Conserving the plants of Ben Lawers

The best-known feature of Ben Lawers is its arctic-alpine flora. The primary reason for the Trust’s acquisition of the property was to conserve this flora. To many people this means the concentration of rare species, the “roll-call of celebrities”. However, these species naturally grow in communities, with a range of other species, and these communities are also distinct entities that are important, sometimes rare features of the Reserve. Our conservation aims are to maintain the natural diversity of both species and communities, the populations of the rare species and the area of important plant communities. These attributes are measurable, at least in theory, thus enabling us to test whether our aims are being achieved. To this end we have established a programme of survey and monitoring, to record the distribution of the species and count or measure their populations, to measure the extent of the important communities and to detect any significant changes. Some later management has been based on results of this work, for example to reinforce species or habitats in decline.

The first record of one of the ‘notable’ species of plants at Ben Lawers was made in 1768, by John Stuart, son of the Church of Scotland Minister in Killin. In this year he recorded the alpine saxifrage, *Saxifraga nivalis*. This pioneering discovery was remarkable, bearing in mind that the readily available literature of today was not available, and the now standard international system of naming plants and animals had been only recently established. For such species, hitherto unknown in Britain, there would be no English name. Twenty years later, John Stuart was still discovering notable species here, with the first record of alpine fleabane, *Erigeron borealis*. Today this is one of our rarest plants.

The vascular plants of the reserve (flowering plants, conifers and ferns) include 17 or 18 nationally rare, ‘red data’ species, (see right) defined by their presence in no more than 15 of the 10km squares of the national grid. This rather arbitrary, simplistic criterion takes no account of population size or even the number of distinct populations, so needs further qualification with categories ‘lower risk’, ‘vulnerable’, ‘endangered’ or ‘critically endangered’. Of the Ben Lawers rarities (vascular plants) nine are ‘lower risk’ nationally, eight are vulnerable nationally, while none are endangered or critically endangered in national terms. However, within the reserve, several species are critically endangered or endangered, including some that are not even rare at a national level, and one has apparently become extinct. The site is equally if not more important for its ‘lower plants’, the lichens and mosses. With a large number of species, c. 500, and a huge concentration of national rarities and even endemics, Ben Lawers is arguably the most important individual site for lichens in Britain, and several mosses are found nowhere else in Britain, e.g. *Hypnum revolutum*, photo left.

The nationally rare species of vascular plants are:

- Alpine Woodsia*  
  *Woodsea alpina*
- Dickie’s bladder-fern*  
  *Cystopteris dickieana*
- Alpine gentian*  
  *Gentiana nivalis*
- Drooping saxifrage*  
  *Saxifraga cernua*
- Alpine fleabane*  
  *Erigeron borealis*
- Mountain bladder-fern  
  *Cystopteris montana*
- Highland saxifrage  
  *Saxifraga rivularis*
- Mountain sandwort  
  *Minuartia rubella*
- Snow pearlwort  
  *Sagina nivalis*
- Scottish pearlwort  
  *Sagina x normaniana*
- Alpine forget-me-not  
  *Myosotis alpestris*
- Woolly willow  
  *Salix lanata*
- A dandelion  
  *Taraxacum cymbifolium*
- Bristle sedge  
  *Carex microglochin*
- Scorched alpine sedge  
  *Carex atrofusca*
- Close-headed alpine sedge  
  *Carex norvegica*
- False sedge  
  *Kobresia simpliciuscula*
- Alpine bartsia  
  *Bartsia alpina*

* Scheduled in Wildlife and Countryside Act 1981

† Now thought to be extinct on the Reserve.
Threats to rare plants on the Reserve

Threats to the survival of the species are various. Many of these species are naturally rare, confined to very special habitats in extreme conditions high on mountains. The total area of such habitats is very limited in Scotland, with discrete sites often being widely separated, such that plant populations are often totally isolated from the rest of their species. A declining population cannot be reinforced by another population if it is so isolated.

Collecting of specimens of plants was popular in the 19th and early 20th centuries, and has been a threat to some species with very small populations. Collection of very rare and legally protected species has been recorded at Ben Lawers during the 1980s and 90s, including highland and drooping saxifrages, and would almost certainly be a cause of local extinction of the former species without intervention (see right).

Uprooting any wild plant without consent is an offence, and five species of vascular plant at Ben Lawers are given total protection under the Wildlife and Countryside Act. Irresponsible criminals have still collected plants of at least two of these species, although many such crimes may well go unrecorded. With such rarities scattered over a 9-mile stretch of nine mountains, it is of course impossible to protect them by surveillance.

Another potential threat arises from recreational use of the hill. Walkers will readily see the scars created by their predecessors: areas where all vegetation is destroyed. Indeed, the vegetation on high ridges, where most walkers go, is very fragile. The mosses and lichens that often make up most of the sward may be destroyed by a single footstep, but no plant can withstand the repeated trampling that occurs on a popular hill. Any specially wet areas are also particularly vulnerable, yet some such places are the habitat of some of our rarest species. Given the expectations and right of access to our properties, the only management techniques open to us for this are those of footpath management. These are described in our paper on ‘Footpath Management’.

A case of ‘species recovery’ work (undertaken to forestall a terminal threat) is the Highland saxifrage, Saxifraga rivularis. We have good evidence of a marked decline in the 20th century, from a very small concentrated population to a single remaining plant by 1989, and of collecting being at least a contributory factor in this decline. With no chance of an unaided recovery, we have tried to prevent extinction by propagating and planting new individuals on the Reserve. The first planting was in 2004, and the new plants will be monitored to measure success. A successful project would be the recovery of a viable population able to sustain itself in the future.

What is it that compels individuals to collect rare plants, almost certainly knowing they are committing an offence? This drooping saxifrage plant was uprooted in the 1980’s, in spite of being ‘fully protected’ by listing in Schedule 8 of the Wildlife and Countryside Act, 1981. This distinctive plant, in a location well known to Reserve staff, disappeared, leaving just a small hole as evidence of its existence.
However, the most ubiquitous threat on the Reserve is the heavy grazing and browsing by herbivores, such as sheep and deer. This has resulted in a massive decline of the taller species (trees, large shrubs and tall herbaceous plants), most of which are now confined to inaccessible ledges on cliffs. These ledges do not offer sufficient space to accommodate a good population of many of the species. The instability means that remaining plants often don’t survive to their potential life span.

Several species, especially willows and juniper, are in a terminal decline to extinction. Woolly willow, for example, has been reduced to two female plants within the Ben Lawers and Tarmachan area, neither on Trust property. (Details of the measures taken to conserve them are given in the paper The Ben Lawers Treeline Woodland & Montane Scrub Project.) Some very short plants, such as dwarf herbs, may compete well and thrive under such conditions.

Grasses also compete well under grazing, as their growing point is at the base rather than the tip of the shoots.

Large areas of the hillsides are now a species-poor grassland, dominated by a coarse, tufted species, mat-grass. It is believed that this dominance is the result of intensive sheep-dominated grazing. Indeed, an eye-witness account from 1799 reported the “extirpation of heath” on the hills of Perthshire, and on Ben Lawers “the verdure extending to the very summit”, both associated with the “introduction of sheep on a large scale”.

This is evidence of major changes in the vegetation, “occasioned by the sheep themselves”. It is likely that burning also contributed to this process.

However, while tall plants may be damaged or eliminated by grazing, dwarf plants may gain advantage by the removal of their competitors. Some of the notable plant communities, especially ‘alpine calcareous grassland’ (see next page), are created partly by grazing and would not exist in their present form without it.

This particular grassland is rich in dwarf herbaceous plants, including some scarce or rare species, and is one of the important features of Ben Lawers and the other Breadalbane hills. Trials have shown that removal of grazing leads to the development of taller vegetation, possibly excluding some of the dwarf plants or reducing their numbers. For example, the nationally rare alpine gentian (top left) is maintained at artificially high numbers by grazing, and benefits from the suppression of its competitors. Conversely, the equally rare and important alpine fleabane (bottom left) is confined to inaccessible cliff ledges by grazing, and readily invades the sward below the cliffs when grazing is removed (although when this was demonstrated in the trial, collectors dug up and stole the plants!). Thus the enhancement of one species is correlated with the decline of another, and vice versa. Managing the land to achieve as favourable a result as possible for both species, and for contrasting vegetation types such as tall herbs and dwarf herb-rich grassland, is a long-term challenge for the Trust.
Part of this challenge is the issue of grazing by large herbivores. Why does such grazing happen on the NNR?

A number of grazing rights are held by farmers who own the farms below the head dyke, established when the former Breadalbane Estate was sold in lots in the 1950’s, the sale that enabled the Trust to buy its land on the Ben Lawers range.

As the sheep grazing provides the living for these farming families, it is difficult to make changes to management for conservation reasons, other than within fences. Deer are of course wild animals, indigenous to the area. They are manageable by culling, but this is a medium-term process, often inhibited by the popularity of the hills for recreational hillwalking.

**Monitoring plants at Ben Lawers**

Ben Lawers is renowned for the concentration of rare species of plant that grow there. The best known of these are the ‘higher plants’, the flowering plants and ferns. The Trust acquired the property in 1950 with the primary aim of conserving these species for future generations. This general aim has been expressed as explicit, measurable objectives for management, e.g. to maintain the populations of rare species and the diversity of species and their habitats.

Conservation of living species requires a considerable knowledge of their populations, where they are, how numerous they are, and of the factors affecting them in both short-term and long-term changes. With so many threats to our native species we particularly need to know whether those we look after are healthy, i.e. whether current conditions are allowing them to survive for the future, or whether there is a decline that may result in a danger of local extinction. Surveys involve counting, if possible, or some way of assessing abundance, and mapping all known locations, with annotated photographs to help identify and refine specific sites.

To test whether we are succeeding in our objectives we need to gather information on the distribution and abundance of species, and repeat such surveys at intervals, in effect to carry out a regular census, just as our government does for the nation’s human population.

When the numbers are recorded, we also have to interpret them to identify long-term trends rather than short-term fluctuations that are natural features of wild populations living in dynamic habitats. These are especially characteristic of mountains. This may require additional studies to understand the changes during the intervals between the less frequent surveys. For example, such a close study was made of the snow pearlwort, after initial fears that it may have disappeared from the Reserve.

A set of 10 study plots were examined in detail, annually, over a 14-year period. This showed that the habitats were dynamic and unstable, leading to small-scale catastrophic events affecting the populations. But while one local population was declining or becoming extinct, another was increasing at a comparable rate, thus compensating, to allow the overall population to remain stable. Similar dynamic changes have also been observed in other species, such as mountain sandwort.
This all adds up to a labour-intensive, time-consuming and therefore expensive project. While some species can be counted as individuals, with special techniques developed to enhance the accuracy of counting, others cannot be so counted, for various reasons, and different methods of detecting change must be devised, often adapted for each case.

In some cases no practical method has yet been found, but the main constraints on progress are usually time and money. However, over two decades we have shown that many of our rarest species have stable populations, although not necessarily at a favourable level, but others are declining towards extinction.

In the latter cases management is being undertaken to reverse the process, for example as with the willows, described elsewhere. Monitoring is again necessary to measure success in such active management, or to inform further changes if success is not achieved. Several of our rarest plants have been monitored in some detail, except for the alpine gentian, which, as an annual rather than a perennial species, has denied us a reliable and time-efficient method of census.

**Special plant communities**

While individual plant species will be adapted to certain environmental conditions, a range of species with common requirements will grow together as a recognisable community. These are named and classified, and constitute many of the named features of the Reserve that we aim to conserve. The following are just a few, those that are considered the most important at Ben Lawers, because of their extent there and their rarity on a European scale. Those that are not in good condition need to be improved by management.

**Cushion grassland**

This remarkable species-rich community is dominated by ‘dwarf herbs’, plants of very low stature. The two cushion-forming arctic-alpine species, moss campion and cyphel, are prominent and give the name ‘cushion’ grassland. The closely cropped sward is the habitat of rarities such as the alpine gentian, and other species such as alpine mouse-ear and Sibbaldia. The habitat is one of the most striking features of Ben Lawers and other neighbouring hills of the Breadalbane district.

**High altitude flushes**

These areas of cold water seepage are enriched by minerals dissolved from the base-rich rocks. A range of sedges, rushes and mosses often occur with yellow saxifrage; some are national rarities.

Bristle sedge, for example, is not found anywhere else in Britain. The mineral soil is often only partly covered, with the cover of vascular plants below 50%.

The ground is soft and very easily poached by either hooves or boots. The pattern of drainage is crucial to the condition of these sites, some of which have been irreparably damaged by the use of all-terrain vehicles. Even a bicycle wheel rut can alter the drainage and affect the plants. Wheel-ruts have obliterated the bristle sedge, our most notable plant, from some flushes.
Tall herbs
This spectacular community is so vulnerable to grazing that it only survives on inaccessible ledges, and thus is much reduced from its natural, potential distribution on the Reserve. Enhancing it is a major target of our conservation work, along with willows (below), and is at present dependent on the use of fencing for protection.

Many of the species are not specially adapted to mountain environments, but occur at both high and low altitudes. At higher levels on the hill, there are alpine species occurring together with some of the more widespread species. With this combination, the planned birchwoods are likely to be the most herb-rich in the Highlands.

Willow scrub
This is one of the most endangered vegetation types in Scotland, almost entirely restricted to ungrazed cliff ledges. It is so sparsely scattered at Ben Lawers that most plants are single or in very small groups only. The most constant species generally is downy willow, on Ben Lawers often occurring with dark-leaved willow. Only mountain willow (bottom right) is abundant in some parts of the Reserve, probably due to its dwarf growth-form, enabling it to tolerate browsing, although it is scarce at a national level.

All the other constituent species are reduced to a few individuals, close to extinction. The restoration of this community is the target of a major part of our conservation work, with treeline woodland and tall herbs.

Plants in crevices on lime–rich rocks
This habitat is hardly recognisable as a plant community, unlike the others, because rock crevices are often widely separated, narrow fissures unconnected to each other.

The plants therefore tend to be more isolated than in the previous four types of vegetation.

Some notable examples are alpine woodsia, drooping saxifrage, alpine saxifrage, mountain sandwort, rock whitlow-grass and mountain bladder-fern.

These species do not all grow together in any one place, but in one very high area four of them do occur in fairly close proximity.
Conservation on display: the Nature Trail

The easiest place to see conservation in progress is on the Ben Lawers Nature Trail. Here you can find examples of plants and animals that had been previously wiped out by grazing and browsing. Once you approach the Edramucky Burn, via the main path, most of the trail is within an exclosure (a fence built to keep out sheep and deer). Since 1990, vegetation in the exclosure has been developing slowly into a more varied and structured form. The contrast between this and the vegetation on the other side of the fence is obvious - and the difference is not only in the plants: insects and birds are now exploiting the new woodland and scrub habitats. The exclosure around the Nature Trail is just one of five, each built to conserve woodland, scrub and tall herbs within Ben Lawers NNR. In the long term, we hope to extend this work to other areas using overall control of grazing rather than fencing.

It is thought that the altitudinal limit to normal tree growth is at the level of the top of this exclosure, around the lip of Coire Odhar. There are perhaps only one or two sites in Scotland with a vestige of woodland extending up to the natural treeline; if the treeline was a recognised habitat it would be critically endangered or extinct. Here we aim to restore the natural continuum of vegetation: a herb-rich birchwood, like the vestiges on cliff ledges, grading into scrub at the top, with areas of tall herbs dispersed throughout in suitable sites, similar to that which can still be seen in other parts of Europe. This process is now happening, at its natural speed, within the conditions created by the fence. If you were to make repeated visits you would see the changes taking place. We believe that this will, eventually, offer visitors a unique and rewarding experience that is currently virtually impossible to find in this country.

The rowans in the exclosure were all naturally seeded, not planted. The seeds are introduced by birds, such as thrushes, that feed on the hillside. The berries will provide even more food for the birds, so maintaining the process of regeneration.

Common plants such as wood anemone can now flower more profusely within the fence, often forming a carpet of colour.

Birch trees have been planted, as virtually no seedlings were present on the site in 1990. The planting has been very patchy and uneven, with clusters leaving much clear, open ground and a mosaic of different types of vegetation.

A steep-sided gorge like this one has trees, shrubs and tall herbaceous plants growing on its sides. When compared to areas that have been grazed, the effect of long-term grazing becomes clear. The gorge demonstrates at least some of the species that grow in places that grazing animals can't reach. Many such plants are regenerating naturally within the fenced areas of Ben Lawers NNR. Some, however, such as the shrub willows, have been unable to produce sufficient seed. To overcome this problem, Ben Lawers staff collected seed from elsewhere and grew young trees for planting in the protected exclosures.
Further reading

Various authors. *Ben Lawers*. The National Trust for Scotland.


