

**MONTANE
SCRUB
ACTION
GROUP**



Scrubbers' Bulletin 12



Scrubbers' Bulletin No. 12. December 2015.

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

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Cover photo: Downy birch at 1000m asl Saunarhaugen, SW Norway.
Photo above: Norway study tour group and hosts, Anuglo, May 2015.
Photos by A.W. Featherstone.

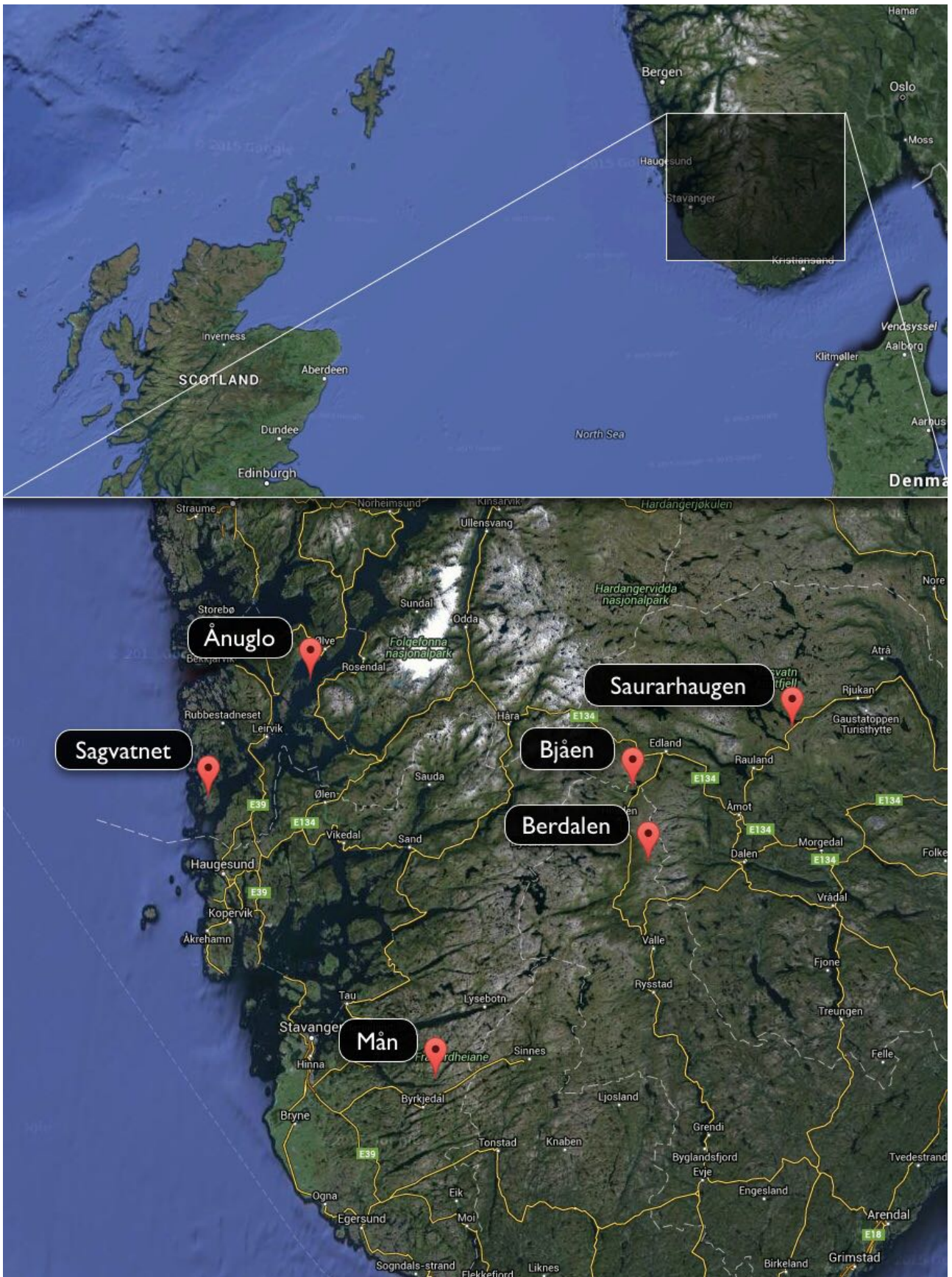
Welcome to issue number 12 of the Scrubber's Bulletin, the Norway edition

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

This issue is largely about the Norway study tour of May 2015. We are grateful to the authors and photographers for their contributions, and welcome potential articles and images for future issues.

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Map showing locations visited SW Norway May 2015.

Introduction.

Alan Watson Featherstone

Executive Director, Trees for Life.

The contrasting state of the landscapes in the Highlands of Scotland and Southwest Norway have been known to Scottish conservationists for many years. Just over 300 miles away across the North Sea, in an area of comparable latitude, rainfall, temperature, windspeeds and geology, the land in SW Norway is almost entirely covered by natural forest in which birch and Scots pine predominate, along with abundant aspen and other trees. That landscape provides both a stark contrast with the ecologically-depleted and largely deforested Highlands (and the Southern Uplands), and also a powerful potential model for what habitat restoration efforts in Scotland can aim towards achieving.

While a number of informal visits to Norway have been made by various interested people, it is Duncan Halley, a Scotsman who has worked for the Norwegian Institute for Nature Research (NINA) for over 20 years, and has developed detailed ecological comparisons, particularly with regard to forest cover, between SW Norway and the Highlands.

See: www.nina.no/english/News/News-article/ArticleId/3941

One of the main areas of major contrast between the two regions is with regard to the montane scrub treeline vegetation community, which is widespread, abundant and healthy in SW Norway, but virtually completely absent today in Scotland. As part of its ongoing work, the Montane Scrub Action Group (MSAG) had been considering a study tour for its members to SW Norway for several years, but had been unable to secure the necessary funding for this.

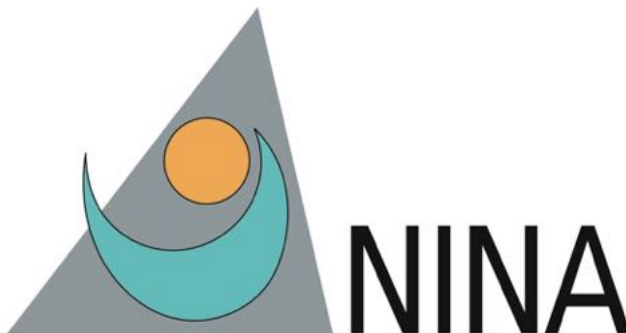
In 2014, Trees for Life, one of the partners in MSAG, decided to fund a weeklong study tour to SW Norway for seven of its staff, and this was planned for late spring 2015. Other members of MSAG then decided to join the trip, and when it took place, between 21 and 28 May 2015, 14 participants took part in it. In addition to Trees for Life, the other organisations represented on the tour were Scottish Natural Heritage, Forestry Commission Scotland, Borders Forest Trust, National Trust for Scotland, Cairngorms National Park Authority and MSAG itself.

Duncan Halley very generously offered to host the tour within Norway, planning out the itinerary and locations to be visited, as well as organising meetings with relevant local foresters and land managers. The sites chosen for the tour were selected to illustrate a range of different forest communities, of varying ages, species composition and developmental stages, and ranging from the coastal fringe woodlands to the montane scrub zone, at 1,000 - 1,100 metres in elevation. The trip was scheduled to provide an opportunity to see the trees and other vegetation in the fresh foliage of late spring, but SW Norway experienced its coldest winter on record in 2015, with exceptionally heavy snowfalls resulting in snow banks of over a metre in depth persisting in the montane areas to the end of May. This was the same jetstream weather pattern that also led to late snow in Scotland. While this prevented observation of the montane scrub plant species in leaf, it did provide for some adventurous walking conditions, and the opportunity of seeing abundant moose tracks in the snow!

The articles that follow have been written by various participants on the tour, and cover the full range of sites that we visited. Much relevant experience was gained about the natural regeneration of extensive woodland and scrub areas that has occurred in SW Norway in

the past century, and this provided very useful perspectives and insights that can inform the work of MSAG and other forest restoration practitioners in Scotland. The success of this study tour also helped to catalyse a subsequent tour for land managers from the Cairngorms National Park to many of the same locations in autumn 2015, also hosted by Duncan Halley.

We are very grateful to Duncan (right) for his tremendous contribution in organising and hosting the tour (as well as for his Norwegian cooking skills!), to all the local people who met with us and shared their expertise and knowledge, and to Mick Drury of Trees for Life for organising all the logistical details from the Scottish side.



Participants on the Norway study tour, May 2015.

Duncan Halley	Norwegian Institute for Nature Research, NINA	
Alan Watson Featherstone	Trees for Life	Executive Director
Alan McDonnell	“	Conservation Projects Manager
Mick Drury	“	Field Projects Co-ordinator
Craig Dickson	“	Conservation Week Co-ordinator
Doug Gilbert (D.J.)	“	Dundreggan Operations Manager
Allan Common	“	Dundreggan Site Co-ordinator
Jill Hodge	“	Dundreggan Project Co-ordinator
Diana Gilbert (D.)		Consultant, MSAG chair
Giles Brockman	Forest Enterprise Scotland	Environment Manager
Richard Thomson	Forest Enterprise Scotland	Ecologist
Phil Baarda	Scottish Natural Heritage	Woodland Advisor
David Hetherington	Cairngorms National Park Authority	Ecologist & TfL board member
Andrew Warwick	National Trust, Scotland	Warden/Ranger
Tim Frost	Borders Forest Trust	Site Manager
Lynn Cassells	Borders Forest Trust	Site Officer

Arrival. Mån, Fidjadalen 21st May.

58° 51.532'N 6° 23.332'E

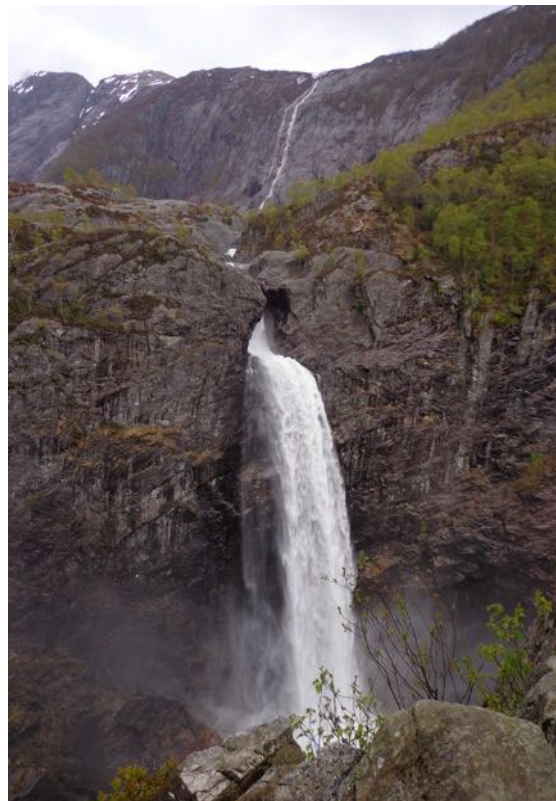
Lynn Cassells

On our arrival to Norway, we had a short drive inland to Fidjadalen. Our journey through wooded valleys was already giving us a flavour of what to expect from our Norwegian trip. We met with Auden Steinnes, our guide for the day, who works for the Rogalund Department of the Environment, and had a brief chat in the car park to set the scene. The area is quite similar to the West Highlands with a mostly acidic bedrock, low in nutrients, and a very wet climate with over 280 days annually of precipitation. It is a good area for oceanic plants, in particular mosses and lichens due to the milder temperatures and high humidity levels. Most of this land is owned by private individuals.

Auden gave us a brief history of the area explaining how, like many other parts of Norway, it was subject to man-made deforestation, with evidence of charcoal in the same layers as *Calluna* and tree roots in peat. Pre-deforestation there would have been a mix of oak, alder and pine in the valley bottom with birch, oak, alder and even some ash, elm and lime spreading up the sides. Underneath there would be a diverse flora which would include patches of grass, ling heather and mire. Following the start of farming in the area, the changes were quite dramatic; the valley bottom would have been occupied, with a farm steading and associated buildings, and the fertile ground used to grow crops and keep stock. Trees, mostly birch and oak, would only have survived on the more inaccessible slopes and ling heather only at the top, with grass dominating in other areas. The landscape as it is today is post farming – what has regenerated following the removal of stock and managed field systems. Around us species such as birch and rowan were dominating and in terms of wildlife, Auden explained that capercaillie are very common, pine marten numbers were on the increase and there are populations of both red and roe deer in the area.

After loading up with 2 days worth of food for the group, we began the hike up a steep rocky hill. We had a brief stop mid-way to look at the impressive Månafossen, a 90 foot waterfall throwing a torrent of water down a steep rock face (the third best in Norway ... see <http://www.world-of-waterfalls.com>). We continued on until we reached flatter ground and eventually a view of the beautiful mountain lodge we would be staying in. Now owned by the local hikers association, it was previously a farmhouse at 320m above sea level. After we settled in, unpacked and had the all important cup of tea, we split off into a number of groups for a quick explore of the valley before dinner.

As well as getting a better idea of the mix of tree species, with generally birch and juniper dominating and rowan more evident higher



up, we were able to take the time to investigate what else was around. We found lots of juniper bushes with *Gymnosporangium clavariiforme* tongues of fire fungus, but struggled to find its counterpart host hawthorn. We started to get a better idea of the flora of the area and found twinflower *Linnaea borealis* and ostrich moss *Ptilium crista-castrensis*, both frequently associated with pine woods in Scotland. We also came across oak fern *Gymnocarpium dryopteris*, beech fern *Phegopteris connectilis*, chickweed wintergreen *Trientalis europaea*, bog rosemary *Andromeda polifolia* and interrupted clubmoss *Lycopodium annotinum*.



After a long day we settled down to a superb meal prepared for us by Duncan. We sampled the traditional Norwegian dish of Sodd, small meatballs in a watery soup with potatoes and vegetables on the side. It really did hit the spot after a long day. We'd also sampled some of the 4m of annual rainfall this area receives so it was heartening to light all the woodstoves and dry out in the warmth of the old farmhouse.



Fidjadalen 22nd May. Through the birch belt and into the scrub zone.

Richard Thompson

We left Mån Farm early and headed for the densely wooded glen. The farm lies at 320m asl and our walk took us to over 600m, above the treeline. Valley sides are steep. Upper slopes are interspersed with precipitous crags and impressive waterfalls whilst lower slopes are covered in boulder scree. Small patches of mire occur on the valley floor and contain abundant bog rosemary. As we walked higher up the glen we headed into an impressive wall of terminal moraine.

Woodland on the south-east side of the valley appeared to have limited diversity, being composed largely of downy birch (sub-species *odorata*). There are also occasional large goat willow (possibly hybridised with grey willow) and rowan. Frequent common juniper occur along the bottom of the valley and these appeared to be in very poor condition, many having fruiting bodies of *Gymnosporangium*. There was some diversity in the vascular plant ground flora including abundant bog blaeberry and may lily. There was modest diversity in the bryophyte flora (including abundant *Ptilium crista-castrensis* and what I took to be *Anastrepta orchadensis*).

Once across the terminal moraine (an interesting route, with boulders the size of small family homes) we were immediately impressed by the increase in diversity and growth rates on the south facing slopes. Tree species here include bird cherry, hazel and aspen. Ground flora is also more diverse and includes abundant twinflower, serrated wintergreen and cow wheat. I have never seen such a stark contrast as a result of aspect. Willow grouse (the same species as our red grouse) droppings were seen well inside the dense woodland.



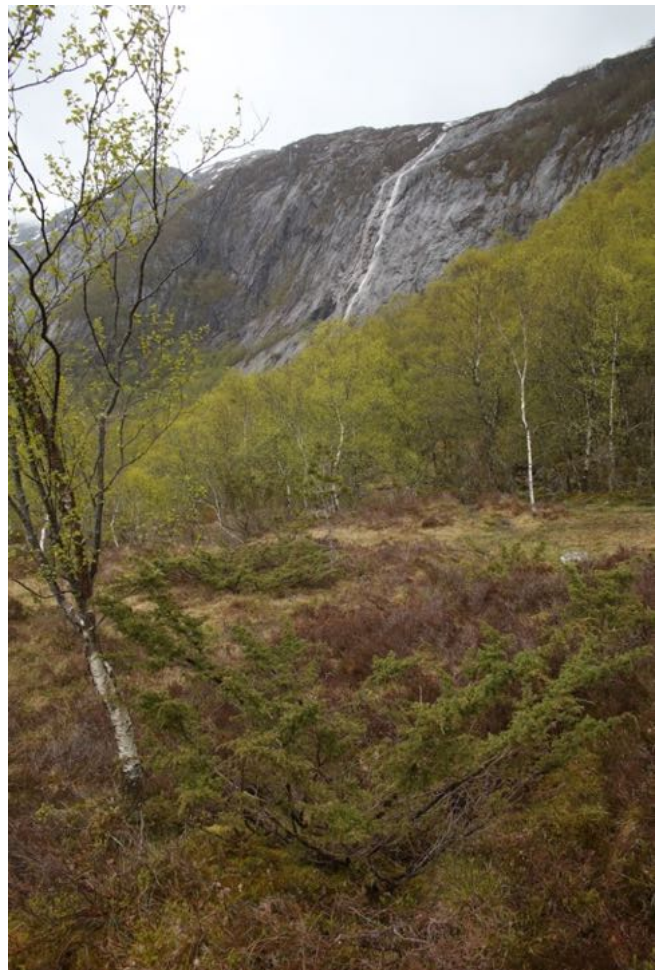
A contingent of the more waterproof members of the group headed upwards to the treeline whilst the remainder kindly headed back to warm up the farm with its many stoves and to commence cooking the Sodd. We emerged out of the sweet smelling birchwood at around 580 metres. Here prostrate juniper grew in amongst multi-stemmed, low growing downy birch. Twenty metres higher up, the amount of juniper increased (many female plants) and the occasional rowan could be seen growing tall, less influenced by the exposure and, presumably, less prone to the mechanical effects of the snow.

At around 560 metres, we encountered the first snow patches of the trip. By 580 metres on our downward path back to Mån Farm, we began the oft repeated ceremony of falling through the snow up to our waists. Crossing what I at first took to be clearings in the birchwood and clambering for support, we found



ourselves stepping onto procumbent downy birch, bent under the snow and, on occasions, snapped. In clear patches, we began to notice the “damage” caused by the snow and the resultant multi-stemmed form that most of the higher elevation birch took. Above the treeline, bog rosemary grows in amongst wet sphagnum, deer grass and hare’s tail cotton grass, all in small rock hollows with dry heath in-between. A ring-ouzel was spotted singing from one of the few rowans.

What was the genesis of this woodland and scrub? Despite the remote location of the farm and the difficult access, it was inhabited until 1915, in the last 10 years worked by two widowed sisters and their children. At the beginning of the 1900’s there were 50 sheep and 8 cows at this farm. There were 3 other farms in the glen. Information in the old farm described clog making and stripping bark off tree branches to feed the animals. This suggests that some accessible trees remained within the landscape. Berries were an important source of food, suggesting that grazing levels were not excessive enough to stop flowering of shrubs. The main source of fuel for the farm was peat, suggesting a lack of firewood – hard to believe now. The peat was largely harvested from the plateau high above the farmstead, a considerable feat of labour.





The landscape around the farm at Mån in 1927 and, below as it is today.



There are the remains of hydro-powered sawmills (originating around the 16th-17th century) in the area suggesting the presence of substantial, close grown trees at that time (assumed to be Scots pine). The lack of old growth indicator lichens throughout the day was very noticeable, even on well lit trees with highly suitable bark such as aspen and goat willow. This suggested a break in continuity of woodland cover at the landscape scale. So, the evidence for the extent of woodland cover prior to the generation of the current forest is inconclusive and appears to be slightly contradictory. There must surely have been a substantial number of seed trees in the landscape prior to the drop in livestock numbers as upper slopes are so precipitous – reminiscent of Glen Coe and the woody fragments that cling to the slopes of Bidean nam Bian. This, combined with the dominance of free-draining mineral slopes must have been conducive to the sudden colonisation that undoubtedly took place.

Sheep still graze within the woodlands but their numbers are substantially less than they would have been 100 years ago, around 1000 head each summer now. There are no cattle today. However, there were signs that the number of red deer and moose are beginning to increase. Duncan showed us how to identify moose browsing and, once we had our eye tuned into this, it was evident in much of the mid and upper slopes.

It was really fascinating to visit this glen with a climate similar to parts of Scotland (latitude level with the southern tip of Orkney) and a landform not unlike Glen Coe and Glen Shiel and I guess that, given a sudden drop in grazing and browsing levels in these locations, there may be a similar result from natural processes. I was less certain how this example would apply in more typical parts of upland Scotland with the greater extent of peat, leached mineral soils and all-but absent seed sources. Norwegians mourn the loss of open habitats and their cultural landscapes. I was left with the impression from this visit that, in general, we should not expect such an overnight transformation if the number of ungulates sharply declines in Scotland as it did a century ago in Norway.

Bykle 23rd May. Tracking reindeer.

59° 38.407'N 7° 25.738'E

Craig Dickson

We drove on from Fidjadalen, with a lengthy detour because of snow blocking our route through a mountain pass, to arrive at Bjåen, a hamlet in Bykle in Aust-Agder County. We were based in the Bjåen tourist lodge for three nights, a converted farmhouse and barns providing luxury accommodation heated by biomass. There were some interesting antiques and memorabilia from an earlier age, including a trophy cabinet with a stuffed golden eagle. Duncan raised the saltire to celebrate our arrival.

After dinner on the first night a small group headed out to explore the surrounds. There was about a metre of snow on the ground, that made the going challenging with some of the



group members falling through the crust up to their waist on a regular basis. Very quickly we crossed a number of wild reindeer *Rangifer tarandus tarandus* tracks in the snow and spotted a small herd on the skyline with the sun setting behind them, a beautiful site after a long day. The herd quickly disappeared over the skyline so we stalked, not so quietly, up to the horizon and lay out of site watching them from a few hundred metres away.

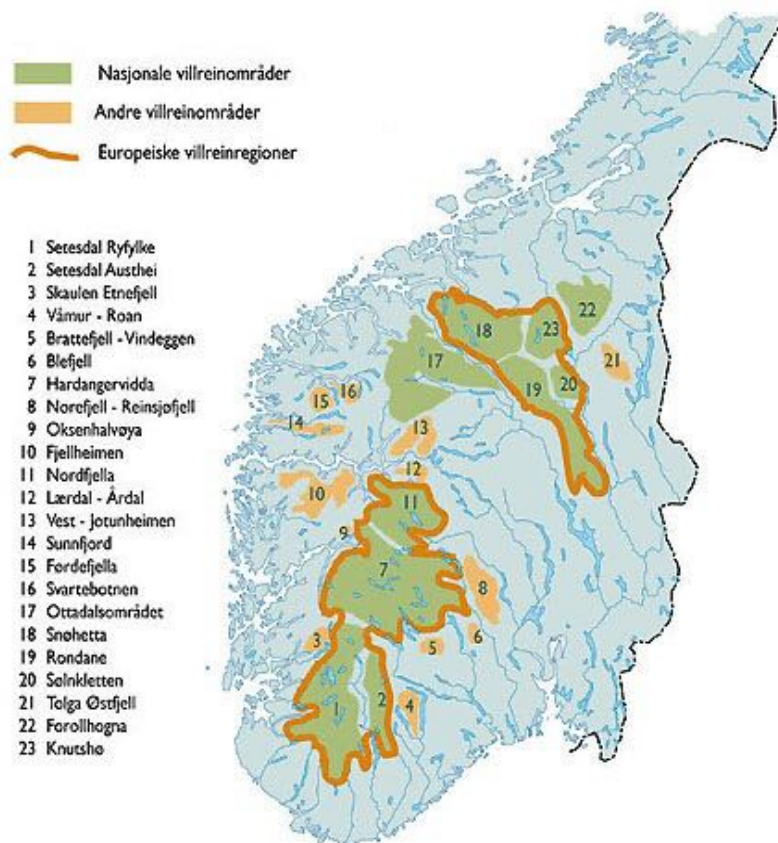


The reindeer were grazing on an exposed area, most likely on lichen (constitutes 40-80% of their diet), dry grass and/or shrubs. In summer their diet also includes, herbs, grass, leaves of dwarf shrubs and some lichen found at higher altitudes, where there are less insects.

In Norway, the original wild reindeer mountains were in four main regions with clear climatic differences from west to east and from south to north. The mild, high-precipitation areas along the coast were good for calving and spring/summer grazing grounds, while the cold, low-precipitation inland areas provided attractive winter grazing with little snow and large amounts of lichen. The reindeer historically migrated between these areas, however due to the presence of infrastructure such as railways and roads there are now impassable barriers that block the original migration route between east and west. In addition, there have been a number of encroachments and disturbances, which have led to the four original regions now being fragmented into 23 separate areas (see map). Today there are roughly 30,000 wild reindeer in these areas in southern Norway covering some 35-40,000 km². They are managed by hunting with the season starting around 20 August and lasting until the end of September.

Apart from the subgenus of *Rangifer tarandus fennicus* in Finland and the arctic reindeer on Svalbard, Norway today holds more than 90% of the wild Reindeer in Europe (including north west Russia). The largest population of between 6000-7000 is found in Hardangervidda area, which our group was on the southern end of. This population serves as a reservoir for wild reindeer in Scandinavia.

Reindeer can be 160-220cm long, with a shoulder height of up 80-150 cm and live up to 18 years. A bull can weigh up to 300 kg, with a slaughter weight of 50 to 140 kg. The female is considerably smaller. Both sexes grow antlers, typically



having two separate groups of points, a lower and upper. The antlers of a reindeer bull are the second largest of any extant deer, after the moose, and can range up to 100 cm in width and 135 cm in length; they have the largest antlers relative to body size among deer.

Wild reindeer need to have large, continuous mountain areas if they are to be ensured good conditions for survival into the future. The Wild Reindeer Society runs a broad-based project focusing on the challenges facing future management of the animals. The project proposes establishing nine national wild reindeer areas within Norway, and to underline the country's international responsibility, two European wild reindeer regions (outlined in orange on the map). Through focusing on safeguarding the habitats of the wild reindeer and increasing people's awareness of their value, the Society aims to ensure that the mountains of Southern Norway will continue to provide refuge for viable populations in the future.



Norway also has a large population of domesticated reindeer herds, managed by the Sámi. Domesticated reindeer are shorter-legged and heavier than their wild counterparts. See <http://reindeerherding.org/herders/sami-norway> for further details.

Scotland probably hasn't seen wild reindeer roaming freely for over 8000 years, due to climate change, over-hunting by humans or a combination of both. The establishment of free-ranging semi-domestic reindeer in the Cairngorms since the 1950s is frequently and mistakenly referred to as a reintroduction. The two extant herds are owned by The Reindeer Company and as well as receiving some veterinary care they receive supplementary feeding as a management tool to discourage distant dispersal.





Reindeer herd at Bjaen early 20th century and, below, the farm area today.



Diana Gilbert

Wonderful as it was to see the snow it did mean we were not experiencing the willow zone or treeline. So on Sunday morning we drove north and east to search for open ground on a high plateau area with wooded ridges above low ground of open water and peat mires, much of which was still snow covered. The road (37 Rjukanvegen) in this area was running south-west to north-east at about 950 m asl., and there were very few huts to be seen, but there was a built track running north-west from the road which promised access to the vegetation on the west of the road. It was being used by locals for recreation and we watched, fearing the worst, as one brave soul attached his three sled-dog German pointers to the front of his bicycle and hurtled off down the track at full tilt ... but he did return in one piece with lathering dogs about 15 mins later.

The track on the western side of the main road appeared to run along the boundary between the lower, wetter ground and a ridge with downy birch woodland. The lower ground, immediately south of the track was clothed in ericaceous plants including heather *Calluna vulgaris*, crowberry *Empetrum nigrum* agg, cowberry *Vaccinium vitis-idaeus*, with abundant dwarf birch *Betula nana* and the ubiquitous juniper *Juniperus communis*. On the north side of the track the vegetation gave the appearance of a sea of lichens (most unknown but including *Cetraria islandica*) with dwarf birch, and the occasional juniper, emerging out of it. The dwarf birch tended to have short growth with thick stems and large buds, and although the foliage was lacking on several the male catkins were beginning to open. We also encountered a dead lemming (found by Doug) along this edge, a "lifer" for



many of us, and a surprise to see how small they are. The track was of fairly standard construction, elevated with drains along each side and these had exposed mineral soils with a shrub willow, *Salix lappounum* or *glauca* scattered along them. One examined had male catkins just opening but also was host to rose galls (possibly the gall midge *Rhabdophaga roseum*). On the north side of the track the ground was more variable, gradually rising to a glacial ridge, which was clothed on the south-facing slopes in scrub birch, and, to the north and east, over-looked a complex area of open water, mire and further glacial ridges.

Despite the altitude and the apparent 'unmanaged' appearance of the area there was evidence of human use, including the route of an old track winding between the trees. It might have been over 50 years old, although the depressions

of the wheel tracks were still evident. Duncan explained that it was no longer permitted to take motorised vehicles off-road, although, as with many such 'rules', there will be exceptions. We also encountered a two to three meter diameter pit which had evidently been excavated; the immediate thought was that it must be a charcoal pit, but this was not confirmed and its use was unknown. And so to lunch sitting at the top of a glacial ridge enjoying the northern light over the wetlands, watching the waterfowl in front of us and discussing what we'd just seen.

In the afternoon a group of us walked up to the high point, Sauarhaugen at 1120 m asl., on the east side of 37 Rjukanvegen, following the birch-clad ridges. The lower ground was similar to that already described but we also crossed small soligenous mires between the successive ridges with interesting vegetation including few-flowered sedge *Carex pauciflora*, a cranberry, probably *V. oxycoccus*, and *Sphagnum* species. The "scrub" birch generally had single stems, 3 to 4 m tall, which provided sufficient cover to allow us a magical view of a male goshawk flying overhead between their crowns. There were occasional Norway spruce and stunted Scots pines. We passed a number of wood ant nests in the upper parts of the wood, variously decorated with vole, grouse and fox droppings and two of which had a few cold but valiant active workers.

The scrub birch gave way, as we approached the high point, to heath-dominated vegetation, eventually demonstrating the effects of altitude and exposure on the top with the presence of creeping azalea *Loisleuria procumbens*, arctic bearberry *Arctostaphylos alpinus* and three-leaved rush *Juncus trifidus* growing on very shallow gravelly soils. Dwarf birch was still present but even more bushy and prostrate than the less exposed plants near the road. Close to the summit a few more of the shrub willows seen in the ditches at the track-side were evident on less accessible, sheltered ground.





Back at Bjåen, after a welcome supper, various groupings of participants set off to further explore the area around the accommodation. The scrub birch woodland (*Bjorkebelt*) lined the road to the farm on the south-facing slopes which were home to a number of bluethroat *Luscinia svecica* much to everyone's delight, both visually and aurally. Above and on north-facing slopes snow still ruled supreme. On the south-facing slopes the snow melts first around the base of the trees, perhaps due to the increased heat absorption of the wood, resulting in deep holes around their trunks. This melting also revealed evidence of activity to maintain open grazing ground around birch immediately behind the farm on the edge of the dense woodland. There was a large expanse of water to the north of the access road to the farm which held waterfowl and was a regular evening access route for a fox.





Berdalen. 25th May. 59° 26.555'N 7° 30.564'E

Mick Drury

Our day in the Scots pine forest of Berdalen felt like walking up through Glenmore. Indeed this area was chosen as a good comparison with the Cairngorms granitic geology, with similar rainfall, wind speeds and temperature patterns. This is a big landscape, forested now, but with an earlier farmed history. A few granny Scots pines stand as testimony to time, but most pine has regenerated within the last 50 years or so. It was just like Scotland ... the pines, birch, juniper, aspen, willows, areas of open bog and wet heath, burns to cross, impressive anthills. Except there were piles of moose pellets, and lots of capercaillie droppings; some folk flushed caper at one point. There were willow warblers, song thrush, redstart, black grouse, a pied flycatcher, a willow tit; a dead lemming. Rowan is noticeably absent and the lack of bog myrtle inspired speculation as to peat depths and soil nutrient status. Holly is absent, a possible post glacial effect.

Historical records and place names show that the surrounding lower slopes were managed as hay meadow and pasture until the early/mid 20th century; they are now well into succession to young forest. Presumably, given the open nature of the forest and the frequent young pines, this was until recently a wood pasture landscape. Old axe marks on some of the pines, possibly for fir candle, and occasional stumps, probably cut by hand, provide evidence of a former cultural landscape.



Up into the birch zone, the *bjorkebelt*, downy birch becomes more frequent as the pines phase out; most is multistemmed, increasingly broken and twisted with altitude, wind blasted and snow damaged. Occasional Norway spruce are found through the forest, on higher elevations than the pine. We had lunch up at the mountain hut of Berdalsbua at around 1050m. Norway has a very civilized network of huts. Providing comparative ease and luxury for the walker, we found a fully stocked larder, a gas cooker, woodstove with fuel, compost toilets, even duvets on the bunks. Payment is retrospective on an honesty basis. We could have holed up there for weeks!



Climbing higher up above 1100m we were now in the scrub or willow zone, the *vierregion*, with prostrate downy birch, juniper, patches of dwarf birch and montane willows, bearberries and crowberry, diverse lichen communities, all in an intimate mosaic. There was evidence of moose, roe deer, or possible reindeer, and hare up here. The willows, *Salix lapponum* or *glauca*, were preferentially browsed, but protected in places within clumps of dwarf birch. Here the willows were growing in dry heath communities yet accompanied by dwarf birch which is mainly found associated with blanket bog in Scotland. A pair of eagles were spotted gliding along the distant crags opposite, prompting discussion on how these birds don't need the open mountain landscape they're associated with in Scotland.



Some reflections were made on the similar landform of the Cairngorms and how we're dealing with relatively small-scale landscapes back in Scotland. We set off downhill considering how could we expand our thinking and ambitions back home?

To the coast. Bomlo, Ånuglo. 26th May. 59° 55.894'N 5° 43.784'E

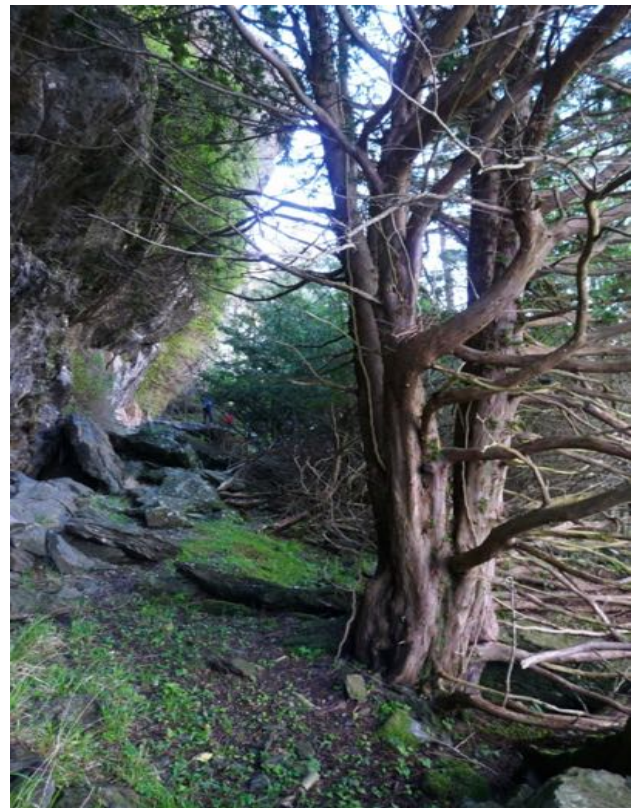
Giles Brockman & Jill Hodge

On the morning of the 26th we set off early from Bjaen, leaving the snow behind and driving over to the coast onto the large island of Bomlo, in Hordaland province. Here, characteristic of the west coast of Scotland, the mountains extend down to sea lochs (fjords) and islands. That afternoon we were hosted by May Britt Jensen and Stein Byrkjeland of the provincial Environment Department, and Ragni Nordas from Statens Naturoppsyn, the Norwegian government nature agency. We were ferried in small groups out to Ånuglo, a nature reserve; three islands and part of a fourth larger island, around 180 hectares in total, are now protected. The principal designated feature is the calcareous Scots pine forest found here, with yew (photo below) and holly.



This area, and most of coastal southern Norway, was largely cleared of woodland by the bronze age. There were periods of regeneration as the recorded history of land use for the islands indicates that the tree cover was removed at least three times since the time of the Black death (c1360). Deforestation was perhaps never as extensive as in Scotland and after each felling the forest has managed to regenerate within a history of farming. Export of timber to Scotland and Holland was significant some 200 years ago. Around 100 years ago, during harsh times for the population, the deer were all hunted heavily, to the point where the roe deer became extinct. Low browsing levels have allowed the regeneration of the forest again over the past century, most trees thus being relatively young with a few older Scots pine of 240-250 years.

The ownership of the islands was transferred from the State Forest Service to the Environment Department in the early 2000's. Now designated for conservation this situation is somewhat unusual in Norway as most protected areas are privately owned and found in the unproductive, mountainous regions. However more of the western pinewood areas are now being designated. Some 15% of the land area of Norway is protected.



The island of Ånuglo is a mix of Scots pine and broadleaved woodland, also with large groups of planted Sitka and Norway spruce; the latter is considered non-native in this area. Some Western hemlock and Grand fir are also present. Measurements found c24,000 m³. The management plan intends to remove the exotics using commercial forestry operations, with timber extraction expected to generate a small surplus; this is important as funding was not available to undertake the work as an expenditure activity. The brash residue will be left to decay and for natural regeneration of native species to recolonise. The management team are aware of the likelihood of secondary regeneration of the spruces and hemlock and that they will have to take action to remove seedlings over a 10 year period, or so. There are issues with Himalayan balsam and *Rosa rugosa*.

The island habitats include Scots pine woodland (akin to W17 and W18) but with a varied geology, including calcareous areas; plants such as cow-wheat, sanicle and twinflower are present in good numbers. There is also a strong component of broadleaved species including ash, hazel, aspen and oak, and the SW of Norway, including here, is the best location for holly and yew in Scandinavia. Stein speculated whether Yggdrasil, the tree of life of Norse mythology, could be the yew rather than the ash. It was a surprise to come across three small leaved lime trees. The island includes pond habitats, breeding sea eagles and, a speciality, the white-backed woodpecker, also breeding.



We paused for a group photo (page 2) beside a rock face where, reputedly, the largest ivy (left) in Scandinavia climbed above us; there were others nearby. During WW2, there was a naval engagement between the German and Norwegian forces, during which a torpedo that missed its target ran ashore and exploded, destroying one of the old ivy plants here.

There was evidence of red deer on the island in the form of well-used tracks and dung, and occasional moose are also present; there are no roe. Although there was browsing and bark stripping on ash and hazel, it was not at a level that was impeding tree regeneration and ground flora. The attitude of the management team was that deer numbers were probably increasing but they were not yet concerned. Hunting is a hugely popular activity in Norway and additional licences will be granted if necessary.

We pondered how much of the forest survived, and for how long, to allow the recent regeneration of trees and associated biodiversity to occur within 100 years? Would this regeneration ever occur in Scotland at similar locations towards the west coast if the grazing pressure was removed - or is there too much peat depth and too few trees to act as a seed source?

Bomlo, Sagvatnet. 27th May. 59° 37.141'N 5° 11.344'E

Alan McDonnell

One last time we steeled ourselves for the ordeal of wading through Norwegian woodland, with its rich structure, bustling birdlife and intriguing history. It was a tough job, but someone had to do it. Today we were in the Sagvatnet area and had the help of no less than 16 friendly Norwegians, including site wardens and senior managers from the Hordaland Environment Department, a lower plants specialist, Hans Blom, from the Forest and Landscape Institute, local landowners and even the Mayor came to join us. They were eager to show us around some of their nature reserves, facing a barrage of questions, and clearly intrigued to learn what we would make of the landscapes they know so well.

They took us first to an area of coastal heathland (photo below) that lies on the same latitude as Fair Isle (Shetland) and is characteristic of the very exposed western Hebridean coasts. An area of open habitat created by thousands of years of farming use, the heathland is highly valued by people from the area as a cultural landscape and as a contrast to the woodland that blankets much of the rest of western Norway. The heaths are now under threat from succession to woodland because sheep and cattle farming in the area has declined steeply since the 1860s, when large scale emigration to North America began. Roughly a third of Norway's population left between 1860 and 1930, with young would-be shepherds and farm labourers prominent amongst those departing. The decline in the rural population here continued after WW2, when the economics of farming made keeping livestock increasingly marginal.



We were on the wet west coast of Norway, where soils have been thinned by past farming and extreme wind events are frequent, but Scots pine, birch and aspen, amongst other species, are returning rapidly. Coastal heathlands received government protection in May this year and the Environment Department has been working hard to incentivise the remaining local farmers to maintain some level of grazing to keep the heaths open and

free of trees. The eagle owl is resident amongst the mixed topography of the land locally and it's considered important to keep some relatively open habitat for the bird. The contrast between the Norwegians' aims for their heathland and the Scottish party's goals to increase woodland was lost on no one, but the value local people place on this cultural landscape was just as clear.

We then drove nearby to walk through one of the richest of all the species-rich woodlands we saw during our week in Norway. The diversity of what we saw caused much head-scratching, a calcareous pinewood. Our brows furrowed at odd species mixes, such as finding pine and hazel standing within a few yards of each other. The ground flora included ancient woodland species like sanicle, dog's mercury and early purple orchid, while the trees held lobarian and graphidion lichens. This was impressive, but nothing unusual, that is until we were told that this woodland habitat was probably a heavily grazed grassland only 150 years ago.

How did such a young woodland come to look so grown up? We directed our perplexity to the locals, who confirmed that, as with much of the rest of western Norway, most of the woodland in this region had previously been felled for fuel or removed by grazing and burning. In fact, as recently as the 1920s, there were fears that Norway would become almost entirely deforested. When pressed further, our hosts, while clearly accustomed to seeing this level of woodland recovery, did add the qualification that small refugia of woodland flora must have remained in pockets of the landscape to enable this level and speed of recolonisation. While the precise extent of these refugia is unknown, all the evidence is that they were very limited and it is clear that these woodlands have come a very long way indeed in just the last 150 years or so.

We retired to the local community hall where we were treated to lunch and Alan W F made presentations to our hosts. The afternoon saw us afloat again, ferried in groups across to

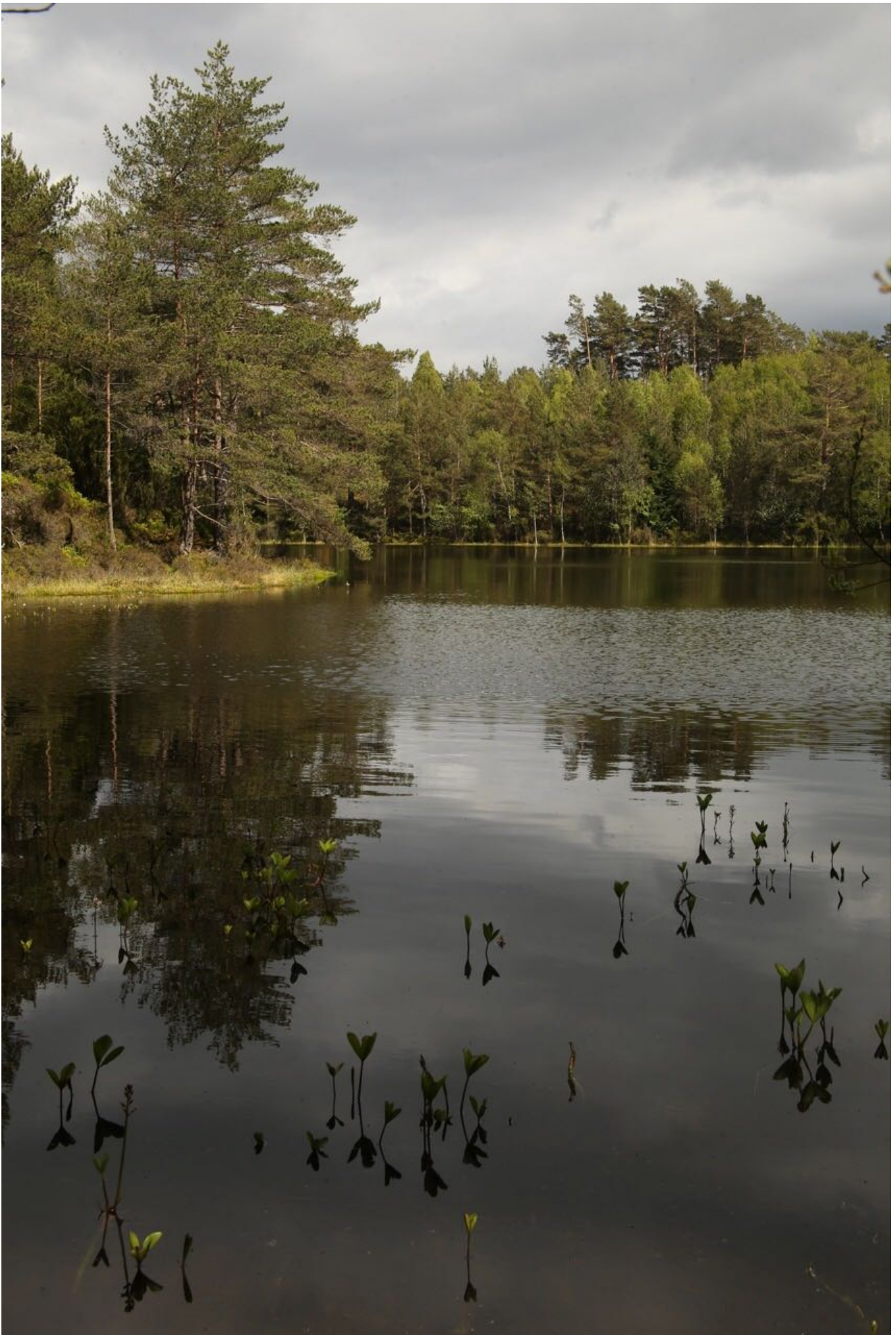


another area of pinewood, passing a large wind-bent stand of aspen on the cliffs, evidence of the extent of exposure here. The pine grows very close to the shore, yet there was little evidence of salt burn. Again we were stunned by the calcareous gorges where we found hazel, yew and a correspondingly rich ground flora. Richard joined Hans Blom to look for *Lobarion* lichens in amongst likely hotspots. They found a patch of *Pseudocyphellaria*

norvegica, the Norwegian specklebelly, a new record for this site, as well as some *Nephroma laevigatum*. A *Sorbus* sapling was also found. This couldn't be identified positively from last year's leaves but could have been *Sorbus aria*, *S. rupicola* or *S. norvegica*.

On the return journey some folk were rewarded by a close encounter with a sea eagle, thanks to our boatman who had a fish to hand. We thanked our hosts and headed off to a meal in Leirvik and then drove south towards Stavanger for the final night's stay closer to the airport. It's apparent that closer to Stavanger the process of succession to forest is at an earlier stage but this area is predicted to become well forested over the coming decades.





Some pertinent wildlife observations.

David Hetherington

In addition to the group's very instructive experiences of the vegetation of SW Norway, there were also some fascinating and relevant observations of animal life.

Of the nine woodpecker species in Europe, Scotland has only two compared to Norway, which supports seven. How much is this paucity of species in Scotland due to climatic unsuitability, difficulties in colonising an island, or severe historical deforestation? If you were to look at a British distribution map for the lesser-spotted woodpecker, you could be forgiven for assuming (as I had) that its absence over much of the northern half of Britain stemmed from its inability to cope with a cool, wet climate. It was interesting then to find a nest hole for this species in a birch tree on the island of Anuglo, which is just off Norway's hyperoceanic SW coast and on the same latitude as Shetland. The species also breeds much further north in Norway, including above the Arctic Circle. This suggests that Scotland is not climatically unsuitable for lesser-spotted woodpeckers. The lack of any confirmed breeding records from Scotland could instead reflect an unrecorded extinction event here brought about by historical woodland clearance and management practices. After all, our two extant species, the great spotted and green woodpeckers, both had to recolonise after historical extinctions. Sadly, as the English population continues to decline and contract southwards, it seems unlikely that Scotland will be colonised by lesser-spotted woodpeckers anytime soon.



Our sighting of capercaillies among the pines at Berdalen was a highlight, but not perhaps entirely unexpected given that landscape's environmental similarity with the Cairngorms. What was much more of a surprise for us was to hear from our Norwegian hosts that this species also breeds in hyperoceanic western coastal regions, where they have spread back into the new Scots pinewoods that have expanded spectacularly through natural regeneration in recent decades. This is at odds with the received wisdom in Scotland, where a worrying range contraction over the last 40 years away from the West Highlands towards Strathspey has been put down to the unsuitability for capercaillie of areas experiencing high rainfall. Norway seems to tell us that habitat quantity and quality count for more than a western, oceanic climate. In theory, capercaillie could one day breed again in the pinewoods of our west

coast, but to do so they will need expanded, well-connected woods with good habitat structure and plenty of the right ground flora such as blaeberry.

Our three days based at over 900 m up at Bjåen were both botanically and zoologically fascinating. Spring was unusually late in arriving, with deep snow still covering most of the landscape. Just in front of our accommodation was a small, south-facing meadow, which seemed to be the only place in the whole district that had lost its snow cover. This tennis court-sized patch of wet grass acted like an African watering hole in a drought, drawing in birds from miles around. So from the windows of our rented house, we could observe an abundance and diversity of hungry, frustrated birds intent on feeding and breeding in this landscape of montane downy birch. They included passerines such as bluethroat, fieldfare, ring ouzel, grey wagtail, brambling, and reed bunting, and ducks such as mallard and teal, as well as waders including snipe and golden plover. Within easy strolling distance we'd also seen black grouse, crane, and goshawk. One of our party even felt the brush of a merlin's wing on his trousers as it careered through us, intent on chasing a pair of chaffinches!

The abundance of these birds in a high-altitude habitat type which is largely now absent in the Cairngorms was very instructive. Intriguingly, however, in our three days at Bjåen we also saw foxes four times. One sighting was at night, when in response to golden plover alarm calling we saw a fox trotting across the snow towards the thawed meadow below the house. The other three sightings were in daylight, and in the middle of open country, including on a frozen lake. One of our two sightings from the car was remarkable for how close and long we were able to observe the animal as it searched for voles or lemmings under the snow. It was unfazed by our car slowing down and then stopping just 20 meters away. We could wind down the window and take photos as it hunted.



I've lived, worked and driven around in the Cairngorms for 10 years and I doubt I've seen foxes four times during that time, being as they are very shy of humans because of heavy persecution. So in Norway's version of the Cairngorms, foxes don't seem to be heavily controlled, yet I couldn't help but notice the prevalence of ground-nesting birds in this landscape.

Norwegian Hunting Culture.

Doug Gilbert, with thanks to Duncan Halley.

With many more people on the land as owner occupiers in Norway than in Scotland there is a strong culture of hunting; 9.5% of the total population are registered hunters, almost half a million people. The game resource is a public asset and hunting rights are owned by the landowner, both as in Scotland. However, management in Norway is through a publically accountable system in which government, communities, landowners and hunters have clearly defined roles, very different to Scotland; the licence fee pays for this system in Norway. Red and roe deer, and grouse, are the main game species in SW Norway.

For large game, hunting is organised in areas ("vald") that must be above a stipulated minimum size, and the local authorities issue quotas for the relevant species in these areas. For both large and small game, the landowner may limit the length of the hunting season and the number of animals a hunter may shoot per day. In areas where lynx hunting is permitted, the regional carnivore management boards set the quotas. On our visit we asked if the effects of browsing on vegetation were taken into account in setting the quotas for red deer for instance. The response seemed to be not in the way that we might do it in Scotland, by looking at browsing levels on native vegetation. However, the impacts on agricultural and forestry crops is a factor.

Hunters must register themselves on a national database and pay an annual hunting fee (c £50). Over 200,000 people did this in 2014/15, of whom only 1% were not Norwegians. Every hunter must pass a standard "hunting test" that indicates they can identify target species and know about the regulations around hunting in Norway. Hunting statistics, including numbers of species shot, is gathered by a central statistics agency (see www.ssb.no/en/jord-skog-jakt-og-fiskeri).

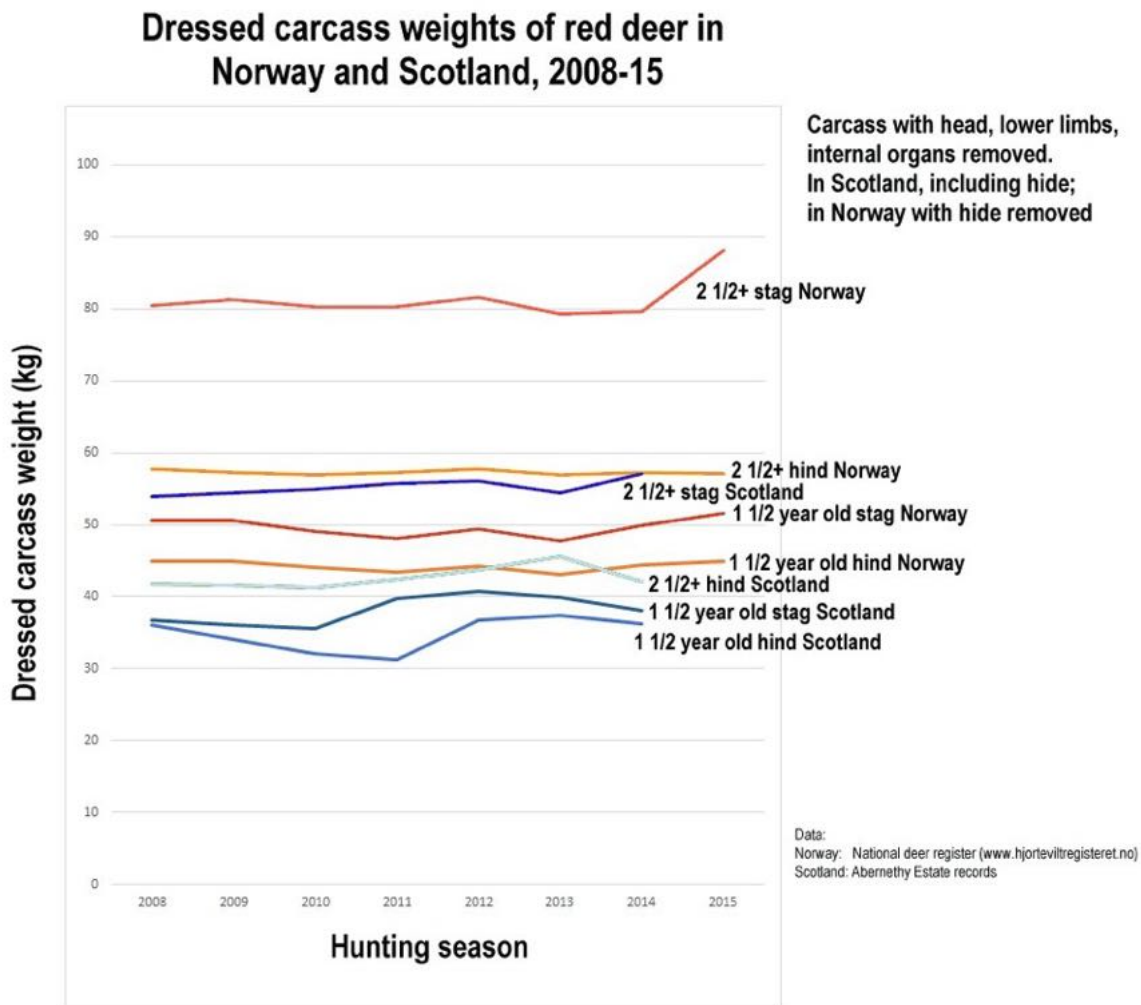
An important distinction in the culture of hunting relates to the Norwegian (and wider Scandanavian) view that hunting is a common right that should not be restricted by private landowners, and should be available relatively cheaply. It appears that this culture has prevented the widespread commercialisation of hunting – especially where local hunters have assumed a kind of stewardship of the land and resource, quite separate from any actual landownership rights. Apparently, commercial hunting is beginning to flourish in Norway, in part encouraged by national authorities (see <http://fp7hunt.net/Portals/HUNT/Reports/Norwegian%20research%20findings.pdf>), although it is meeting resistance from local hunters.

At the start of the 20th century, moose and roe were extinct in SW Norway and the red deer population was very low. During the 1950's with a rapid rise in red deer numbers, quotas were introduced. Due to competition for food in many areas evidence since the 1990's showed declining carcass weight, body condition index and calving percentage, and a consequent animal welfare issue. There has also been concern to reduce road accidents and conflicts with agriculture. The Norwegians are currently managing red deer populations lower. Thus the harvest increased substantially during the period 2000 – 2010 to approx. 39000 in 2010 and has tailed off since due to the consequent population reduction (about 35000 in the 2104/15 season). This compares with around 100,000 red deer killed in Scotland annually, although these figures are estimates because Scotland does not collect robust hunting statistics. See:

(http://www.scottish.parliament.uk/ResearchBriefingsAndFactsheets/S4/SB_13-74.pdf)

With regard to carcass weights, preliminary data for 2015 suggest that this approach is starting to work ... see graph overleaf. Direct comparisons with Scotland are tricky as there is no national register for this data here. However the graph shows weights with reference to the Abernethy Estate records. There is a dramatic difference, with the Abernethy mature stags around 70% of the weight of those in Norway and roughly equivalent to the weight of a Norwegian hind of similar age. This figure probably overestimates the average Scottish stag as the given Scots weights include the hide (some 5-6kg approx); and with higher cull levels than elsewhere and therefore reduced population density at Abernethy, their stags may well be getting heavier than the average. English red deer are about the same weights as Norwegian ones; the Scots deer are the odd ones out in an international comparative context.

Graph courtesy of Duncan Halley.



Discussion and conclusions.

Diana Gilbert & Mick Drury

Across all of Norway the most recent forest inventory period (2010 - 2014) gave a figure of 40% forest cover, an increase over the previous 5 year inventory period of 6%, predominantly from natural regeneration and mostly in the SW (D Halley, pers com). This compares with a figure of 20% cover in Scotland of which 22% is native (Scottish Executive 2006, FCS 2014). However, when comparing these figures it is necessary to also take into account another factor; despite a treeline/montane scrub zone at between 900 and 1,100 m asl, Norway has a much larger percentage of its land area above the treeline/montane scrub zone than in Scotland. The Scottish treeline, reached at only two sites, is between 600 and 650 m asl, and past assessments of potential maximum altitudes have set it at 700 m als (Pears, 1968). In Rogaland, a coastal region we visited, and one of the most oceanic and windy, the current tree cover is 25% and is expected to rise to 52% through natural regeneration if there is no change in current land use.

Approximately 200 years ago both countries may have had largely similar open landscapes with predominately grazed grass heaths and mires over peat. In Scotland the

elevation reached by high forest tree species is not known and thus the extent of montane scrub at the point when human land use began to impact on woody vegetation is also unknown. The Scottish Highlands were depopulated in favour of sheep, especially during the first half of the 19th century. The intensity of sheep grazing since then, and accompanying rise in the red deer population following the Victorian enthusiasm for stalking, have led to a continued pressure on woodland. With grouse moors also managed intensively, especially by burning, tree regeneration has been challenged. Even in recent decades there have been further native woodland losses, especially in unenclosed upland areas (FCS 2014).

Height / m	Area / ha	Area %
0 to 100	108,782	34.96%
100 to 200	86,229	27.71%
200 to 300	67,459	21.68%
300 to 400	35,680	11.47%
400 to 500	11,259	3.62%
500 to 600	1,715	0.55%
600 to 700	29	0.01%
700 to 800	1	0.00%
Total	311,154	

Native woodland area in Scotland in altitudinal bands (FCS 2014).

By contrast, because the area above high forest is so much larger in Norway, montane scrub vegetation maintained a presence throughout the expansion of human populations and land use changes until the mass rural emigrations in the mid-19th century. These emigrations followed the passing of the US Homestead Act of 1862 and left much of the land abandoned. By then, wild herbivores such as red deer were at very low numbers due to habitat loss and subsistence hunters looking for meat; roe deer and elk became regionally extinct. The reduced browser numbers allowed regeneration from woodland refugia, on precipitous cliffs, to establish and triggered the exponential forest expansion we see today. It's difficult now to comprehend the details of that former cultural landscape, and to compare it to the history of land use in Highland Scotland and therefore to judge to what extent we could expect a similar ecological response given a similar pattern of land use change.

Our brief trip to this corner of Norway certainly opened the group's eyes and minds to consider how this relatively small variation in land use history in an area with similar geology and climate has resulted, 150 - 200 years later, in such a fundamental difference in vegetation cover and productivity of the land.

Key observations and questions.

Seed source: How did the trees spread, where were the seed sources? From the areas we visited it is apparent that the topography in SW Norway is different from Scotland; between sea level and the treeline there are very deep valleys with steep, precipitous sides difficult for herbivores and so there is a greater potential for tree refugia, with fertile, open valley floors below. Here the farmsteads usually had a number of mature trees in the vicinity, valued for various uses. The valleys contrast with high plateau areas which are at or above the treeline and are usually covered in snow over the winter period. During our travels we encountered woodlands of a wide range of ages suggesting that the

reforestation has been incremental, presumably starting close to a seed source and spreading over the most suitable ground initially.

Herbivory: There are no data on herbivore numbers from the relevant period in Norway, but we do know that they were very low with, as already noted, regional extinctions of roe deer and elk, reindeer confined to the north, and red deer a key food source for a poor rural population. If herbivore numbers were similarly reduced in Scotland would the trees return in a similar way, bearing in mind the 150 - 200 year time scale? In the current political landscape in Scotland this is unrealistic, but there is evidence from a number of areas that regeneration does occur where there is still a seed source and browsing pressure is effectively controlled (e.g. Glen Feshie and Glen More in Strath Spey). It was interesting to note that herbivore numbers are now on the rise and we certainly noticed evidence of relatively heavy browsing on the previous season's growth on the few willow plants that we saw.



Treeline landscape Bjaen area October 2015, with dwarf birch in foreground.

Climate. Duncan Halley has compared the climatic data for Norway and Scotland. Norway spans a huge range of latitude, with the climate varying considerably, but the detailed data suggest consistent similarities in a range of climatic characteristics in specific parts of SW Norway which support prolific woodland regeneration and specific parts of northern Scotland with very low tree cover. In the area we visited, all this regeneration has taken place under year-round temperatures (winter average 1-3°C, summer average 10-15°C), rainfall levels (2-4000+ mm/year), duration of snow cover (generally 10-25 days per year) and wind speeds that are similar to, or even less favourable than, many parts of western

Scotland which have very little tree cover. As always the devil may be in the detail. The statistics do not specify how much of the precipitation is snowfall. Snow is considered to be important for montane willows in particular (Odland & Munkejord 2008) but the climate predictions for Scotland suggest that snow will become increasingly rare and may be absent by 2050 (Murphy et al 2009).

Associated Vegetation: There is a more diverse flora in SW Norway, including species that do not occur in Scotland and some that are rare and causing conservation concern, eg widespread twinflower in the pinewoods. As might be expected the calcareous coastal areas have a very rich flora. Dwarf cornel, a species associated with less heavily grazed wet heath in Scotland was seen from sea level to 900 m asl, all under a woodland canopy. The widespread presence, in Norway, of species that are scarce or restricted in Scotland suggests a less intense land use history that has allowed their survival, either in remnant woodland or areas of low browsing intensity.

Forest structure: Much of the forest zone woodland in SW Norway is composed of relatively young trees and we saw very few old or over-mature trees, particularly pine. This supports the fact that most forest is either secondary, and so may still be in a relatively early successional stage, or has been managed for much of the past 1,000 years. There is a history of widespread water-powered sawmills in SW Norway and we know that Scotland was importing timber from Norway and the Baltic from early in the 16th century. Some of the woodland areas close to sea level are now beginning to show evidence of succession, from colonising trees of pine and birch, to high forest with oak, yew, and small-leaved lime now entering the canopy. In other areas the woodland was apparently very new, perhaps only 40 or 50 years old. Even in the areas with the youngest trees we saw no Scots pine monocultures, the stands tended to be either predominantly birch or birch and pine, with a scattering of rowan or willow. Does the lack of these species in Scotland indicate former selective harvesting and 'weeding' of unwanted species? Juniper is present in SW Norway wherever there is un-intensively managed vegetation, at all altitudes; does this suggest far less historic burning?

Higher up the *bjørkebelt* (birch belt) appears to be the primary treeline, present everywhere we went up to altitudes around 1000m asl, significantly higher than in Scotland. It was particularly visible in the landscape on south-facing slopes across the wide plateau areas high above the fjords, at the treeline. Most of the north-facing slopes were still under deep snow. These landscapes are on a much larger scale than any in Scotland, but as we do have isolated downy birch trees, and increasingly pine regenerating at altitudes above 600 m asl, could this be the start of a new treeline? Can an individual tree survive long enough in isolation to be the start of a woodland? Are the more diverse wet heaths the most likely areas to support regenerating trees? Are the impoverished, leached Scottish soils the result of woodland removal and consequent loss of nutrient cycling?

The *vierregion* (willow or scrub zone) is reportedly very widespread, with dwarf shrub heath communities dominating. We only encountered a few willows due to the high levels of snow cover and it was not possible to positively identify whether we were seeing downy willow or bluish willow (*S. glauca*), or to get a sense of the habitat in which they were growing. Despite this they were seen in a wide range of situations, including growing closely intertwined with, and perhaps being protected by, the less palatable dwarf birch. Starting in the *bjørkebelt* and extending into the *vierregion* dwarf birch was ubiquitous, in greater densities than juniper, both on well-drained and wetter ground. Downy birch was

also seen high into the *vierregion*, in krummholz form, overlapping with dwarf birch. As well as grouse species, both golden eagle and goshawk were seen in this zone.



Treeline landscape Bjaen area October 2015, with willows and downy birch.

It was interesting to see the shrub willows growing within and close to the dwarf birch, rather than in completely different communities as in Scotland. Both downy and bluish willows are relatively catholic in their edaphic requirements and this was demonstrated by those willows that were seen, primarily with neutral to acid vegetation. So are the locations where downy willow is now found in Scotland related more to land use than to the requirements of the plant? Or is it dictated by where the summer herbivory combines with predictable winter snow cover, providing protection from frost and/or winter browsing?

Soils: In many areas of SW Norway past agricultural use has significantly thinned the cover of soil over the bedrock, yet regeneration has occurred even on the remaining thin acidic soils. Peat was harvested widely into the 20th century, in places at an industrial scale. Tree regeneration has occurred on peaty substrates (D Halley pers com), with new forest soils subsequently developing; blanket bogs have scattered trees. It was not clear from the visit how widespread deep peat is/has been in Norway and to what extent areas of deep peat have now become forest, or whether regeneration occurs only on those areas of peat that have been harvested.

Culture: Patterns of land ownership and management are very different in SW Norway. There are no very large land owners and a far greater proportion of the population has a stake in the open spaces for recreation and hunting. The Norwegian hut system is well organised, accessible to and well used by all. The Norwegian government has generously

supported rural development, with a resultant thriving rural population. Landholdings are small and diverse. Woodland areas are protected from uncontrolled felling, but they are valued as a resource for timber, fuel and for other forest products such as fungi and berries, and for game. In particular the treeline and scrub zones are recognised as providing essential shelter for stock and for game, and these zones also support a thriving wildlife resource.

The main overarching question arising from the visit is: In the evolution from open to wooded landscape when was the 'tipping point' reached in SW Norway? At what point does the seed production become so voluminous that establishment of natural regeneration becomes inevitable, and so forest expansion becomes exponential, and facilitates the development of a fuller ecology, and an increase in herbivorous/game species?

Final conclusions and suggested research areas.

Although this visit was ostensibly to learn about treeline and montane scrub habitats in Norway inevitably the discussions and visits covered the full range of forest types in the SW, partly because the division is artificial and partly due to the high levels of snow cover at higher altitudes. Many of the issues related to forest expansion in Scotland are common across the altitude range; primarily herbivory and the relative lack of seed sources. It is difficult to visualise SW Norway in 1860 and so compare it with Scotland today. However, given that forest expansion apparently occurred unplanned and without high-level policy initiatives our knowledge of regeneration requirements suggests that it would initially have been focussed around remnant woodlands. We concluded that, perhaps due to topography, remnants may have been fairly widely spread along the valley walls. We know how far seed spreads from mature trees, particularly for pine (French et al). However, a better understanding of the speed of forest expansion relative to the area of seed-bearing trees and of the geographic relationship between type of ground colonised and the seed sources would be very useful. There is also a question of the viability of many remnant willow (and possibly some dwarf birch) populations and whether they are able to expand naturally from their current locations.

Inevitably, in Scotland the question of time-scales cannot be avoided. It is accepted that there is no inherent issue with Scottish climate, soils and geology that suggests it should not be largely wooded, as in Norway, and that this is the case for the full altitudinal range of woodland types. Without the serendipity of the combination of emigration and poverty experienced in Norway it is far harder to make the necessary decisions that might kick-start the natural forest expansion they now experience. Where to begin: Do we resolve the issues in and around the existing woodland resource and ensure they will expand naturally; or do we intervene to establish seed sources in areas with suitable ground but currently no remnant woodland? Or do we take the line that centuries of extractive land use has left soils impoverished and that natural expansion is improbable in the short term and there is a need for larger-scale intervention?

The group also concluded that we tend to be conservative in our assessment of suitable ground for montane scrub, particularly dwarf birch and downy willow, and we could experiment more with the planting in a wider range of vegetation communities. The growing evidence that dwarf birch is not specifically a plant of blanket mire was supported by the range of habitats in which it was seen in Norway. The extensive altitudinal overlap of downy and dwarf birches in Norway gives us scope for further experimentation.

There have been great differences in the history of land use between Norway and Scotland over the past two centuries and this is illustrated by the contrast in vegetation cover today. Although it was interesting to learn that many rural people in Norway look with some aesthetic envy on the open landscapes of Scotland, in comparison with Scotland, in practical terms, their rural sector appears to thrive. As far back as 1993 this difference from the Scottish rural sector was recognised and Reforesting Scotland organised a study tour to look at the much wider range of rural activities, particularly those associated with greater woodland cover, and how the support structures might translate to rural development in Scotland. Some reflections on their trip can be read overleaf. Ultimately it is how rural policy drives land management in Scotland that we believe is the main reason behind our relative lack of treeline and montane scrub habitats, as well as native woodlands at lower altitudes. At the time of going to press, the Scottish Government is consulting on proposals for land reform legislation, including measures that seek to diversify ownership and strengthen the extent of the public interest on privately owned land. These could be very relevant to the future of our native woodlands.

With the formation of Nordic Horizons in 2010 (see <http://www.nordichorizons.org>) there is a growing interest in learning about life and policy in the Scandinavian countries, and in December 2015 we were pleased that Duncan Halley gave a presentation to the Nordic Horizons group at the Scottish parliament (see <http://www.nordichorizons.org/the-nurturing-nature-event-resources.html>).

As ever, patience will be necessary; it is probably relatively recently that the 'tipping point' has been reached with regard to the return of so much forest in SW Norway and we are many years away from that in Scotland. However, with the status and potential value of treeline and montane scrub communities being more widely appreciated here, not least with regard to ecosystem services (Armstrong et al 2015), we hope that there can be some further progress towards that turning point.

Thanks again to Duncan Halley and our hosts and guides in Norway.

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Update on Reforesting Scotland's Norway study tour 1993.

Mick Drury, with thanks to Donald McPhillimy

In 1993 Reforesting Scotland (RS) organised a study tour to Norway, with two aims:

To examine the Norwegian land use system and to identify the economic, social and environmental benefits and problems associated with it in the context of land use in Scotland. Secondly, to develop thinking on issues relating to the future of land use in Scotland such as forestry, farming, crofting, rural policy, environmental management, rural development and land tenure.

Participants on the tour were from a wide range of sectors concerned with rural development in Scotland. It is evident that the tour was influential in stimulating debate about the future for rural Scotland amongst those that participated and other individuals, groups and organisations that they have been involved with. Many worthwhile working relationships were established. To quote Donald McPhillimy: "I'd say that the trip to Norway has influenced my whole career and that my own personal philosophy on land use, land ownership, forestry and conservation in Scotland is very close to that of Reforesting Scotland".

There were seven 'observations and main themes' that resulted from the tour:

1. Optimum use of biological potential

The land should be used in a way in which the whole is greater than the sum of the parts. The biological potential of land should be assessed, restored and sustained.

2. Extensive diverse forest

An extensive and diverse forest resource managed in the interests of all of society providing a wide range of benefits, options and products.

3. Diversity of economic opportunity for land occupiers and communities

Farmers and rural communities thrive on a diverse range of economic opportunities which can provide flexibility, multiple skills and exploitation of niche and small-scale markets.

4. Local access to and control of resources

Resources should be distributed equitably and be related to an appropriate scale of ownership. Decision making should be devolved and 'bottom-up'.

5. Rural Support sensitive to local needs

Incentives and support should be closely targeted and sensitive to local variations and needs.

6. Commitment to rural populations

Urban and rural society should be mutually supportive and accountable. This requires clearly articulated political commitment.

7. Cultural landscape is a useful concept

Most of our landscape is a product of the interaction of people and the land over many hundreds of years. Such landscapes and the skills associated with their management represent extremely valuable sources of acquired knowledge and information which can easily be lost forever.

Since devolution in 1999 the Scottish Parliament has provided a forum to debate issues important to rural Scotland. The first legislation passed was the Land Reform Act which enshrined in law the right of free access to the countryside by foot, outside certain reasonable exceptions. It also introduced the Community Right to Buy Scheme which was further developed by the Forestry Commission as the National Forest Land Scheme. There were also significant changes with regard to crofting legislation.

In 2005 the directors of RS commissioned a survey to find out how circumstances and situations in Scotland had moved on with regard to the 7 themes. And had RS been influential in stimulating debate about the future for rural Scotland? From the survey findings, the general feeling amongst the respondents seemed to be that good progress had or was being made on themes 1,2 & 4; poor progress on 3,6 & 7; and there was an even split regarding theme 5.

Land Reform is currently high on the agenda again with further legislation, the Land Reform (Scotland) Bill at draft stage. To quote Donald again: "There is a big emphasis on community empowerment in Scottish legislation, in contrast to Norway where the community is represented by a much wider private ownership base. That is the next aspiration in Scotland with land reform potentially an on-going process".

Norway/Scotland Baseline Comparison

Updated from RS – Norway Study Tour Report, 1994.

Norway	Scotland
Small country of 5.2 million people on north-west fringes of Europe	Small country of 5.3 million people on north-west fringes of Europe
Temperate and boreal ecology	Temperate and boreal ecology
Oceanic and continental climate	Oceanic climate
Allodial land tenure with many owners and a regulated land market	Feudal land tenure with 80% of private land owned by 4000 owners and a free market in land. Some recent significant community buy-outs of private estates and Forestry Commission land.
Small-scale landownership pattern	Large-scale landownership pattern
Extensive and diverse forests resource owned by farmers – mainly native species	Separation of agricultural and forestry activities
Integration of forestry and agriculture at all levels	Forest resource mainly in the form of intensively managed plantations of exotic conifers owned by the State and private estates and institutions. However, significant support for native woodlands and community woodland ownership has been forthcoming in recent years.
Agricultural policy central to sustaining rural populations and delivered via small farms	EC Common Agricultural Policy in UK chiefly production oriented and dominated by large farms
Norway an independent country outwith the EC	Scotland a country of the UK within EC
Public right of access to the countryside enshrined in law.	Public right of access to the countryside enshrined in law.

Mountain willow scrub in the European Union.

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Introduction

Sub-alpine scrub dominated by small willows, typically 0.3 to 2 m high, is found in many mountain ranges in Europe and in the far north. Its conservation value has been recognised by inclusion on Annex I of the EU Habitats Directive as habitat type '4080 Sub-Arctic *Salix* spp'.

It is one of the 233 habitats currently listed on Annex I of the EU's Habitats Directive (EC 2013). Listing on Annex I means that the Member States must protect the habitat by designating and appropriately managing sites as part of the EU's Natura 2000 network, there is also an obligation to monitor Annex I habitats and regularly report on their conservation status under Articles 11 & 17 of the directive.

The habitat has been listed on Annex I since the Habitats Directive was adopted in 1992 at a time when the EU (then the European Community) only had 12 Member States and the habitat was only found in Scotland. In 1992, Annex I was based on the then recently published CORINE biotopes classification and the habitat was listed as '31.622 Subarctic willow scrub', which the CORINE Biotopes manual describes as

"Subarctic *Salix lapponum*, *S. lanata*, *S. arbuscula* or *S. myrsinites* formations of ungrazed cliff ledges in the central and northern Highlands of Scotland" (Devillers & Devillers-Terschuren 1991).

In 1995 Austria, Finland and Sweden joined the European Union and it was clear that very similar vegetation occurred in Finland and Sweden and this was recognised in the first Interpretation Manual of European Habitats published in 1996.

"Subarctic willow formations of the Highlands of Scotland, of the mountains of Iceland and of the mountains of Scandinavia (often along brooks), European Russia, Siberia, northern China, Korea and Japan." (EC 1996).

Italy proposed sites for the habitat arguing that, although sub-alpine rather than sub-arctic, it had stands with a similar species composition and occurring in the same ecological niche. However it was agreed at a biogeographical seminar (see Evans 2012 for details) held at Gap, France in July 1999 that similar vegetation in the Alps should not be included under this habitat as they were clearly not sub-arctic, that the species of *Salix* were different (e.g. *S. helvetica*, *S. waldsteiniana*) and that the Alpine stands were classed under a different habitat type in the Palearctic Classification of European habitats (Devillers & Devillers-Terschuren 1996) which had been used as the basis for the Interpretation manual.

However when negotiations with the countries which joined the EU in 2004 and 2007 for possible additions to Annex began, Poland proposed 'Subalpine bush communities' and the Czech Republic 'Subalpine deciduous scrub of the Hercynian Mountains and the Carpathians (*Salicion silesiaca*)' which although not sub-arctic or the same Palearctic habitat, did have a similar species composition (e.g. with *S. lapponum*) to stands in Scotland and Fennoscandia. With the agreement of both the existing Member States and the Candidate countries it was agreed to widen the definition of the existing habitat to include stands in the Alps, Carpathians and other mountains (Evans et al 2013). This

revised definition was included in the 2003 and subsequent editions of the Interpretation Manual. However the name was not changed although a name including the term 'sub-alpine' may have been helpful for understanding by non-specialists.

Although more or less restricted to calcareous soils in Scotland, elsewhere the habitat can occur on both calcareous and siliceous soils. Sites are often flushed and in areas of moderate snow lie. In the Alps similar sites are often occupied by *Alnus viridis* (Green alder) scrub and the two types of scrub are frequently placed together in the order *Alnetalia viridis*. At least in the French and Swiss Alps, *Alnus viridis* scrub is much more widespread. There appear to be few descriptions of the habitat outside Scotland published in English apart from very brief descriptions in Polunin & Walters (1985) and Ellenberg (1988). More detailed accounts are available in other languages such as French, German, Italian, Polish and Swedish.

Distribution

Under the agreed reporting format for Article 17, Member States are asked to report habitat area in km² but no value was reported by Austria and Germany although the area is likely to be quite small in both countries. They are also asked for a distribution map based on a standard 10x10 km grid and area can also be estimated from this (see EEA 2015 for more information). Information reported, together with EU assessments of conservation status (see below) can be found at <http://bd.eionet.europa.eu/article17/reports2012/>.

Map 1 shows the distribution as reported by the EU Member States under Article 17 for the period 2007-12 while Figures 1 & 2 show the proportion by biogeographical region¹. The habitat is mostly found in the Fennoscandian mountains and the Alps, but with important areas elsewhere including the Carpathians, the Pyrenees, the Massif Central and of course the Scottish Highlands.

Although not reported from Spain, similar vegetation with *S pyrenaica* and *S bicolor* is present in the Pyrenees (Vigo et al 2006). In some cases this has been considered to be the Annex I habitat '4060 Alpine and Boreal heaths'.

The area reported by France is likely to be an overestimate as the area per grid cell is quite high suggesting the habitat is more common in the French Alps and Pyrenees than in other parts of the Alps which does not seem to be the case (personnel observations). It is known that habitat area has been overestimated in France for other habitats (EEA 2015) and the French reports notes that data quality is low.

¹ The Habitats Directive divides the EU into 9 biogeographical regions (Alpine, Atlantic, Continental etc), see Evans (2012) & http://bd.eionet.europa.eu/activities/Natura_2000/chapter1 for further information.

Table 1: Area of '4080 Sub-Arctic *Salix spp*' reported per biogeographical region by each Member State

MS	Region	Area (km ²)	N° of 10 x 10 km grids
Austria	Alpine	Not reported	4
Bulgaria	Alpine	0.04	2
	Continental	0.14	2
Czech Republic	Continental	0.33	4
Germany	Alpine	Not reported	17
Finland	Alpine	20	84
	Boreal	1	7
France	Alpine	185	180
	Continental	1	17
Italy	Alpine	37.9	190
Poland	Alpine	0.05	5
	Continental	0.02	Not reported
Romania	Alpine	0.0012	9
Sweden	Alpine	1100	300
	Boreal	14.8	15
Slovakia	Alpine	0.66	12
United Kingdom	Atlantic	0.23	33

Figure 1: Area (km²) of habitat '4080 Sub-Arctic *Salix* spp' per biogeographical region (Alpine subdivided into Fennoscandia & other)

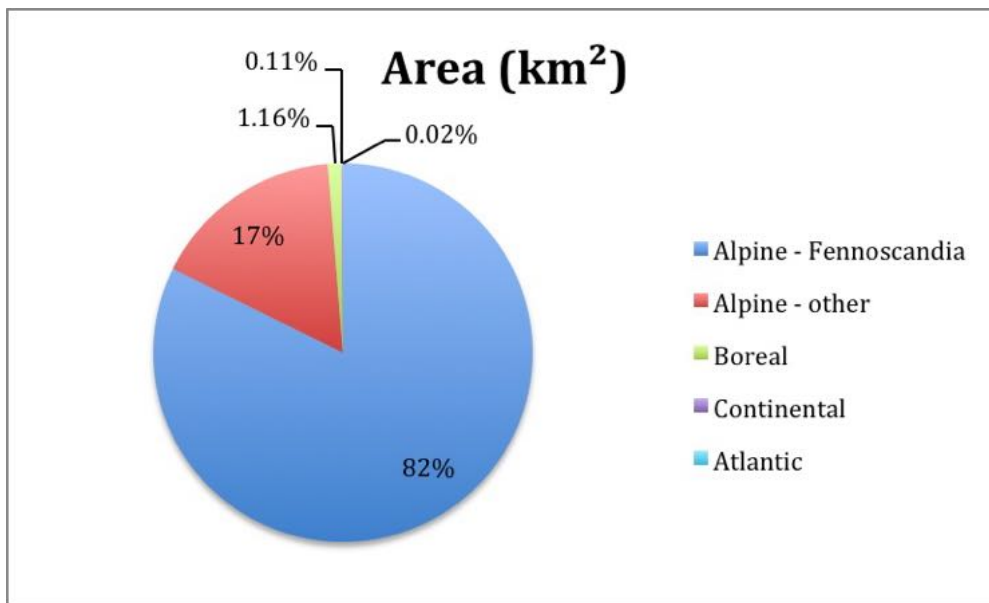


Figure 2: Area (N° of 10x10 km grid cells) of habitat '4080 Sub-Arctic *Salix* spp' per biogeographical region, the Alpine region has been divided into Fennoscandia, Alps, Carpathians, Pyrenees & Bulgaria.

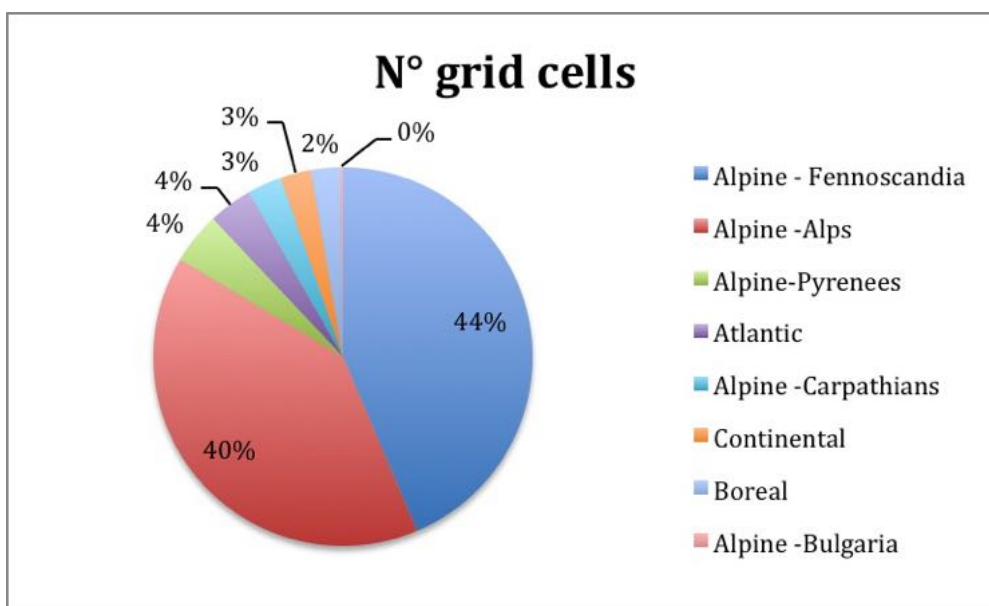


Table 2: Conservation Status and total area per biogeographical region

Region	Range	Assessments of parameters				Area (km ²)	Area (N° of grid cells)
		Area	Structure & function	Future prospects	Overall Conservation Status		
Alpine	FV	U1	U1	U1	U1 stable	1344	803
Atlantic	Unknown	U1	U2	U2	U2 declining	0.23	33
Boreal	FV	FV	FV	FV	FV	15.8	22
Continental	FV	FV	FV	U1	U1 stable	1.5	23

Note: FV = 'Favourable', U1 = 'Unfavourable-inadequate' & U2 = 'Unfavourable-bad'

Conservation Status

The reporting format adopted for Article 17 requires Member States to assess conservation status using a standard methodology based on assessments of 4 'parameters' - range, area, structure & function and future prospects. These are combined to give an overall assessment as 'Favourable', 'Unfavourable-inadequate', 'Unfavourable-bad' or where information is lacking 'Unknown'. Countries are also asked to give a trend (improving, stable, declining or unknown) when the conservation status is unfavourable. There is a separate assessment for each biogeographical region where the habitat occurs, so for example France has reported '4080 Sub-Arctic *Salix* spp. Scrub' from both the Alpine and Continental regions. The European Topic Centre on Biological Diversity collates the Member State information and produces a combined assessment for each biogeographical region. Further details of the methods and results are given in the report 'State of nature in the EU' (EEA 2015).

As shown in Table 2, the habitat is only considered Favourable in the Boreal region, although it is also Favourable in both the Finnish and Swedish Alpine regions so can be assumed to be Favourable in Fennoscandia. The habitat is also reported as Favourable by several countries in the Alps but the relatively large proportion of the habitat in Italy reported as 'Unfavourable-inadequate' leads to an overall assessment as 'Unfavourable-inadequate'. However in comments to the French report it is noted that the habitat may not be in such a good status in the Pyrenees.

An assessment of the EUNIS habitat 'F2.1 Subarctic and alpine dwarf willow scrub' using modified IUCN Red List criteria will be published in 2016.

Pressures

The Member States are asked to note up to 20 pressures acting on each habitat using an agreed hierarchical list, and to rank them as high, medium or low importance with a maximum of five as high. Only France and the United Kingdom reported high ranking pressures for habitat 4080; for the UK these were grazing, hunting and air pollution while France reported sport & leisure structures (presumably linked to skiing) and changes to hydrology (drainage ?) for the Alpine region.

If all pressures are considered, the most frequently reported are under 'Human intrusions and disturbances' (19 records), agriculture (14), transportation and service corridors (11) and pollution (10). When examined in more detail, these are related to recreation (possibly skiing related), overgrazing (but also abandonment of grazing in Sweden as a low pressure) and airborne pollution, including acid rain and Nitrogen deposition.

Natura 2000

The proportion of this habitat included in Natura 2000 is generally very high, mostly 90% or greater and in Bulgaria, Poland and the UK is reported as 100%. The exception is Sweden where the habitat is most common and cover is 55% for the Alpine region and 41% for the Boreal. The figure reported for the French Alpine region is 8% but this is probably unreliable as it is likely that the overall area has been overestimated (as noted above).

Beyond the European Union

Similar willow dominated scrub, with a similar species composition, also occurs in Iceland, Norway, Russia and Switzerland (Påhlsson, 1994; Koroleva, 1994; Delarze & Gonseth, 2008; EC1996). The Norwegian forms are similar to those found in Scotland and Påhlsson (1994) notes three types;

Salix spp.-*Geranium sylvaticum*-type

Salix spp.-*Deschampsia cespitosa*-type

Salix spp.-*Vaccinium myrtillus*-*Cladonia* spp.-type

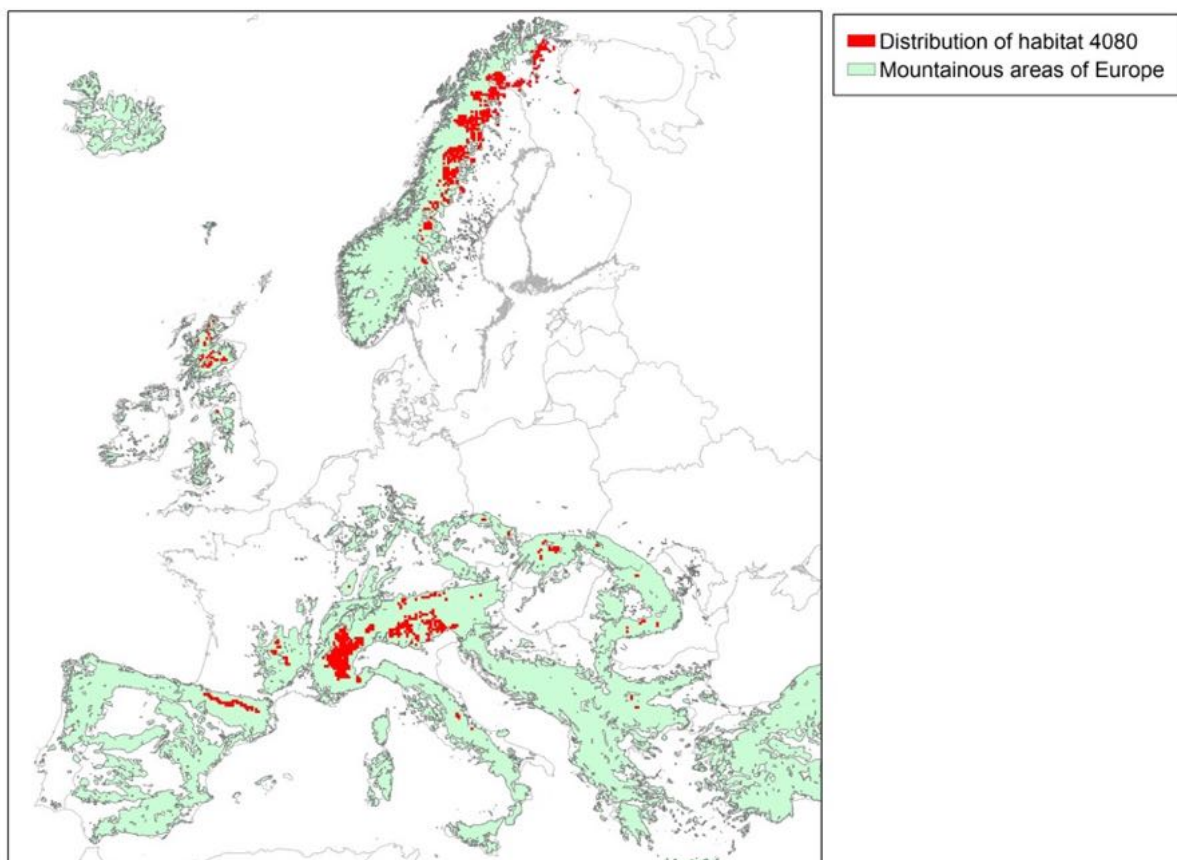
In Switzerland the habitat has been assessed as 'Least Concern' in an unpublished, provisional Red List (Raymond Delarze, pers comm) while no mountain willow habitats are listed in the Norwegian Red List (Lindgaard & Henriksen 2011).

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Map 1: The distribution of habitat '4080 Sub-Arctic Salix spp. Scrub' in the European Union.



Source: Reports from Member States under Article 17 of the Habitats Directive & EEA (2010)

N.b. Excludes Norway & Iceland, both outwith the EU.