

# Why the present is not the key to either past or future



*In this summary of her 2025 paper<sup>1</sup> Sarah Watts explains why we need to move beyond relict habitat to improve outcomes in upland restoration*

**W**e are experiencing a fruitful time for the return of trees to the Scottish uplands. The benefits mountain woodland provides for biodiversity and nature-based solutions to mitigate climate change impacts are now becoming realised.<sup>2,3</sup> More data exists than ever on the distribution and condition of wild, remnant populations and nation-wide mapping of restoration action,<sup>4</sup> spanning decades of inspirational work

Downy willow planting at Creag an Lochain, Ben Lawers NNR. Photo: Sarah Watts.

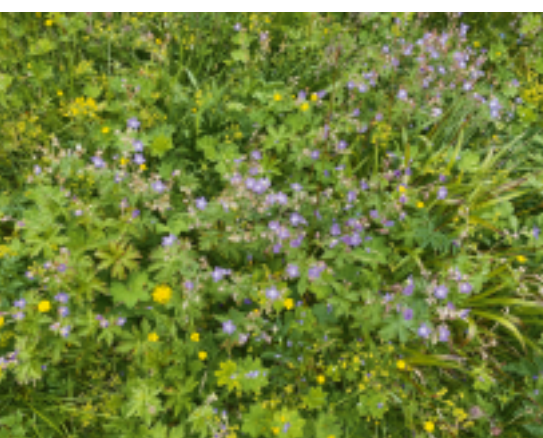
by many dedicated individuals and organisations.

Over 30 years of progress in montane scrub restoration has seen the planting of 400,000 threatened arctic-alpine willows, spanning from reinforcement by 'genetic rescue' to large-scale habitat creation.<sup>5,6,7</sup> What opportunities are there for the years ahead? My PhD is investigating how we can build on this momentum to enable mountain woodland to flourish in the future.

The key site for my research is Ben

Lawers National Nature Reserve (NNR), where the National Trust for Scotland (NTS) has been pioneering upland habitat restoration since the 1980s.<sup>7</sup> Most significantly, an enclosure was erected around Creag an Lochain in 2000 to exclude large herbivores from 180 hectares between the altitudes of 525 and 923 metres, within which over 45,000 montane willows were subsequently planted.

Here, in summer 2021, I measured a variety of growth attributes of 1,050 downy willow (*Salix lapponum*), along with the physical and vegetation characteristics at the location where each individual was planted. This work amounted to 51,450 data points gathered over 31 days – the most intensive fieldwork campaign of my



From top to bottom:  
Measuring downy willow during PhD fieldwork. Photo: Jane Watts.  
A wild downy willow plant growing on rocky ground below a calcareous crag. Upland tall herb indicator species at Creag an Lochain. Photos: Sarah Watts.

#### Acknowledgments

The montane willow restoration work at Ben Lawers NNR was led and implemented by David Mardon, Andrew Warwick and Helen Cole, with the assistance of many NTS volunteers and seasonal staff. Funding for this research has been provided by the University of Stirling, Woodland Trust, Corroul Estate, Scottish Forestry Trust, Macaulay Development Trust, National Trust for Scotland, Forest Research and Future Woodlands Scotland.

PhD! I was excited to deliver the research because as a mountain woodland restoration practitioner myself, I would be using the outputs to inform our planting at Corroul.

The aim was to understand which sites had produced the biggest, most productive shrubs, and what environments were connected with poorly performing willow. Such knowledge is important for enhancing effective outcomes in new restoration projects, as well as identifying where we should avoid planting to ensure our montane shrubs survive and thrive for decades to come.

At Ben Lawers, the NTS had often sought to plant in places similar to those where wild, relict downy willow are found in Scotland: on thin calcareous soils sheltered by wet crags and among tall herbs. Consequently, it was valuable to test the hypothesis that these reference conditions are preferential for promoting shrub health and development.

Some results were anticipated: Downy willow growth and catkin production 16 years after planting was positively associated with higher soil fertility and tall herb cover. This group of upland flowering plants, which includes globeflower, wood crane's-bill, wild angelica, water avens, great wood-rush and lady's mantle, can therefore be a helpful guide to planting site selection. In terms of vegetation, there are certain similarities between favourable locations for willow restoration and the present-day relict montane scrub habitat. On the other hand, wet soils with a high coverage of sedges and rushes were often found to have less well growing shrubs which were not generating seed.

Most intriguingly, and contrary to expectations, increasing soil pH had a negative association with willow growth and reproduction, and there was no noticeable benefit from sheltering by crags or cliffs. In contrast to the current distribution of relict populations in Scotland, calcareous soils and rocky mountain slopes are not actually essential for downy willow to prosper. Planting could also take place in acidic to neutral soils, since the species may have a much broader ecological niche than we had previously assumed.

This unbalanced circumstance likely arose because our montane willows have become extremely restricted to inaccessible cliff ledges primarily due to centuries of overgrazing. These places do not reflect the more extensive range of mountain woodlands in the past, and instead represent refugia rather than truly optimal habitat. Using the features of present-day relict habitat as the basis for restoration may thus constrain montane willow planting to only a subset of potential locations.

Efforts to revive the altitudinal treeline must be underpinned by action to facilitate natural regeneration and address the original causes of loss, particularly overgrazing by large herbivores. We should move beyond simply protecting and replicating the features of degraded mountain woodland fragments, to encompass a broader range of opportunities available at the landscape scale. Together with action to boost genetic diversity, this holistic approach will build long-term resilience and foster a more naturalistic, complex and vibrant montane mosaic.

#### References

1. Watts, S.H. et al. (2025) Why the present isn't the key to past or future: Moving beyond restricted relict habitat conditions to improve outcomes in mountain woodland restoration. *Restoration Ecology* 33: 70130.
2. Watts, S.H., Jump, A.S. (2022) The benefits of mountain woodland restoration. *Restoration Ecology* 30: e13701.
3. Monger, F. et al. (2025) Natural flood management benefits of catchment-scale woodland creation in the UK uplands. *Ecological Solutions and Evidence* 6: e70152.
4. Watts, S.H. (2024a) Mapping relict and restored mountain woodland across Scotland. *Scrubbers' Bulletin* 16:22–29.
5. Finger, A. et al. (2022) Conservation genetics of montane willow populations in Scotland—limited natural recovery despite long-distance gene flow and high genetic diversity. *Environmental Research: Ecology* 2:015001.
6. Rao, S.J., Painting, A. (2023) Beginning the “genetic rescue” of the Mar Lodge Estate montane willow populations. *Scrubbers' Bulletin* 15: 50–59.
7. Watts, S.H. (2024b) Montane willow scrub restoration in Scotland: reviewing 30 years of progress to reestablish the altitudinal treeline. *Restoration Ecology* 33: 14290.

**Sarah Watts** is a PhD researcher at the University of Stirling and Conservation Manager at Corroul Estate.