From fire to forest? Observing tree regeneration in gorse-dominated moorland

Ross Gray and Maeve Leith

Dartmoor has been shaped by human activity for millennia, with fire long used as a land management tool (Greeves 2006). Discussions around managed burning and reforestation are often polarised, shaped by differing values, experiences, and expectations of the land. This makes it particularly important to ground conversations in evidence, observation, and mutual respect. On Dartmoor today, managed burning remains a culturally rooted practice, often used to reduce fuel loads, improve grazing conditions, and encourage species like Heather *Calluna vulgaris*. As climate conditions shift and policy frameworks change, however, long-held assumptions about the benefits of burning are being re-examined.

On Holne Moor, in the south of Dartmoor, concerns about increased gorse cover and reduced grazing productivity have driven continued use of fire. Although other research has suggested that in gorse-dominated areas, fire may exacerbate rather than solve these problems (Rees & Hill 2001), long-term datasets on vegetation change under different management regimes are rare. As highlighted by Harper *et al*. (2018), more research on fire needs to be done in environments that reflect the UK's humid climate and social context, rather than relying on findings from fire-prone regions abroad. To make informed decisions, landowners and managers need clearer evidence about when and where managed burning is beneficial or harmful. As stated by Davies *et al*. (2016): in the case of insufficient evidence and a lack of agreement, it is critical that land managers and scientists adopt an *adaptive* approach to decision-making, including the need to monitor and learn from management actions, to keep an open mind until an evidence-based consensus is reached, and to involve all stakeholders and viewpoints in decision making.

Observations

In the 1970s, one of the authors (RG), a Holne Commoner, observed what was locally known as 'The Orchard of Thorns': a grove of mature Hawthorns *Crataegus monogyna* in an

otherwise sparsely treed upland. This encounter sparked a lifelong interest in the role of trees in moorland settings. Although not interested in gorse specifically, he took part in swaling (the West Country term for managed burning) for decades, this being the accepted practice. He did try to argue against burning Bracken *Pteridium aquilinum*, which felt counterproductive, and urged others to avoid burning established trees, which are vital perches and nest sites, but these suggestions were not widely taken up at the time. By the 1980s, however, a pattern had emerged: areas burned when gorse was tall and isolated would return as thick carpets of gorse, reducing both access and grazing.

In the mid-1990s, the introduction of Environmentally Sensitive Area (ESA) schemes led to reduced grazing on Holne Moor. Two large flocks were removed, and traditional pony numbers declined. By the late 1990s, a lot of the gorse had formed a near-continuous canopy, to the consternation of all stakeholders. Then, unexpectedly, Rowan *Sorbus aucuparia* saplings began appearing in their thousands, emerging through the gorse and growing rapidly.

The picture became clearer during the 2001 Foot and Mouth outbreak, when grazing ceased almost entirely. That autumn, while sat at 450m above sea level on acid grassland near blanket bog, RG counted over 100 Rowans in a single square metre, along with oak and Blackthorn *Prunus spinosa* seedlings.

The conclusion was clear: certain tree seeds were regularly arriving, dispersed by birds such as Fieldfares *Turdus pilaris* and Redwing *T. iliacus*, but under normal conditions the germinated seedlings are grazed off before they can establish. The nine-month pause in grazing during 2001 revealed their presence, along with the unexpected role of gorse in sheltering young seedlings. The seed bank is already in place, needing only a sharp reduction in grazing pressure (Porton *et al*. 2024) to kickstart a transition towards a more treed landscape. However, the prospect of woodland expanding into open moorland is deeply contested. There are significant questions over the desirability of extensive tree cover, with different stakeholders holding divergent views on the future path for Dartmoor's uplands.

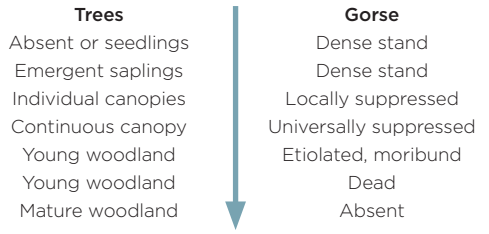


Figure 1. The sequence of naturally occurring changes from continuous gorse cover to mature woodland, documented at the Plock of Kyle, Lochalsh. From *Gorse: Woodland in Waiting - J. Merryweather, 2014.* This sequence would almost certainly be paused at "Individual Canopies" of trees with "Locally Suppressed" gorse on Dartmoor, due to both grazing and browsing pressure.

To observe and monitor naturally regenerating tree growth on Holne Moor, the Protected Areas of Scrub Regeneration (PASR) project was established in 2002 by RG and ecologist Sue Goodfellow of the Dartmoor National Park Authority (DNPA). The project's aim is to observe the natural colonisation by scrub and tree species on gorse-dominated moorland sites excluded from burning but open to grazing for at least 30 years. Now 23 years in, PASR already offers rare long-term insights into the flexibility of moorland habitats, the limitations of fire as a management tool, and the potential of working with natural processes.

Methods

Three unfenced plots, each representing typical gorse-dominated moorland, were marked out in 2001 on Holne Moor, with firebreaks maintained annually by the Holne Commoners Association to provide protection from burning. The plots differ slightly in aspect, altitude and soil depth but all contained dense stands of European Gorse *Ulex europaeus* and Western Gorse *U. gallii*, with extensive saplings mainly of Rowan, along with small numbers of Hawthorn and Holly *Ilex aquifolium* emerging from the gorse carpet.

Monitoring involved fixed-point photography carried out by DNPA staff and volunteers. Informal observations from RG supplemented these records, providing additional detail on seasonal changes, grazing patterns, and site history. The plots remained unfenced, allowing livestock grazing and browsing to continue.

In 2010, Plot 1 was burned for ease of livestock gathering, creating an unplanned

Controlled burning, known locally as swaling, has traditionally been carried out on Dartmoor in order to manage gorse. Andrew Payne/Alamy Stock Photo

comparison with Plots 2 and 3. Although monitoring records between 2008 and 2024 have unfortunately been lost, the fixed-point photography resumed in 2025 with additional observations recorded by the authors.

Results

Over the 23-year period, clear differences emerged between the plots.

Plot 1 (burned in 2010): After 15 years of subsequent regrowth, the gorse is mature and fragmented, thinning out and breaking down. No mature trees are present (the first generation of Rowan perished in the fire) and ground flora includes Bramble *Rubus fruticosus* agg., Bilberry *Vaccinium myrtillus*, Bracken and Tormentil *Potentilla erecta*, with scattered next-generation Rowan saplings emerging.

Plots 2 and 3 (unburned since well before 2001): In these plots, the dense impenetrable gorse matured and began to senesce after 10–15 years, breaking down into a more open structure. Bracken has become increasingly dominant, while understorey species present in 2025 include Foxglove *Digitalis purpurea*, Bilberry, Bramble, Herb-robert *Geranium robertianum*, Wood Sorrel *Oxalis acetosella* and Ivy *Hedera helix*. Regeneration of pioneer trees occurred early in the project, but browsing pressure has since stunted growth and limited the development of true woodland. Very little cover (<10%) of gorse of either species remains today.

Adjacent areas (burned within the last 3–4 years): Low carpets of gorse covering the total burned area.

Gorse dynamics: Across all plots, dense gorse cover initially excluded livestock and walkers. After a decade, however, natural senescence began, with gorse thinning and dying back, hastened by shade from young trees. This allowed access for grazing animals and other species. By contrast, rotational managed burning (usually done every ten years) leads to dense regeneration of gorse owing to germination from long-lived seed banks, a trait well documented in the ecology of this species (Broadfield & McHenry 2019).

Tree establishment: Rowan was a particularly successful and widespread pioneer in unburned plots, where dense gorse offered initial protection from browsing. Being fire-sensitive, it was absent from burned areas. Hawthorn, along with Holly, was also present in low numbers in unburned plots. Even in areas with both swaling and livestock browsing, there are some surviving

Tree regeneration in Plot 2 in April 2025. Maeve Leith

RG standing in the fire-break running along the edge of Plot 3, with dense gorse on the other side. Maeve Leith

trees on the open moorland on Holne Moor; the dominant species being the slow-growing and gnarly-barked Hawthorn.

Discussion

This project contributes context-specific evidence on the ecological outcomes of land-management decisions in gorse-dominated moorland. The aim is to support management decisions that are grounded in local conditions, practical realities, and a frank understanding of trade-offs. As Harper *et al*. (2018) note, conservation land managers are caught in a paradigm: they are expected to maintain culturally valued, fire-shaped ecosystems while facing uncertainty about the long-term resilience of these landscapes under

changing climatic, cultural, and policy conditions.

A recent evidence review by Natural England (2025) highlights the need for more caution and nuance when it comes to managed burning. For example, the review finds little strong UK-based evidence that managed burning reduces wildfire risk; most of the studies supporting that idea come from very different ecosystems abroad. Similarly, the belief that managed burning is carbon neutral is not supported by the evidence. These findings underline not only the urgent need for more UK-based studies, but also the importance of using fire carefully, based on local conditions and clear objectives. As with all land-management tools, the trade-offs need to be weighed site by site.

The results of this 23-year case study challenge the assumption that fire is the most effective management tool for controlling gorse on Dartmoor. While managed burns can temporarily reduce vegetation height and improve access, they also stimulate prolific gorse regeneration, locking the landscape into a cycle of gorse disturbance and dominance. In contrast, where fire is excluded, gorse stands eventually break down naturally. This allows a broader range of species to establish, including Bracken, herbaceous ground flora, and bird-dispersed trees such as Rowan and Hawthorn. This alternative hands-off approach relies on two factors: first, the fatal intolerance of gorse to lower light conditions (caused by regeneration of trees); and second, patience and confidence from stakeholders that the method will work, given time (Merryweather 2014). Full reforestation would result in a complete absence of gorse (see Figure 1), but without stakeholder consensus, reductions in grazing, or targeted interventions, full woodland succession on Dartmoor remains unlikely.

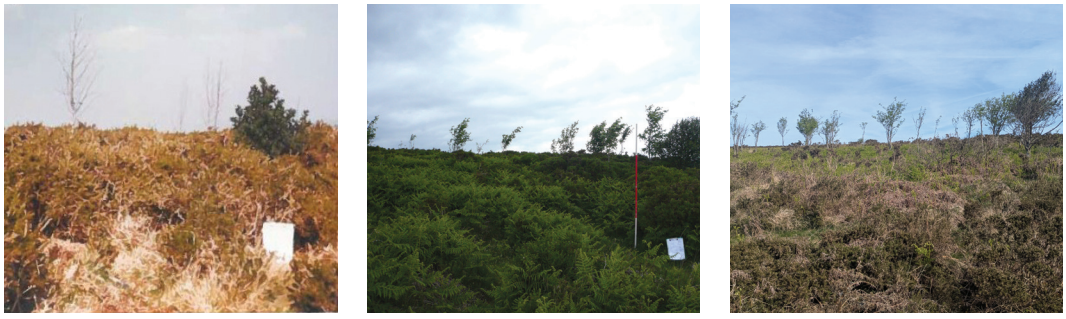
There is strong evidence here that a 'laissez-faire' approach to gorse management is not only possible, but also could benefit a wide range of species, support some natural succession, and reduce long-term management burdens for both graziers and conservationists. Ceasing managed burns on gorse-dominated areas and allowing natural processes to unfold, through cycles of gorse senescence, fragmentation, and tree regeneration, could offer a low-intervention pathway towards richer, more resilient moorland-edge habitats.

Wildfire risk in UK uplands remains under-researched. Most wildfires are known to be caused by humans, suggesting that user engagement is key to effective prevention. Regular cutting of irregular fire breaks where possible continues to be a practical and effective tool for limiting fire spread.

Feedback

Since the circulation of an interim PASR report in May 2025 (Gray & Leith 2025), a range of stakeholders have been approached for feedback and comment, including hill farmers, ecologists, conservationists, academics and representatives of statutory bodies and commoners' associations. Feedback on the report has been encouraging and has included:

- Approval for combining local knowledge with formal monitoring.
- Observations that burning has led to dense gorse cover in other places on Dartmoor.
- Acknowledgement of the need for landscape-scale and landscape-specific management.
- Support for limited, well-timed burning as part



Fixed-point photography from Plot 3, illustrating habitat change over 23 years. Maeve Leith

of a broader mosaic management strategy.
- Recognition of data gaps and short funding cycles in upland research, and strong support for continuing PASR.
- Interest in exploring other commons with no recent burning for comparison.
- Support for using citizen science to extend and deepen ecological monitoring.
- Many valuable perspectives and beneficial recommendations for additional evidence sources, some of which are included in this article, to act as an updated addendum to the original report.

Future

Studies on longer burn rotations (10–20 years) are rare, and empirical long-term data on the ecological impacts of managed burning is limited. In an attempt to address this, Harper *et al*. (2018) call for more long-term monitoring plots, established in partnership with academic institutions and supported by landowners or National Parks, to build a stronger evidence base for future upland management decisions. Importantly, the PASR demonstrates the value of integrating empirical data with local knowledge. RG's observations offer insights into site history, regeneration patterns, and community engagement that would be difficult to replicate through formal monitoring alone.

Going forward, continued fixed-point photography, ecological surveys, and stakeholder dialogue are essential. Reinstating firebreak maintenance around the PASR plots, documenting local knowledge, and setting clear management goals will help support a more nuanced and ecologically grounded approach to tree regeneration and gorse management on Holne Moor and elsewhere. To adapt land management to changing conditions, we must start with observation. The PASR project team hopes to inspire others to implement monitoring projects similar to this one – practical, local, and long-term.

As gorse matures and dies, plants such as Wood Sorrel find opportunities in the understorey. Sabena Jane Blackbird/Alamy Stock Photo

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Ross Gray is a lifelong environmentalist caring for trees, hedges, and the countryside as Dartmoor farmer and commoner, landscape contractor, Holne Tree Warden, Royal Forestry Society SW vice chair, and much more. **Maeve Leith** is a fledgling ecologist, and is researching people's relationships to Dartmoor landscapes at the University of Exeter (the full PASR report is available on her website: https://maeveleith.co.uk/research).