline in *Betula nana* across Scotland and Northern England. The project also benefits from the newly sequenced *Betula nana* genome, originating from the DNA of a plant growing on the Dundreggan Estate.



The first phase of the project developed a database of historic records. This involved collating records from the National Biodiversity Network, Scottish Natural Heritage, The Botanical Society of the British Isles, Trees for Life, Highland Birchwoods and other helpful individuals.

Strong evidence suggests that *Betula nana* was once widespread throughout the UK after the last glacial maximum, with the significant subsequent range contraction and fragmentation. Our database of records will allow us to quantify this. For comparison, we have also collated records of *Betula pubescens* and *Betula pendula* across the UK.

To complement this approach, we are currently exploring predictive niche models. These allow us to predict the suitable habitat zones for *Betula nana*, by training models with observations that we know to be correct e.g. sites we have visited with *Betula nana* present. It was initially hoped that this may allow us to identify previously unknown areas of habitat suitability, however resolution is too coarse to make this practical. It has however enabled us to begin to identify the niche preference of *Betula nana*, and in the future we may be able to broadly identify and prioritise possible re-planting sites. It is also possible to model current populations under different climate change scenarios; this will form part of my work in 2014.



Heading for the 'lightning' path at Loch Muick to survey the extensive population there.

The second phase is field based. This involved spending much of the summer of 2013 visiting sites across Scotland attempting to find *Betula nana* populations from historic records. Anyone who has searched a hillside for *Betula nana* will appreciate how difficult this can be. None of the older records (over around 40 years old) could be located, however the accuracy of more recent surveys was very impressive indeed. To date, with the generous help of many from the Montane Scrub community, I have managed to sample individuals from 25 populations in Scotland, and three in Northern England.

At each of these sites small twig and leaf samples were collected from approximately 32 individuals, with precise geographical coordinates, morphological and site measurements also being taken. We are currently processing these in the lab, extracting DNA and

sequencing specific loci. It is hoped that this will allow us to assess genetic differentiation between populations, detect low levels of hybridisation or identify local adaptation.

To complement this study, fieldwork was also undertaken in the Northern Lapland. Here *Betula nana* forms extensive and continuous habitats with little fragmentation and much lower grazing pressure. It will be interesting to explore comparative population structure and diversity.

Areas for further work and questions for the community

Unsurprisingly, the smallest *Betula nana* populations are the hardest to find. I'm particularly interested in any known locations with approximately <25 individuals, (ideally situated with no other known populations for several kilometres).

An important component of our research involves assessing levels of gene flow between potentially isolated populations. One approach towards doing this involves measuring pollen dispersal with pollen traps. I would be very interested to hear from anyone who has experimented with doing this on any tree species in Scotland, particularly those with an interest in Scrub.

Similarly, I am very interested to hear from anyone with knowledge of any *Betula nana* or potential montane scrub habitats in Ireland. We have received mixed reports on this, please do get in touch!

Lastly, we are very interested in exploring the relationship between genetic diversity in *Betula nana*, and invertebrate species diversity or abundance. We will shortly have an extensive genetic database; it would be interesting to know if sites with higher levels of genetic diversity could support a larger number of species or abundance. This would be ideal for a Masters student perhaps. However this would need the input of someone with substantially more entomological expertise to design an appropriate project.



Finland - View of the river Carsejokha near Kevo Subarctic Research Station in Finnish Lapland. We were based here for two weeks surveying extensive *Betula nana* sites in the nearby area.



Cannich - Surveying *Betula nana* at and above the tree line in Glen Cannich. Samples collected are currently undergoing genetic analysis at QMUL.

Contact: j.s.borrell@qmul.ac.uk

Monitoring planted montane willows at Coire Sharroch, Coire Fee NNR, 2013

Richard Marriott, January 2014

Introduction

Three species of willow have been planted in the enclosure at Coire Sharroch between 2009 and 2012 (Table 1). The rationale for the planting was that there had been no significant regeneration of the willows following the erection of the fence around the whole corrie in the mid 1990s. The planting sites (Figs 1 and 2) were chosen to test the hypothesis that areas of late snow lie (and suitable soil conditions) would provide protection from grazing by mountain hares. It is likely that only deer and sheep were thought to be the main causes of lack of regeneration when the fence was erected approximately 15 years previously. The chosen sites were checked by Barbara Hogarth (BSBI vice county recorder) and by David Horsfield (SNH) beforehand, so that planting would not seriously affect other plants or habitat types if successful.

Method

The protocol used to monitor the willows was a modification of that trialled at a meeting of the Montane Scrub Action Group at Coire Sharroch in 2012, and then subsequently modified again. A detailed description of the methods used and copies of the recording sheets are given in the Appendix.

We found it useful to have a brief exercise with potted plants (in the ranger base at Glen Doll) before going out on to the hill. Most discussion was about the number of 1° shoots. Where there is doubt we decided to record as 2+4 where 2 shoots were clearly thicker and possibly original at planting but where 4 more could be regarded as main stems. At some sites we measured and recorded all planted willows, and at others we measured 50 and then just counted the rest. The monitoring took two days, getting on to the hill by about 11.00am on the first day.

We worked in pairs for the exercise, swapping partners on the second day. One person measured, counted and looked for grazing damage while the other recorded on the prepared sheets. The recorders were : Richard Marriott, Heather McHaffie, Natacha Frachon, Gordon Schofield, Tommy Duffy and Neil Davidson – all RBGE staff except RWM.

Table 1 The numbers of willows planted at Coire Sharroch 2009 - 12

Site no.	Approximate Altitude m	Salix lanata		Salix lapponum		Salix myrsinifolia			Total
		2009	2011	2009	2011	2009	2011	2012	
1	777	42	48	0	0	0	0	0	90
2	792	60	84	0	9	0	0	0	153
3a	554	0	0	150	272	72	66	0	560
3b	521	0	0	0	0	150	180	219	549
4	590	0	0	30	279	30	144	0	483
5	778	52	18	36	27	36	36	0	205
6a	703	36	54	0	0	0	0	0	90
6b	696	36	54	0	0	0	0	0	90
6c	690	60	36	0	0	0	0	0	96
6d	659	36	30	0	0	0	0	0	66
Totals		322	324	216	587	288	426	219	2372
		636		803		933			

Table 2 Summary of the willow monitoring at Coire Sharroch 22-23rd August 2013

	Species	Recorders initials	Number originally planted	Total number of plants seen	Total number of plants recorded and measured	Average number of 1° shoots	Average number current year shoots	Average length of longest shoot (cm)	% with each number of leaves			% with catkin buds present	% with signs of damage			
									<20	20-100	100+		rust	Caterpillar/Slug/beetle	nipped shoots	
1	<i>Salix lanata</i>	GS HMCh	90	54 (60%)	50	1.3	4.16	12.6	48%	52%	0	0	48%	40%	4%	
2	<i>Salix lanata</i>	RWM TD	144	50?? (34.7%)	50	1.9	5.68	19.0	44%	56%	0	4%	0	26%	20%	
3a	<i>Salix lapponum</i>	GS HMCh RWM TD NF ND	422	131 (31%)	83	1.7	9.02	25.4	10.8%	72.3%	16.9%	2.4%	27.7%	10.8%	44.6%	
	<i>Salix myrsinifolia</i>	GS HMCh RWM TD NF ND	138	30 (22%)	24	1.3	5.5	25.1	29.2%	58.3%	12.5%	0	8.3%	0	50%	
3b	<i>Salix myrsinifolia</i>	GS HMCh	549	64 (12%)	quick count											
4	<i>Salix lapponum</i>	GS HMCh RWM TD NF ND	309	128 (42%)	128	1.6	4.7	23.9	19.6%	72.6%	7.8%	0.8%	16.4%	20.3%	45.3%	
	<i>Salix myrsinifolia</i>	GS HMCh RWM TD NF ND	174	37 (21%)	37	1.4	4.7	23.2	18.9%	81.1%	0	0	0	29.7%	59.4%	
5	<i>Salix lanata</i>	RWM TD	60	12 (20%)	10	1.6	5	10.5	90%	10%	0	0	0	50%	20%	
	<i>Salix lapponum</i>		63	7 (11%)	quick count											
	<i>Salix myrsinifolia</i>		72	3 (4.2%)	quick count											
6a	<i>Salix lanata</i>	ND NF	90	61 (68%)	50	2.3	7.7	14	16%	82%	2%	18%	4%	68%	24%	
6b	<i>Salix lanata</i>	ND NF	90	66 (73%)	50	2.2	7.24	17.6	24%	76%	0	2%	0	92%	30%	
6c	<i>Salix lanata</i>	RWM TD	96	28 (31%)	28	2.8	6.9	15.9	61%	39%	0	10.7%	0	61%	32%	
6d	<i>Salix lanata</i>	GS HMCh	66	41 (62%)	41	1.8	6.3	16.5	36.6%	63.4%	0	17%	48.7%	58.5%	5%	

Photos showing late snow lie 2nd April 2008 in relation to willow planting sites

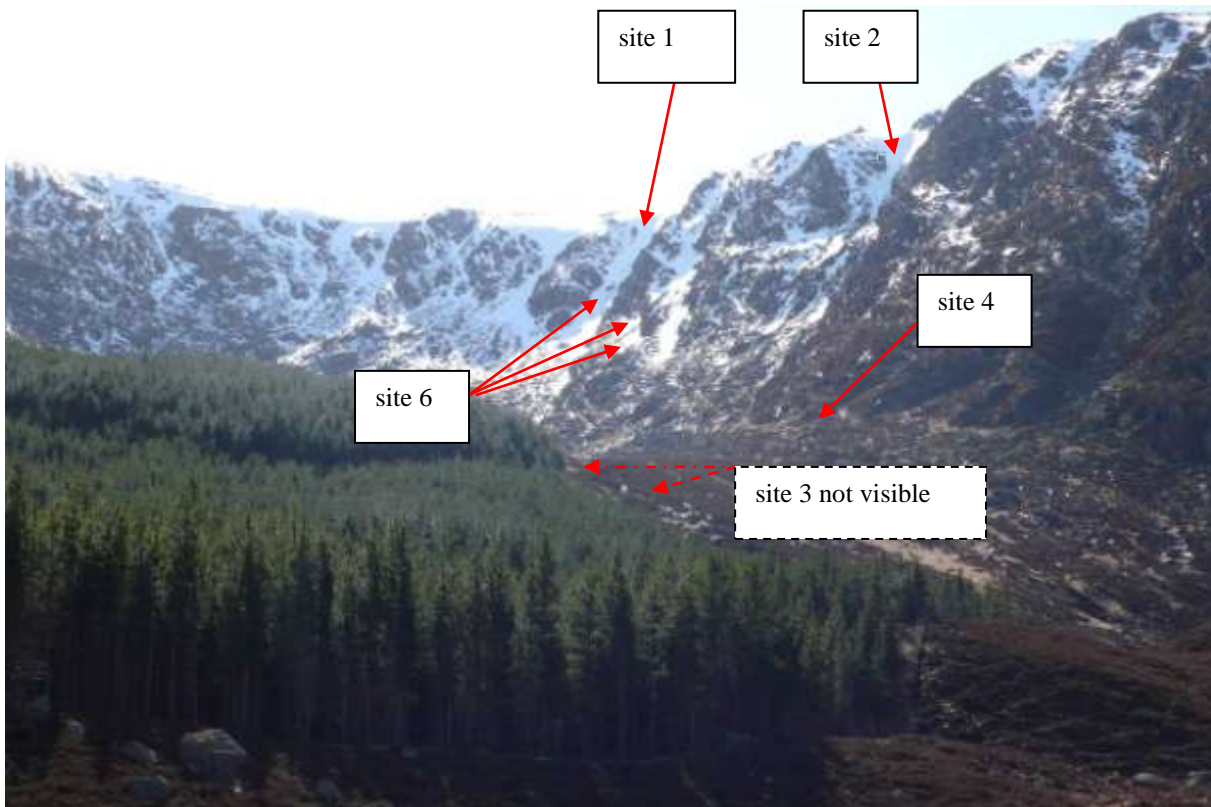


Fig. 1 Photo taken on 2nd April 2008 showing significant depth of snow at sites 1,2 and 6, but virtually none at site 4



Fig. 2 Photo taken on 2nd April 2008 showing less snow at site 5 in Coire Fee gully compared with other sites in Coire Sharroch – see photo above.

Discussion and conclusions

Only very broad conclusions can be made at this stage as the monitoring is a base line for future monitoring of success. The following points seem fairly clear:

1. Targeting late snow sites for planting *Salix lanata* has been reasonably successful with 4 out of 7 sites having 60+% survival. One of those sites with only 34.7% survival (site 2) nevertheless had the best growth rate of all the *Salix lanata* sites. Where the plants had survived lower down the gully (where it was steeper) they had done well.
2. The site with least success (site 5) may have been too accessible to grazing by hares and/or sheep – a few of the latter had entered the enclosure in the last two years. While late snow lie will vary from year to year this site may lose snow protection faster than sites 1, 2, and 6 – see photos below.
3. Planting on the floor of the corrie at 3a and 3b was somewhat less successful despite an attempt to plant alongside the burn where snow lies late. These sites and site 4 (slightly above the corrie floor) had the highest percentage of nipped shoots, almost certainly Mountain hare damage. They are also likely to lose snow protection earlier than sites 1, 2 and 6.
4. Surprisingly *Salix myrsinifolia* had much the poorest survival (22% at best) compared with *S.lapponum* <42% and *S.lanata* <68%. This species may be more palatable and is mostly found only on the crags in this corrie despite growing alongside the burn in Glen Doll. It was also planted in the sites which may lose their snow earlier.
5. Little can be read into the data on rust and invertebrate damage as we did not differentiate between the amount of damage e.g. one leaf with a little rust or all leaves with rust. This has been corrected in the latest version of the protocol (see appendix)
6. At site 6c which had the poorest survival of the similar sites 6a-d (Table 2) the part of the site where the *S.lanata* had done poorly was the RHS (from the corrie floor) where the soils were more acidic. It did better where there was flushing on the LHS – where much of the planting was the later planting done in 2011.
7. The protocol was found to work well in practice and all involved were happy that they understood what to do. The discussion with the potted plants was valuable in sorting out potential difficulty. A similar pre-monitoring check would be useful with respect to identification of species for some people. All those involved in this exercise had visited the site before and most had been involved with seed/cutting collection or planting.

Acknowledgements

I would like to thank Heather McHaffie for preparing the summary table of results and for discussion over the conclusions, and Natacha Frachon, Gordon Schofield, Tommy Duffy and Neil Davidson whose enthusiasm for the work made it such an enjoyable exercise.

Note This account is a modified version of the account which is included in the report of all the work of the Woolly Willow Steering Group Archive (Marriott and McHaffie, 2013) which is to be stored in digital form at the Royal Botanic Garden Edinburgh.

Trees for Life Update

Mick Drury & Jill Hodge, Trees for Life

Perhaps the botanical highlight of our Dundreggan Estate, and indeed the wider area in Glen Moriston, is the population of dwarf birch *Betula nana*, found in the zone between 450 and 650m. TfL has initiated work to promote the species, through survey and fenced exclosures since 1997, and more recently our nursery has been growing increased numbers of trees for various projects.

In 2010 we erected a new 8 ha exclosure on Dundreggan, principally for dwarf birch regeneration, funded partly through the Scottish Rural Development Programme. We need to demonstrate that there is indeed regeneration at the required density (1100/ha) so some manual ground disturbance is being done to facilitate germination, and we will consider planting. We are also experimenting with striking eared willow *Salix aurita* cuttings directly at the site. A further 6ha exclosure is planned for later this year, within a drier heath community at the same elevation. This will help to answer the question whether dwarf birch is better adapted to growing in wet conditions amongst mire communities, as appears to be the case from its current distribution, or whether this is a response to reduced deer browsing pressure with animals seeking more favourable growth elsewhere.

The presence of downy and silver birch *Betula pubescens* and *B. pendula*, rowan *Sorbus aucuparia*, Scots pine *Pinus sylvestris*, eared willow *S. aurita*, creeping willow *Salix repens* and juniper *Juniperus communis* ssp *communis* seedlings, at altitudes of over 500 metres, suggests montane woodland above Glen Moriston could have a diverse range of species if allowed to develop. It will be interesting to see how reducing deer numbers across the open hill in the coming years will promote this regeneration.

Meanwhile there have been some interesting discoveries of species associated with dwarf birch at Dundreggan. These include the BAP-listed micromoth *Swammerdamia passerella* and three boreal sawfly species, 2 of which, *Nematus pseudodispar* and *Amauronematus tristis*, have not previously been recorded in the UK. The third sawfly *Pristiphora borea* has only 3 previous UK records, only one of those since 1931. A tar spot fungus *Atopospora betulina*, for which there are very few records in Scotland, was also recorded. Work on ectomycorrhizal fungi by Emily Hesling recorded a number of associated species.



Dwarf birch (*Betula nana*) with tar spot fungus (*Atopospora betulina*) on leaves



Sawfly larva (*Nematus pravus*) on dwarf birch (*Betula nana*)

Photos by Alan Watson Featherstone

The production of montane plants at the TFL nursery leapt forward during 2013. *B. nana* production from Dundreggan seed continued to go well, with over 11,000 plants in cells at the end of the year. Around half of these were large enough for planting out, with the remainder taking two years to grow to a size where the plug is full of roots. We also progressed nursery work with the montane willows. Cuttings from higher elevation populations of *S. aurita*, from both Glen Moriston and Glen Affric, were collected to create stock beds for future harvest. Small stock beds were also planted with local cuttings of *S. lapponum* and *S. lanata*, and some seed of the *S. lapponum* was harvested and grown on. Catkins collected from the wild of *S. lapponum* and *myrsinifolia* did not, however, yield viable seed – perhaps they were collected a little too early. We had help from Les Tucker during the spring with willow species ID and providing some seed of both *S. phylicifolia* (Cairngorms provenance) and *S. myrsinifolia* (Highland mixed provenance); around 3,500 of these were propagated in root trainers, with many large enough for planting out by the end of the growing season. Small quantities of *S. repens*, *S. myrsinites* and *S. phylicifolia* were grown from local Glen Moriston cuttings.

We hope to create new stock beds in the coming year for each of these willow species and provenances to provide material for future propagation from cuttings; we will also attempt to produce seed, by isolating flowering females and hand-pollinating, to grow seedlings of species without hybridization. Having pioneered aspen and juniper propagation over the past decade, the nursery is open for business for montane species!



Members of the Montane Scrub Action Group, TFL staff & champion dwarf birch