



### Summary

- *Rhododendron ponticum* (Rp) is considered an invasive non-native species in the British Isles, being native to the Iberian Peninsula. Since its introduction to the islands in the 18th century, it has become widely established in the wild across significant areas of the UK.
- Its ability to form dense, shaded canopies over vast areas can have devastating impacts on natural habitats and associated flora and fauna, including temperate rainforests, where it thrives on the damp substrates found in such areas.
- Significant efforts have been made in Eryri over recent decades to manage the spread of Rp with the ambition of achieving full eradication in specific strategic areas, driven by the Eryri Rhododendron Strategy (*Rhododendron in Snowdonia and a Strategy for its control, 2008*) and subsequent projects such as Celtic Rainforests LIFE.
- The 3-phase approach to treatment is adopted as the preferred method of control but requires long-term funding and support if to be successful.
- Furthermore, operating on a landscape level, and over a range of different habitat types and terrains of varying scales, can provide a host of different challenges which must be overcome if objectives are to be achieved.

### Introduction

*Rhododendron ponticum* (Rp) occurs as a native species in the Iberian Peninsula and around the Black Sea. Originally introduced to the British Isles as an ornamental shrub in the eighteenth century, by the middle of the nineteenth century it was being widely planted in the gardens and woods of large houses and also for pheasant cover from where it has since spread widely (Jackson, P, 2008).

In a UK context, Rp is considered an invasive non-native species (INNS) due to its adverse on natural ecosystems. For example, the dense thickets exclude native flora, prevent tree regeneration, and eliminate critical habitat, whilst having dense areas of Rp has been shown to adversely impact population of breeding birds and invertebrate communities (Jackson, P, 2008). Consequently, significant efforts are made in Eryri (Snowdonia) and beyond in recent decades to manage the spread of Rp with the aim of achieving full eradication in targeted areas. The resources required to manage populations of Rp is significant and costs the UK economy an estimated £6.2 million annually (Wildflower Charity, 2020). Unlike manageable garden specimens, mountainous populations present fundamentally different ecological and economic challenges. Understanding these contrasts is essential for developing cost-effective management strategies.

### Why *Rhododendron ponticum* is considered an 'Invasive'

Rp has several attributes which makes it a highly successful plant in the British Isles; it has both a wide climatic and broad habitat / soil tolerance, which allows it to thrive in the temperate, wet climates of the UK. As a result of this, if left unmanaged it can form dense canopies over vast areas, suppressing populations of native flora including our international important populations of bryophytes, lichens, and herbaceous plants. It prevents tree regeneration in woodlands - catastrophic for upland forest ecosystems in particular (Jones et al., 2019). Invasive species rank as one of the top five drivers of biodiversity decline worldwide, and Rp is no exception (Wildflower Charity, 2020). Evidence of ecological niche shift indicates Rp occupies novel environmental conditions in Britain, suggesting adaptive changes enhancing invasive success (Manzoor et al., 2020). Critically, seeds from cultivated garden populations continuously disperse into surrounding wild habitats, perpetuating landscape-scale invasion.

### Strategic Approach to Eradication

#### The Eryri Rhododendron Strategy (*Rhododendron in Snowdonia and a Strategy for its control, 2008*)

Despite decades of efforts to manage the spread of Rp in parts of Eryri, previous attempts had been somewhat ad hoc in approach, with no clear strategic approach to the problem. Eryri National Park Authority recognised this, and in 2006 commissioned the production of a strategy (*Rhododendron in Snowdonia and a Strategy for its control*) that would guide future management efforts. The strategy was formally adopted and published in 2008, and provided:

- An overview of the spread of Rp in Eryri, based on historic and more current data, in doing so identifying key strategic areas that should be prioritised for targeted eradication and control.
- Provided indicative costs for managing Rp in Eryri, with the overall ambition of achieving full eradication.

This information helped shape and prioritise resources, including the development of specific projects and work programmes. The strategy gave partners confidence to be more ambitious in their approach to Rp management in the national park, and coupled with information provided by the LIFE Natura 2000 Programme for Wales (LIFE11 NAT/UK/000385), ultimately led to development of the Celtic Rainforests LIFE project (LIFE17 NAT/UK/000020) in August 2018.

### Celtic Rainforests LIFE

Celtic Rainforests LIFE aims to take action against identified threats to temperate rainforests in Wales, which includes the presence of INNS (namely *Rhododendron ponticum*). It is focussed on four Special Areas of Conservation (SACs) in Wales which have habitats 91A0 Old sessile oakwoods with *Blechnum* and *Ilex* in the British Isles and / or 9180 *Tilio-acerion* woodlands of slopes, screes and ravines as features of those sites; Meirionnydd Oakwoods and Bat Sites SAC, Coetroedd Cwm Elan / Elan Valley Woodlands SAC, Coed Cwm Einion SAC, and Cwm Doethie – Mynydd Mallaen SAC. It also encompasses a small part of the Eryri SAC. In respect of the Rp works, the objective of the project was to achieve full eradication of Rp from both within the respective SACs, and to an expanded area around the SACs (referred to as the buffer zone) in order to minimise the risk of future re-infestation of Rp within the SAC from adjacent sites. A 1km buffer zone was deemed necessary due to the complex

picture of high- and low-density areas, high availability of suitable propagating substrate within/outside the SAC and known dispersal distances over 1km (Jackson, 2008). However, consideration of land boundaries crossing the buffer zone and the extent of key strategic sites were to be taken into consideration when commissioning works. In total, approximately 7,961.20 hectares of land was to be targeted (973.80ha within SAC, and 6,987.40ha outside SACs). During the development stage of the project, the estimated cost to treat Rp within SACs was approximately €384k, and €5.4m in the areas outside the SACs. To date (March 2026), the project has spent circa €397k within SACs to eradicate Rp, and €2.7m in the buffer zones. In addition, a further €430k is committed within contracts commissioned by the project for works to be completed before July 2027. The difference between the estimated costs and the real costs highlights the difficulties in developing estimated budgets for landscape scale initiatives, especially when factoring in such a variation in terrain and densities of Rp.

### The Three-Phase Strategy

Celtic Rainforests LIFE has adopted a strategy to effectively manage Rp based on 30 years of prior working knowledge. From experience, it is rarely possible to eradicate Rp in one single visit, therefore several stages of work over several years are best prescribed. This influenced the design of the project from conception as it was known the treatment phase would take at least 5 years.

An effective management requires a long-term, multi-phase approach, outlined as follows:

**Phase 1 – Attack (Year 0):** Initial infestation treatment using five control techniques: stem treatment (>95% kill rate, suitable for sensitive areas), manual cutting and disposal, mechanical mulching (accessible sites only), foliar spraying (plants <1.5 m), and hand-weeding. An appropriate herbicides applied year around, although most effective during active growth season (March – October). Cutting alone doesn't reliably kill plants; chemical follow-up is essential.

**Phase 2 – Follow-up (Year 2):** Intensive monitoring and treatment of stump regrowth and seedlings. Resprouting shoots account for approximately 97% of regenerating plants on cleared sites (Jones et al., 2019), requiring repeat herbicide treatment or hand-pulling over 18–24 months.

**Phase 3 – Maintenance (Year 5+):** Treatment around 5 years post-initial attack. Regrowth is minimal; remaining plants require chemical treatment or hand-pulling. Complete eradication can require 7–10 years minimum commitment.

**Maintenance Phase:** Following the implementation of the 3-phase treatment method, further maintenance will be required long-term to ensure a site remains free of Rp. Period checks of treated sites should be undertaken on a periodic basis (approximately every 3 to 5 years), and an appropriate method of treatment applied if there are signs of re-establishment.

Ecosystem recovery is prolonged: bryophytes recover well following clearance (Maclean et al., 2017), but forbs and grasses do not, with native vegetation covering only approximately two-thirds of cleared sites 30 years post-treatment (Jones et al., 2019).

### Case Study: Comparing Rp management in Domestic Gardens vs. Mountain Pasture

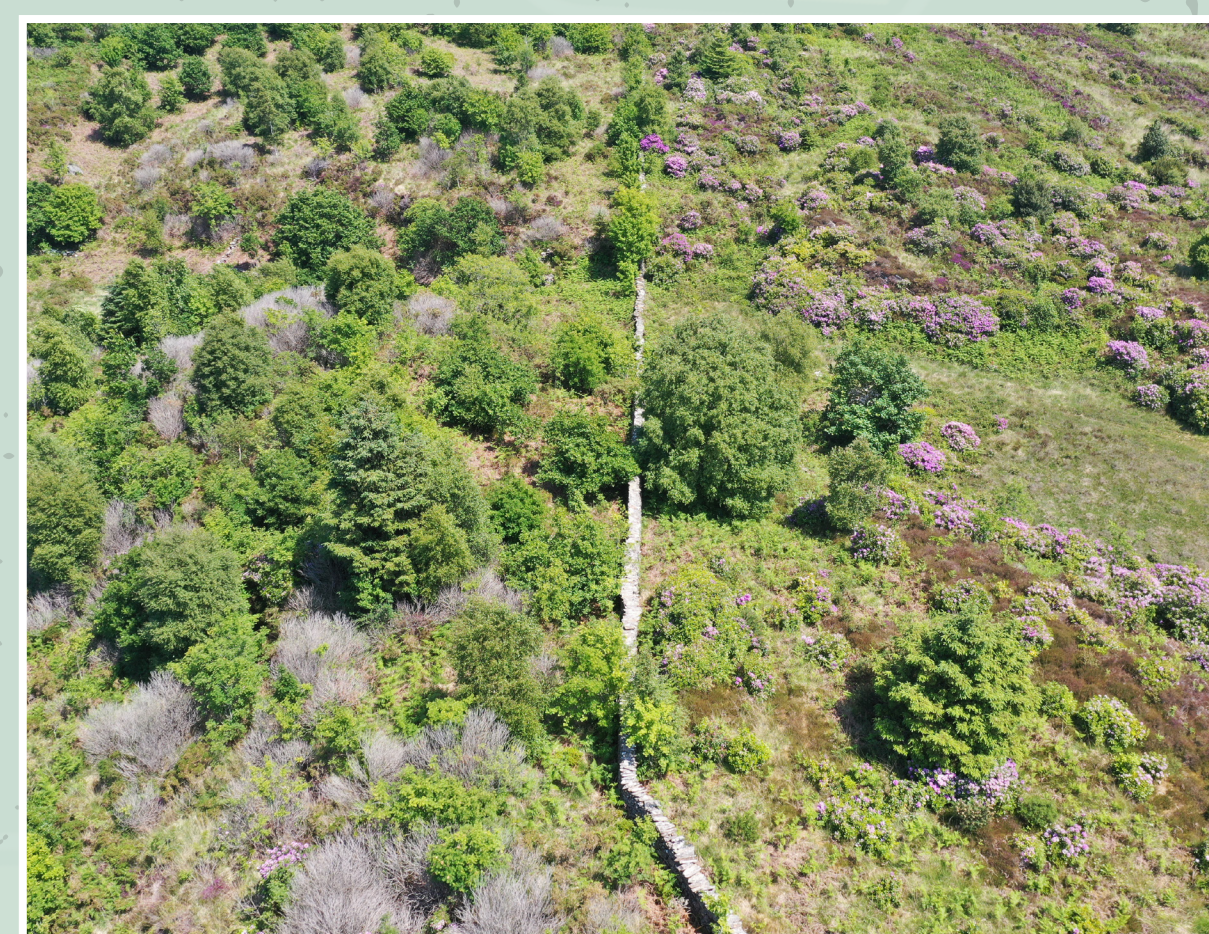
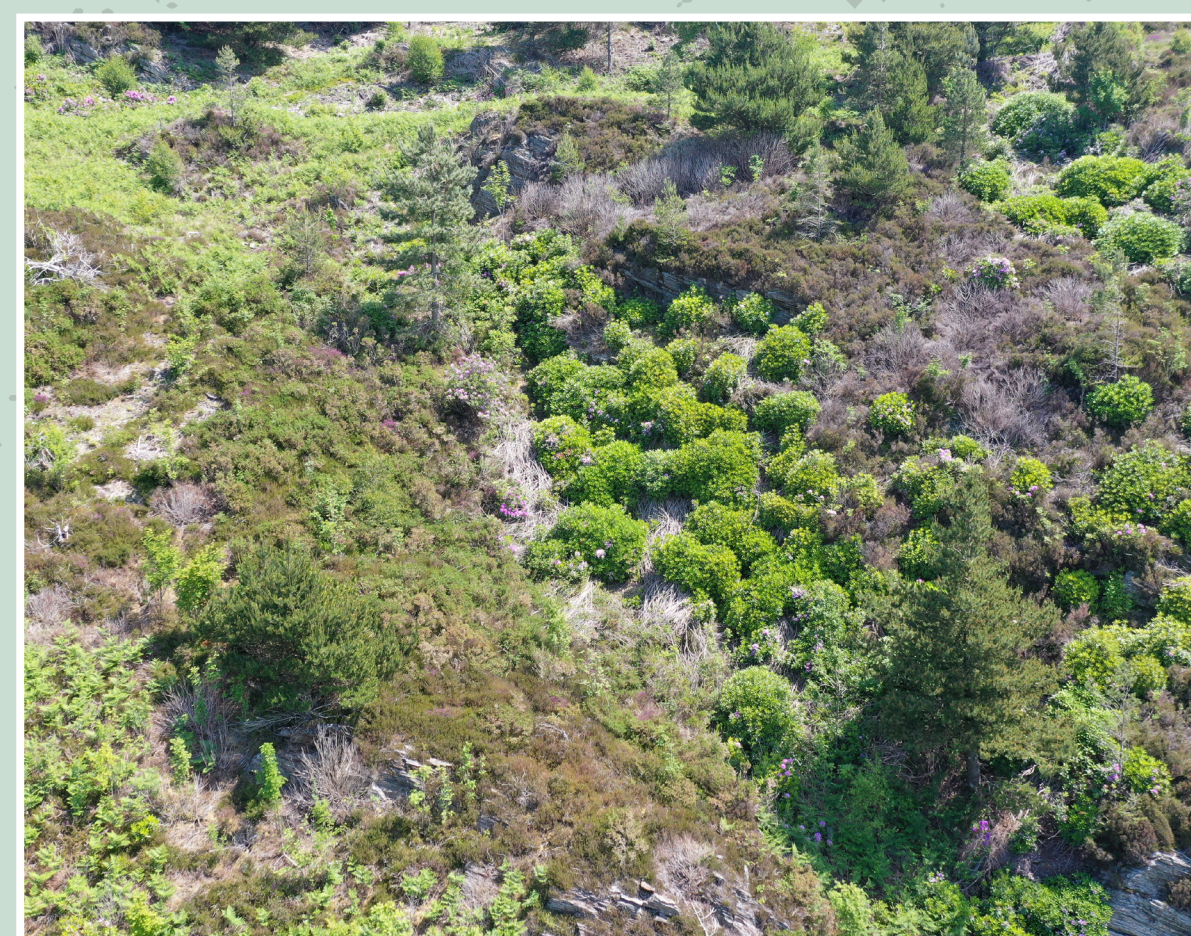
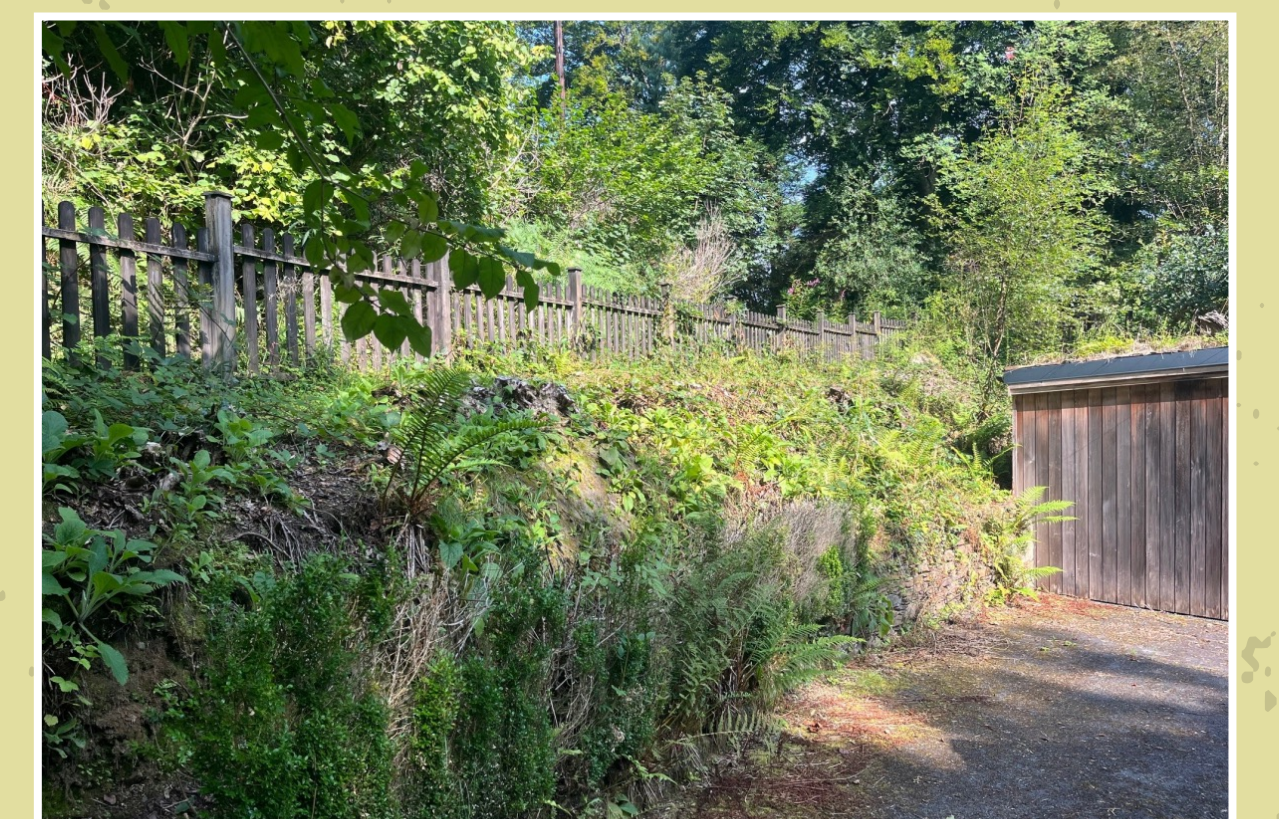
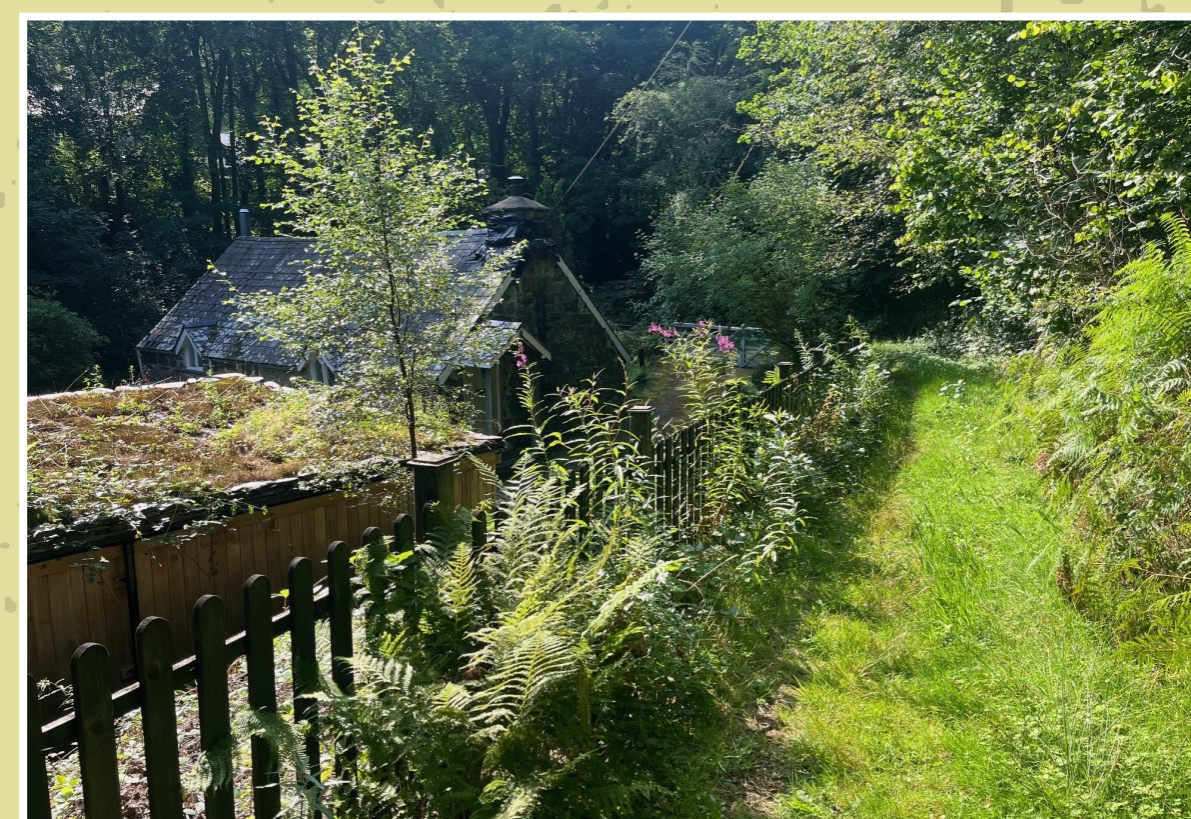
#### Domestic Garden Rp Removal

**Characteristics:** Isolated or clustered plants on level, accessible ground with straightforward logistics.

**Costs and Methods:** Professional removal averages £200 - £2,500, depending on density for 0.5-hectare properties over 3-phases. Stem treatment or foliar spraying suit garden specimens, dense thickets are unlikely to be found. Disposal constraints must be considered: Rp waste cannot enter standard green waste collections but must deal with in situ by either burning or chipping the cut material for decomposing on site, or by being transported to a registered facility under Schedule 9 of the Wildlife and Countryside Act 1981 (as amended).

#### Challenges:

- Many homeowners are reluctant to remove Rp due to its attractive flower and effectiveness as a privacy screen. No easy solution available as replacement plants will take a significant time to re-establish and artificial screens i.e. fencing, can be expensive or are unsuitable for those specific locations.
- Limited enforcement mechanisms - control in private gardens relies on voluntary participation.
- Frequent homeowner requested constraints, such as preferred time windows, specific treatment instructions, plants or features to avoid etc. These are documented on a site-by-site basis, which complicates administration and coordination with contractors.
- Economies of scale – smaller contracts not also economically attractive to contractors, and it can be difficult to attract interest during tendering. Grouping small contracts, particularly in a specific geographic location, and awarding as one contract a possible solution to this problem.
- Trying to establish land ownership can be problematic. Many properties are second homes, and as a result owners live away and are difficult to identify or make contact with.



#### Mountain Pasture Rp Removal

**Characteristics:** Potentially vast areas (> hundreds of hectares) across variable topography – steep slopes (>30°), rocky outcrops, watercourses (or lack of), and remote locations. Dense thickets are common.

**Costs and Methods:** Large-scale removal typically costs £400 - £6,000 per hectare depending on density, terrain and method. Steep terrain is significantly more expensive to treat if rope access work is required. Landscape-scale coordination requires substantial government funding and decades-long commitment.

#### Challenges:

- Mountainous sites typically incur 10–50% cost increases compared to flat terrain. Increased labour costs due to difficult accessibility and extra manual labour required.
- Reinvansion more likely in large areas due to persistent seed banks in neighbouring land or insufficient removal in previous phases.
- Wet weather prevents foliar spraying, and watercourses are common. Manual labour and time required increases if resorting to stem injection or hand-pull methods to cover large areas.
- Trying to cost works on large sites difficult, both for Officers wishing to estimate costs beforehand (for example, when developing project proposals), and for contractors when tendering for those works. High risk of tenders being underpriced, and contractors withdrawing from the works before they are completed.
- Disposal of cut plants can exponentially increase costs, e.g. hiring wood chipping machinery. Burning operations require environmental permits and air quality compliance.
- Livestock is common and a workplan must be agreed with the owner and contractor, increasing administration.
- Lack of nearby water supply (i.e. streams) can be an issue when implementing foliar treatments in remote areas. No easy solution as poor access means that carrying large volumes of water, or transporting a water tank to a site, are not viable.
- Shortage of contractors trained in rope access work means work schedules can be full or prices can be high due to a lack of competition.
- Monitoring a large site is time-consuming and safe access can be difficult.

### Conclusions

Effective eradication of Rp requires simultaneous action at multiple scales and is a long-term commitment. Domestic gardens, whilst presenting smaller absolute costs, are deceptively burdensome when factoring in landowner buy-in for the long-term, specialised waste disposal requirements, and repeated monitoring visits. Critically, the continual seeding of domestic plants into wild habitats undermines the feasibility of preventing their spread at a landscape scale. Educating homeowners to prioritise sustained, multi-year eradication is critical for lasting success.

Mountainous open areas demand landscape-scale coordination, substantial government funding, specialised equipment, and

decades-long commitment. Research within Eryri demonstrates all cleared sites showed regeneration (97% from stumps), highlighting multi-phase management criticality. Ecosystem recovery remains incomplete even 30 years post-clearance (Maclean et al., 2019). Costs double every 20 years if control is delayed, underscoring early action urgency.

Success demands partnership: engaged homeowners and landowners committing to 3-phase eradication programmes, and government funding prioritising early intervention (Rawat et al., 2024). The Eryri case demonstrates that invasive species management transcends property boundaries and solutions must be ambitious to match the scale and pace of ecosystem degradation caused by invasive populations.

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