

# Restoration Cases Flagship Collection

## Case #16

Rewilding the Scottish Highlands

ETH zürich | CROWTHER LAB



*Planted Scots Pines and blooming heather inside a fence in stark contrast to the surrounding landscape. Photo credit: Alan Watson Featherstone*

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**In brief**

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## Overview

The Scottish Highlands have been largely devoid of trees for centuries. Forest clearing was followed by the eradication of large predators (wolves and lynx) and a dramatic increase in grazers, mainly deer and sheep. To date, high grazing pressure has prevented forests from growing back, and large hunting estates have prevented actions to control deer.

In this challenging context, the NGO Trees for Life (TFL) rewilded thousands of hectares to native Scottish forest. They showed that areas near remnant forests can regenerate naturally if grazing pressure is reduced and developed methods to propagate and plant native tree species. They also reintroduced red squirrels to many forest fragments and advocate the reinstatement of other keystone animals, especially large predators. Their work has shown that native trees and plants can regenerate naturally in some places, but only when grazers are controlled. Their future work focuses on collaborating with landholders and hunters to rewild the Highlands at larger scales.

## Exemplary practices

TFL founder Alan Watson Featherstone began collaborating with the national government at a very small scale to create enclosures and plant trees for several years, as part of the Findhorn Foundation, before setting up TFL as an independent charity in 1993. This early work, funded by individual donations, provided a powerful demonstration of what can happen when grazing is reduced, and helped build momentum. Their work has always relied on a combination of strong, dedicated leadership and organized volunteer programs, which served to educate and engage people from across the UK to implement rewilding programs. Their rewilding techniques mimic nature whenever possible; species are planted where they would naturally be found, and trees are planted in irregular stands. Their nursery specializes in hard to find/grow native species, many of which are unavailable commercially, and produces for their operations and others.

## Key lessons learned

- ▶ *Persistent, visionary leadership can go a long way towards making rewilding a reality.*
- ▶ *Reducing grazing pressure is critical for restoring the Scottish Highlands.*
- ▶ *Deer populations can be reduced locally, allowing forests to recover.*
- ▶ *Rewilding requires a mixed-methods, location-specific approach.*
- ▶ *Animal reintroductions are difficult but essential for long term ecosystem function.*
- ▶ *Rewilding needs people: Incorporate local needs and culture into rewilding design.*





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# Restoration narrative

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## Geography and ecological setting

Today, the Scottish Highlands are largely devoid of trees. But it wasn't always this way. At one time, forests covered most of Scotland, including 1.5 million ha (5,791 square miles) of "Caledonian" highland forest. Located throughout the Highlands (which occupy the NW part of Scotland) the Caledonian forest is the westernmost extent of the European boreal forest, and native trees include Scots pines (*Pinus sylvestris*) (the only coniferous tree) and broad-leaved species like downy birch (*Betula pubescens*), silver birch (*Betula pendula*), European aspen (*Populus tremula*), rowan (*Sorbus aucuparia*), alder (*Alnus glutinosa*), hazel (*Corylus avellana*), holly (*Ilex aquifolium*), willows (*Salix spp.*), bird cherry (*Prunus padus*), wild cherry (*Prunus avium*), sessile oak (*Quercus petraea*), ash (*Fraxinus excelsior*), and wych elm (*Ulmus glabra*) (Featherstone, 2019). Forests were once home to large mammals including wild boar, elk, the Eurasian lynx, the European brown bear, the European beaver, and grey wolves (Short, n.d.; Featherstone, 2019). Today, less than 2% of this original forest remains and all large predators have been eliminated, along with other keystone species like beaver and wild boar (Figure 1).

The Scottish NGO Trees for Life works to rewild the Caledonian Forest through tree planting, assisted natural regeneration, and wildlife management. Their current efforts are based on the success at two key sites, Glen Affric and subsequently Dundreggan, a 4,000 ha (15.4 square miles) privately-owned estate where rewilding efforts have been underway since 2008. These two locations are the focus of this case study.

## People and livelihoods

The Scottish Highlands have been settled for centuries. In the Dundreggan and Glen Affric areas, inhabitants used the “Sheiling” system of agriculture from the 11th century. Mixed crops were grown in valleys, and small herds of livestock pastured in upland areas in the summer, in keeping with the ecological fragility of the region (Bil, 1990; Holl and Smith, 2007). But in the 1700s and early 1800s the “Scottish Clearances” forced many small farmers to leave. Farms were amalgamated into hunting estates, many with absentee owners who used the land occasionally for hunting deer (A. W. Featherstone, 2022, personal communication; D. Gilbert, 2022, personal communication). Today, some estates are for private use and others for tourism.



Figure 1. The original extent of the native pinewoods of Scotland (left) shown as the black-and-white barred area in comparison to the existing remnants (right) shown in black. Only 2% of the original native pinewoods remain. In the right-hand map, the barred area shows the forest regeneration area envisioned by Trees for Life. Source: Featherstone, 2016

Fishing and hunting are major economic activities and bring many tourists to the Highlands (Micklewright, n.d.).

## Deforestation history

The Caledonian Forest was largely deforested by the 1700s for wood, fuel, and farmland. During the 16th and 17th centuries, people would also burn woodlands to destroy wolf habitat and drive them from villages (Short, n.d.; Featherstone, 2019). Remaining forests were limited to remote/inaccessible areas (Holl and Smith, 2007). Deforestation was accompanied by a change in climate following the last Ice Age, and wet soils inhibited regrowth once forests were cleared (Oosthoek, 2013).

By 1950, only ~1% of the original Caledonian Forest remained, dispersed over 80 small patches. Once cleared, grazers—domestic and wild—prevented forests from growing back. Sheep and cattle farming was accompanied by the eradication of large predators and a dramatic increase in red deer populations. Deforestation, competition from the invasive gray squirrel, and eradication caused populations of the only native squirrel, the red squirrel, to drop.

Once estimated at 3.5 million in the UK, today there are 171,000 red squirrels, of which 75% are in Scotland (Trees for Life, 2020).

The damage from grazers is widespread and dramatic (Stewart, 2010; Brown et al., 2011). “The problem is, we’ve exterminated all the predators here,” says Trees for Life (TFL) founder Alan Watson Featherstone (2022, personal communication). “The wolves, the lynx, the bear, long gone. Deer numbers have been encouraged to rise because of sporting interests. People pay quite a lot of money to come and shoot the stag. And so, estate owners feed the deer so they survive the winter when they shouldn’t, perhaps. Deer numbers have gone up and up and they’re totally out of balance with their ecosystems. They’re eating all the young trees, and that’s been happening for 200 years.” From the 1850s onward, many deer hunting estates were stocked seasonally with red deer (Barkham, 2019), causing damage to the ecological and productive potential of the land (Armstrong, Holl, and Halley, 2014).

Most Highland tree planting initiatives did not help native forests. By the early 1900s, only 6% of Scotland was woodland (Oosthoek, 2013), spurring the British government to found the Forestry Commission in 1919 to establish timber reserves.

Fertile lands were left for food production and timber relegated to the Highlands (Oosthoek, 2013). Timber reserves used North American species including sitka spruce, western red cedar, and Douglas fir. By 2000, tree cover in Scotland had increased to 18%, but most new tree cover was species-poor, non-native plantations (Oosthoek, 2013).

Glen Affric and Dundreggan both have important remnant native forests. Often called “the most beautiful glen in Scotland,” Glen Affric (57.312N, 4.863W; 230 masl) is a large valley with many smaller, tributary valleys, located 25 km west of Loch Ness (Scottish Natural Heritage, 2010). Land use history includes commercial conifer plantations, heavy grazing, and peatland draining in some areas. Glen Affric is home to one of the largest ancient Caledonian Pinewood forests with many native Caledonian trees (NatureScot, n.d.) alongside heather, blaeberry, creeping ladies’ tresses, twinflower, one-flowered wintergreen, juniper, hawthorn, blackthorn, sloe, dwarf birch, and rare ferns in the understory (Featherstone, 2019). Birds include the crested tit, Scottish crossbill (the only bird endemic to Scotland), black grouse, and capercaillie (Featherstone, 2019; NatureScot, n.d.). Glen Affric was designated a National Nature Reserve in 2002 and is a ‘priority habitat’ in the European Union’s

Habitats and Birds Directive, which supports restoration efforts (Featherstone, 2019). Nearly 15,000 ha (37,066 acres) of land are managed by the UK government.

Dundreggan (4025 ha; 57.192N, 4.763W; 130 masl) was a hunting estate. Located in a rain shadow, its acidic bedrock created nutrient-poor soils. The many domestic grazers that were on-site from the 1400s were displaced in the 1700s. The Dundreggan hunting lodge was built in the 1800s, and hunting continued until TFL purchased the estate in 2008. Despite a long history of use and deforestation, it is still astonishingly diverse, with over 4,000 species of plants and animals and a small but significant remnant patch of birch-juniper forest. But like most of the Highlands, it was largely grassland, devoid of forests for centuries (Trees for Life, 2008).

## The turning point

The characteristic pastoral landscape of the Highlands—devoid of trees and often people—was accepted by many as its “natural” state. Changing this perception was complicated by the fact that most Highland woodlands were monoculture plantations. Change happened slowly. In the 1960s, UK tourists started to visit the Highlands, and many found the timber monocultures unappealing. By the 1970s, the Royal Society for Protection of Birds (RSPB) began publicizing how tree plantations were detrimental to natural habitats and bird populations (Oosthoek, 2013), and conservation organizations continued this agenda through the 1980s. The British government stopped planting tree monocultures in the Highlands in 1990. The Forestry Commission reduced clearcutting and promoted sustainable management instead, including planting native broadleaved species (Oosthoek, 2013).

People also began to understand that Scotland’s native forests were wild, unique, hauntingly beautiful, and critically endangered—completely dissimilar from monoculture woodlands (Figure 2). The 1959 seminal book, *The Native Pinewoods of Scotland*, began to bring the Highland Forests into public awareness. Finlay Macrae, a student of one of the authors, became the manager

at Glen Affric (Trees for Life, 2018) and began growing and planting native Scots pine—over 8 million trees in his time there. He created a deer enclosure in the 1960s, where young pine trees grew back in abundance in stark contrast to grazed areas (Featherstone, 2019).

Despite their unique beauty, the last of the ancient native forests were not being cared for. After visiting a native forest patch in 1989, Featherstone was inspired to take action. “I saw the remnants of the Caledonian Forest, which were dying on their feet. It was old trees, 200–250 years, at the end of their lives, dying off with nothing growing to take their place. And I really felt the forest was calling out for help” (A. W. Featherstone, 2022, personal communication; Box 1).

Featherstone’s first major rewilding activity was to fence off a 50-ha plot of land at the Glen Affric site in 1990. He approached the Forestry Commission of Scotland for permission. Despite being strapped for funds, they wanted to conserve the native forest, and a partnership was born (Featherstone, 2019). An undergraduate graduate student working with Featherstone found that prior to fencing, around 100,000 Scots pine seedlings were growing on the site. They were on average 8.5 cm tall, but astonishingly, their average age was 10 years old.

*Figure 2. Native Caledonian forest fragment with Scots pine. Photo credit: Terry Donnelly, Alamy*



They had been stunted by heavy grazing (Featherstone, 2019). This enclosure initiated the work that became the foundation of TFL. Four years later, Featherstone established TFL as an independent charity in its own right with the mission of preserving the last remnants of Caledonian Forest and expanding them to restore the forest to the surrounding landscape.

## Visionary leadership: The roots of Trees for Life

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Trees for Life manages thousands of hectares and pounds of donations. But its beginnings were humble and rested on the passion and vision of one individual able to inspire and motivate others. “I always felt this yearning for the big forests,” Says TFL founder Alan Watson Featherstone. “Glen Affric was the closest I could get here in Scotland. In the early 1980s I saw that the Forestry Commission, which owns most of the old forests there, weren’t doing anything about this ancient forest that was dying because of financial constraints at the time. I had this sense of somebody needs to do something about this, and it felt like the trees were calling out for help. That was my starting point.”

In 1986, Featherstone organized One Earth: A Call to Action, a weeklong gathering that aimed to put environmental solutions into action. “We asked, do you feel inspired to stand up in front of 300 people and make a commitment to do something positive for the planet? We can’t wait for governments, for big organizations. It’s got to start at the grassroots level. So, I stood up and said, ‘I commit myself to launch the project to restore this forest.’” At this time, Featherstone had “no formal training, no background, no access to land, and no funds. But I have what I think is the most important thing—this deep connection with the land.”

“It took me three years before any practical work happened on the ground because I had to educate myself, make contact with landowners, raise money. In 1989, me and some volunteers began the first practical action, protecting trees with plastic tubes to keep them safe from deer until a fence could go up to protect them. But the big breakthrough was in 1990, when I reached an agreement with the Forestry Commission, who owned most of Glen Affric and identified a number of areas where there were lots of seedling trees, all getting eaten by deer. We raised £14,000... quite a lot to pay for the fence. And rather remarkably, given my long hair and living on an alternative community and all, the Forestry Commission man said, okay, we’ll do it and make a partnership. We fenced off 50 hectares in 1990.”

The real breakthrough, however, was capturing the attention of the UK public. “In those days the Findhorn community had a very good PR lady who said, ‘Alan, we’ve got to get some publicity for this.’ We managed to contact David Bellamy, a well-known environmentalist in Britain at the time, a great media figure, very expressive, very charismatic. And he happened to be coming up to Inverness. We said ‘Can you come and close the gate to our forest enclosure? He said he had only 2 hour’s time between speaking engagements, but if we could get him on to the site, he’d do it.” Despite reservations about the ecological impacts, Featherstone was convinced to hire a helicopter. Bellamy’s endorsement attracted two TV channels in Britain and the Guardian newspaper. “That was really the launching pad: I went overnight from just being an individual with this idea to being all over the media, both television channels and the press. So, that was a real amazing turning point. When [an idea] becomes grounded in physical reality and can be seen, it can be touched, it can be visited, that attracts a lot more”.

From there “the relationship with the Forestry Commission developed. We planned out two more fences for the following two years and then the next year we started tree planting as well relying on volunteer labor. The Forestry Commission had a rustic, off-grid, old stone

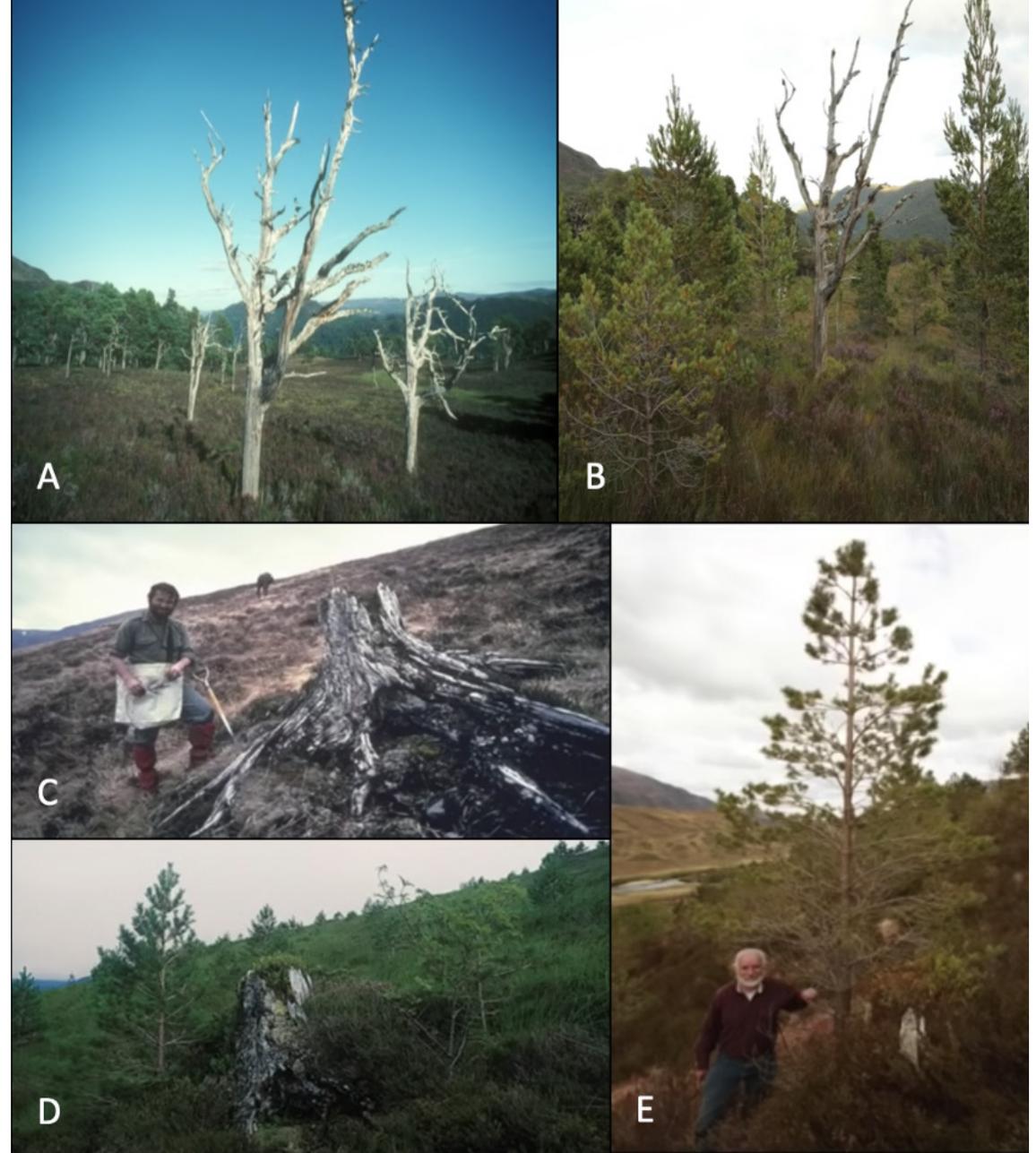


Figure 3. Regeneration progress within grazing enclosures in Glen Affric. The snag serves as a comparison point for the success of natural regeneration in 1989, before (A) the initial enclosure was established in 1990, and after in 2015 (B). The stump serves as a comparison point for another enclosure when pines were planted in 1991 (C), in 2002 (D), and 2011 (E). Source: A. W. Featherstone

cottage out there, and we used it for many years. I started ‘Volunteer Weeks,’ where we provided food and transport to get unpaid volunteers on site. The Forestry Commission provided trees. The volunteer program was really another turning point—people could engage in [rewilding] practically. And, of course, that had a huge effect on people. And then we started a training program, and people came and did that and then went off and some set up their own projects elsewhere. So, it really began to have a knock-on effect.” Alan worked with little pay, even going without funding for a six-month period.

Alan realized the next crucial step was purchasing land. “Basically, as long as we were working with other landowners, there was always a limit to what we could do because they had their own agenda. I knew that deer management was crucial to helping the forest to recover, but it was the exclusive responsibility of landowners.” After several unsuccessful attempts at purchasing estates, the Dundreggan Estate in Glenmoriston became available for purchase in 2004. Alan was established enough to raise the needed funds, and TFL was established as a land-owning entity when it took ownership of the estate in 2008.

*Figure 4.  
Regeneration  
within and outside  
deer exclosures.  
Top panel: planted  
Scots pine fenced  
off 1991, pictured  
23 years later. Note  
the diversity of  
understory plants  
growing within the  
fence vs only grass  
outside the fence.*



*Bottom panel:  
Area fenced  
off in 1997 to  
protect an eared  
willow seedling  
has allowed  
vegetation to  
flourish, pictured  
15 years later.  
After seven years,  
bluebells even  
appeared in the  
exclosure. Source:  
Featherstone, 2016*



## Planning and engagement

TFL works with government agencies, private donors, volunteers and landholders. TFL has worked with the Forestry Commission since the beginning. The initial deer exclosures in Glen Affric were on land managed by the then cash-strapped Forestry Commission. They continue to have good partnerships around shared goals, as the Forestry Commission aims to increase woodlands and connectivity in the Highlands by 25% by 2050. TFL also works with the National Trust of Scotland (Thomas et al., 2015).

At Dundreggan, TFL engages people through volunteer and training opportunities. Volunteers from all over the country and abroad conduct 90% of the work in the nursery and planting trees in return for training and on-site lodging. During “Conservation Weeks” cohorts of 10 volunteers work 9–5 for six days and learn how to plant native trees, remove invasive species, collect seeds, repair fencing, and other tasks. Volunteers can also work longer term for one to three months. In 2018, TFL began a 12-month, fully subsidized training program for rewilding skills, to train Scottish folk as skilled land-management workers and take a step towards empowering them to reclaim their native land. Each year, five students lived on-site and learned by doing .

TFL still struggles to engage nearby landholders and local communities, many of which are wary of their pro-conservation/pro-deer control stance (D. Gilbert, 2022, personal communication).

Their next initiatives include a landscape-wide rewilding program and a new rewilding education center, both of which aim to bring local people on board to rewild the Highlands at scale. Glen Affric and Dundreggan serve as powerful demonstration sites for the ecological and financial benefits rewilding can bring.

## Costs, funding, and other support

Rewilding work began on a shoestring budget. The initial exclosure in 1990 cost 14,000 GB Pounds (US\$24,000), funded by private donations. Subsequent exclosures were partially subsidized by Scotland’s conservation department, and all were located on land managed by the Forestry Commission. While the woodlands grew within exclosures, so did their partnerships. TFL received funds from the National Trust for Scotland, the Royal Society for the Protection of Birds (RSPB), local private landowners, and other groups. The red squirrel reintroductions were made possible by the European Outdoor Conservation Association and Peoples Trust for Endangered Species (Featherstone, 2019).

Trees for Life now receives funds from trusts and foundations, private donations (over 2,000 regular supporters plus additional one-time donations) and generates revenue by selling trees (private trees sales, and on-site tree sponsorships), ethical merchandise, and forest products produced on site (venison and timber) (Table 1).

Budget item	Income	Expense	Budget item	Income	Expense
Private individual donations	£604,500	£718,000	<b>Supporting volunteers and trainees</b>	£205,000	£124,000
Trusts and foundations	£704,500	£918,750	<b>Rewilding Dundreggan</b>	£257,000	£416,250
Business donations	£412,000	£900,000	<b>Propagating trees</b>	£234,250	£249,000
Gifts and products	£991,250	£436,750	<b>Rewilding implementation</b>	£175,750	£201,250
Other	£293,500	£57,250	<b>Fundraising</b>	£282,500	£328,250
<b>Total</b>	<b>£3,006,000</b>	<b>£1,154,500</b>		<b>£3,030,750</b>	<b>£1,318,750</b>

Table 1. Trees for Life annual income and expenditures (Trees for Life, *Annual Review 2019-20*; Trees for Life, *Annual Review 2020-21*).

## Implementation

On the ground implementation started with a 50-ha (123.6 acre) deer enclosure on the Glen Affric site in 1990. TFL founder Alan Watson Featherstone, alongside volunteers recruited through the Findhorn Foundation's international network, began planting pines in 1991. They used an unconventional, staggered approach to mimic nature, distinct from other plantations in the Highlands. They also planted forest stands in 'nuclei' or islands, from which woodlands could expand naturally to connect each other (Featherstone, 2019). Trees were planted with individual plastic tree guards to prevent grazing. This pioneering work created a dramatic 'demonstration site,' and Glen Affric is now one of Scotland's oldest and most well-known rewilding site and attracts tourists from the UK and abroad.

It soon became clear that owning land was essential to rewild at scale, as deer management in Scotland is at the discretion of individual landholders. The work at Glen Affric helped Featherstone to gather the momentum to purchase land and simultaneously found TFL.

### **Procuring land.**

Purchasing land took years. Most land in the Highlands is passed down through inheritance, leaving little on the market.

But Dundreggan’s owner, a wealthy Italian man who used the estate sporadically for hunting, died without a will creating a rare opportunity to purchase it. In 2008, TFL purchased Dundreggan through crowdsourced funds, a process that took three years.

### **Controlling deer populations.**

After Dundreggan was purchased the first step was to reduce deer grazing. Deer numbers—an estimated 20 deer/km<sup>2</sup>—were far too high to allow forests to recover. TFL created a holistic land management plan in line with their own rewilding philosophy and that of their partners (Featherstone, 2019). But deer culling was still highly controversial, and their management objectives were at odds with the surrounding hunting estates which have a vested interest in keeping deer numbers high.

“There is a Deer Management Group operating in Glenmoriston (as elsewhere), says Doug Gilbert, “which aims to improve collaborative management, but it rarely works effectively, and often meetings are fractious affairs with conflict between “traditional” sporting estates and those like us and Forest and Land Scotland, who wish to see fewer deer.” Trees for Life employed a professional deer stalker and concentrated culling around forest remnants in the center of the estate, which lessened the impact on deer populations on neighboring estates (D. Gilbert, 2022, personal communication).

### **Restoration techniques.**

When possible, TFL used natural regeneration. “We would like to let the trees come on their own,” says Steve Micklewright, the CEO of TFL. “But because this land has been so bare for so long, there isn’t the diverse seed source to make this happen.”

Where trees were unable to grow back, TFL planted native species (Barkham, 2019). Deer exclosures were placed in wet areas (moorland and bogs) with few to no trees, and dense areas of understory plants, including heather, grass, bog myrtle and sphagnum moss. TFL used a variety of native trees, including Scots Pine (*Pinus sylvestris*), silver and downy birch (*Betula pendula/pubescens*), rowan (*Sorbus aucuparia*), juniper (*Juniperus communis*) and hazel (*Corylus avellana*). Planting was done by mounding, which involves overturning the soil and planting seedlings on the exposed underside. About 1,000 seedlings/ha were planted (Zu Ermgassen et al., 2018). As in the original Glen Affric sites, trees were planted in nuclei to encourage natural regeneration surrounding them (Featherstone, 2004).

Outside exclosures, seedlings were planted with individual fenced enclosures designed to last about 30 years. Fencing is “a bit of an admission of failure,” says Doug Gilbert—a short-term, expensive, and labor-intensive solution that buys time while deer numbers can be reduced.

Fences eventually get holes that deer can get into, but at the same time act as a landscape barrier to vulnerable species, like capercaillie and black grouse who will collide with fencing when they fly low (Featherstone, 2019). TFL hopes that someday deer numbers will be reduced to the point where fencing won't be needed.

While planting initially focused on Scots pines, TFL expanded to include all native tree species. "TFL are concerned that politicians' tree-planting pledges will lead to new non-native commercial plantations, which are disastrous for most wildlife" (Barkham, 2019). Most trees planted in the Highlands during the 1900s were exotics from North America. TFL had to start from scratch, learning to collect seed and propagate native species. Thus, the Dundreggan nursery specializes in growing scarcer and hard-to-grow species. Some seeds are rare and difficult to access, like woolly willow and dwarf birch (Barkham, 2019). Some species—like juniper—take years to germinate. Others (like acorns) store poorly. Aspens rarely flower and so are a difficult but essential species to plant—they often will not recolonize an area once cleared but are important for a range of other species in the ecosystem, including beavers.

Seeds of all species are locally sourced from native woodlands to preserve genetic and biological diversity.

Volunteers and staff collect seeds from a wide variety of individuals of each species, usually from the same glens that they want to plant the final trees back into. Dundreggan's nursery now supplies other projects and landowners with young trees as well as growing all the trees for their own efforts.

### ***Reintroductions of animal species.***

Beaver, red squirrels, and top predators like wolves and lynx are important to the ecological function of the native Caledonian forests. Of these, red squirrels have been the least controversial—they are small, cute, and less disruptive to people and farming than beavers and predators. Red squirrels often don't survive in fragmented landscapes if forest patches are too small or the distance between them too large. TFL's red squirrel reintroduction program reintroduces squirrels into forest patches. Prior to reintroduction, staff survey the vegetation and structure to ensure that the forest can support them. Once established, squirrels fulfill their important ecological role of dispersing pine and oak seeds and sometimes spread to other patches on their own. TFL has also translocated wood ants from areas where they are abundant in Glen Affric to forest stands that are isolated and lack the ants. Reestablishing forest connectivity remains a major element of TFL's work (Featherstone, 2004).

TFL experimented with using boar to remove dominant, tree suppressing species like bracken. Boar disturb the soil, looking for grubs and also use bracken fronds for their nests, creating an opportunity for trees to reseed. TFL initially confined nine wild boar in a 14-ha (34.6 acre) enclosure.

***Training programs and volunteers.***

From early on efforts at Glen Affric and then Dundreggan relied on volunteers and made training a priority. “In 1991, I started ‘Volunteer Weeks,’ where people came for free and we provided food and transport,” says Featherstone (2022, personal communication). “We began planting trees and doing other work, removing non-native species, collecting seeds for propagation, native trees, survey work, etc., and people would engage in it practically. And, of course, that had a huge effect on people.” Soon Featherstone was training people to train volunteers and developed a more formal training for rewilding. “People then went off and some set up their own projects elsewhere. So it really began to have a knock-on effect,” says Featherstone.

TFL used its volunteer network in a variety of ways. People supported them “by buying trees that we would plant... so we get the cost of the tree covered and then we’re able to plant trees with volunteers, which engages them with rewilding in a virtuous circle” (D. Gilbert, 2022, personal communication).

“Volunteer Weeks”—now called “Conservation Weeks”—continue, and TFL also hosts Conservation Days to engage local people and families in their work. Most recently, TFL wrapped up a 3-year (2018–2020) training program, “Skills for Rewilding,” which each year gave five young people 1-year, fully-funded, on-site placements to learn about rewilding. Many went on to work in rewilding in Scotland. TFL specifically recruited young people and local people to invest in the future of the local community. Training experiences included deer management, working in the nursery, doing surveys and research in the forest, and helping with community work.

TFL brings in volunteers from around the UK and the world, but local participation is challenging (D. Gilbert, 2022, personal communication). TFL markets their volunteering as a way to connect with nature. In the year prior to the COVID pandemic (2019–2020), TFL hosted hundreds of volunteers (TFL annual review 2019–2020). With the opening of the Rewilding Center in 2023, they’ll begin offering more varied volunteer opportunities.



Figure 5. Volunteers at Dundreggan.  
Source: Trees for Life, 2021



Figure 6. (top) Volunteers from a Conservation week. (bottom) Volunteers in the nursery at Dundreggan. Source: Trees for Life, 2021

## Outcomes and impacts

*“At first, Dundreggan’s biggest fenced enclosure looks dominated by bracken. But crouch down, and the horizon is fuzzy with young trees: downy birch, rowan, and plump little Scots pines. There are no straight lines – it is emphatically not a “plantation” like the rigid blocks of non-native sitka spruce on the far side of the glen.”*

—Barkham, 2019

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Securing the Dundreggan Estate through crowdsourced funds and successfully working on a shoestring budget are impressive outcomes in their own right. In 2002, in recognition of the exceptional forest there, Glen Affric was declared a National Nature Reserve, and the Dundreggan estate is now home to the UK’s first Rewilding Center (to open in 2023) (Micklewright, n.d.). The work at Glen Affric and Dundreggan also demonstrated unequivocally that removing grazing pressure is essential for forest regrowth. The forests that returned through planting and reducing grazers (Figure 8) represent a significant expansion of the region’s forests and provide a powerful demonstration site for future work.



Figure 7. Forests—native trees, heather and bog myrtle—regenerating inside a deer enclosure constructed in 1990 in Glen Affric. Photo credit: Trees for Life

### Reduced deer populations and forest regrowth.

In some places forests regenerated without planting once grazers were removed. For example, in the original 50-ha enclosure at Glen Affric, prior to fencing in 1990, there were an estimated 100,000 pine seedlings—with a height of 8.5 cm and an average age of almost 10 years (NatureScot, 2015). “Oh, my goodness. Wow” was Featherstone’s initial reaction. “Ten years old and under nine centimeters tall. And that was 99% because of grazing damage. And that was just pines. It was also broadleaf trees, that of birch, rowan, and others. But the pine is the largest, longest lived tree—the critical tree. It’s the backbone, of course, of the ecosystem” (A. W. Featherstone, 2022, personal communication). Once the area was fenced off, within two years the forest began to visibly recover.

Deer populations were reduced by at least 50% at Dundreggan (from an estimated 500 to about 150-200) mainly through culling. “We’re beginning to see the impact,” says land manager Doug Gilbert. “We’ve now got ecological succession processes starting and trees starting to pick up where there were no trees before.” At these lower deer densities, managers were seeing trees and forests regrowing even in unfenced areas.

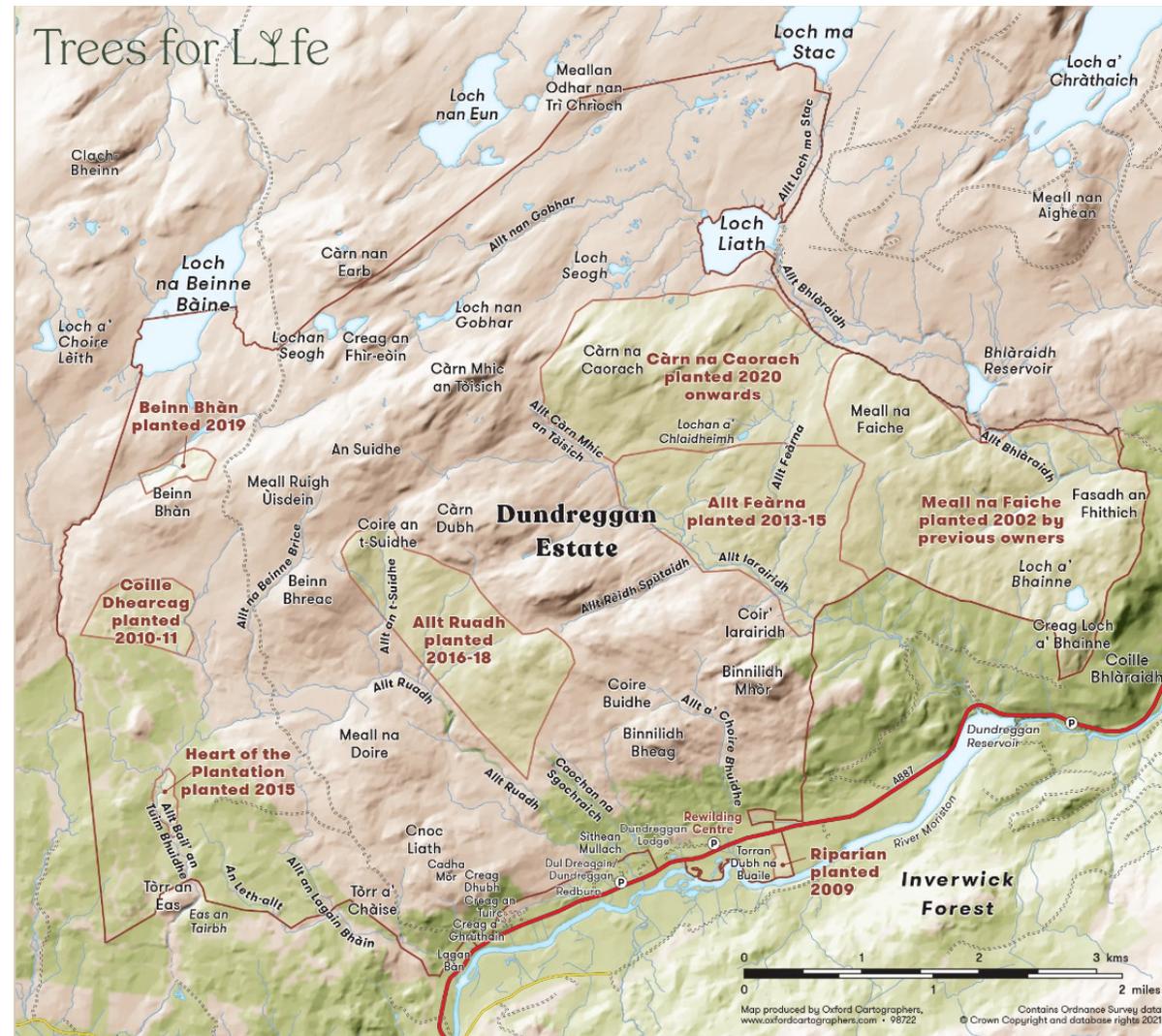


Figure 8. Planted areas on the Dundreggan estate. Source: Trees for Life

**Planting native trees.**

From 2008 to 2022, TFL planted nearly 2 million trees, mainly at Dundreggan (Barkham, 2019). The on-site nursery produced about 60 thousand trees in 2021, including many scarcer natives like mountain willows and aspen. All the trees come from Scottish seeds, meaning they are suited to Highland climates and species and free of novel diseases.

Trees grew best when planted in their optimal soil and hydrological conditions and protected from winds. Understory plants like heather, blueberry, and orchids also returned naturally to most planted areas (Figure 8, after 6 yrs of planting) followed by young pioneer trees (e.g., rowan, silver birch, downy birch, eared willow). In older planted areas, litter from trees improved the soil and stimulated further recovery with later successional species (such as Scots pine, oak, hazel, wych elm, ash, goat willow, bird cherry (Featherstone, 2019). Fifteen years along, some protected and planted trees were over 4 meters tall and produced seed to aid regeneration, as well as habitat for insects which in turn attract seed dispersers.

**Regenerating other ecosystems.** Other ecosystems are also beginning to recover, including peat bogs. Native bog plants are slowly returning to peatland areas, including sundews and native mosses, and in drier areas, heath and bog myrtle.

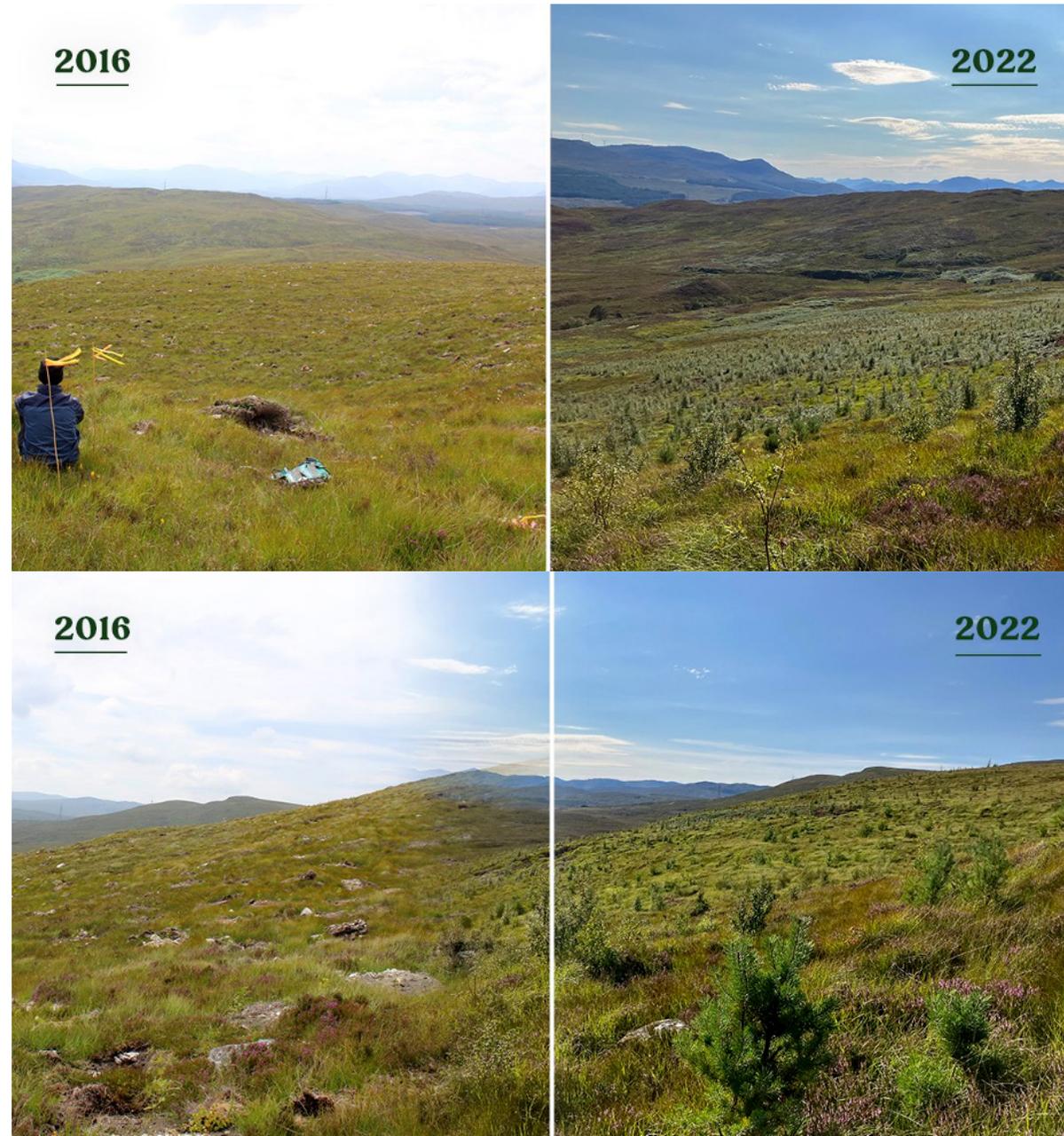


Figure 9. Forests recovering before (left) and six years after planting with native species (right). Note that these areas were planted after deer densities had been reduced. Photo credit: Trees for Life

The progressive return of these plants signifies the restoration of functional ecosystems (Featherstone, 2019).

***Species reintroductions.***

Nine new populations of red squirrels were established. Baby squirrels were frequently sighted and a number of other populations have colonized new woodland areas from these original, successful translocations (Trees for Life, 2020). Boar enclosures also reduced bracken density, and natural regeneration occurred more than in areas without boar (Henney, 2012).

***Increasing connectivity.***

TFL restored connectivity between two key forest fragments, in Glen Affric and Glen Moriston, by setting up a series of fenced enclosures and restoring montane shrublands (Featherstone, 2004). Connecting ecosystems across the landscape remains a critical component of their work and is a central focus of their next big initiative, rewilding the Affric Highlands. This initiative aims to promote rewilding on private lands, at the discretion of individual landholders. Although they do not envision a project-wide land management plan, encouraging more ecosystem rewilding across the landscape is expected to reduce the distance between forest patches and create refugia in the landscape (Trees for Life, 2022).





Figure 9. Tree nursery at Dundreggan. Photo credit: Trees for Life

## Key challenges

Controlling deer populations is controversial but essential, and TFL still wrestles with this challenge. Exclosures are effective but expensive to install, require maintenance, and are not feasible over large areas. Culling requires control over large areas of land and is at odds with the agendas of many hunting estates that dominate the Highlands. Reintroducing top predators is potentially a sustainable, long-term solution, but it has been met with much resistance including from farmers and hunting estates.

Land use goals are often in conflict with neighboring estates. Controlling deer populations and hunting deer might seem compatible but require very different management strategies. Hunters aim to maintain populations and focus on hunting trophy bucks, not females. Cullers aim to reduce populations and are thus after the females (D. Gilbert, 2022, personal communication). “Every other landowner wanted more deer,” says Featherstone of the initial meetings with surrounding estates. “So we were the odd one out. We were a pariah in this group, the conservationists who wanted to take away what they perceived as their financial underpinning for their operations, deer stocking” (A. W. Featherstone, 2022, personal communication).

Despite this, TFL was able to reduce deer populations at Dundreggan through culling. They cull toward the middle of the estate and avoid shooting trophy stags. But to scale up rewilding efforts, other landholders will have to exercise some level of deer control.

Some existing UK policies and landownership make conservation challenging. “Deer management is exclusively [the right of] landowners,” says Featherstone (2022, personal communication). To control deer, land ownership is crucial. TFL dealt with this by purchasing land, but this took many years, and land is seldom on the market.

Funding to start and maintain operations was challenging. “In the early days, we all received a pittance,” says Featherstone. “We once ran out of money and stopped paying our staff for six months, and people just volunteered. And when we started again, it was very minimal wages. We couldn’t attract people who had a career coming from other backgrounds” (A. W. Featherstone, 2022, personal communication). TFL also has to be creative to sustain operations. “TFL’s work is all about doing the same thing over and over again across the land, which isn’t desirable to funders—funders want something new and exciting to sponsor,” says Gilbert (2022, personal communication). TFL is thus constantly trying to reinvent themselves to appeal to funders.

Local community members were not engaged despite a constant influx of eager volunteers and trainees from farther afield. TFL was founded by the Findhorn Foundation, a “hippie commune” that some viewed with suspicion. But now that TFL is established and locals know some of the employees, people are beginning to trust the organization. TFL hopes the Rewilding Center will help the local community engage with Dundreggan (D. Gilbert, 2022, personal communication).

Finding seeds, growing and transplanting native plant species requires specialized scientific and local knowledge. For example, aspens rarely flower in Scotland and must be clonally propagated. Other species are rare, like elm or whitebeam, or located in difficult to access areas. Others have low germination rates, like juniper (2–3 years to juniper from seed, another 5–6 years to grow to be large enough to plant). TFL has had to devise methods for propagation/find seed sources through trial and error for many species, although some, like birch, were easier (D. Gilbert, 2022, personal communication).

Some areas have poor soil quality, restricting tree planting. Because trees have been absent for so long, soils are “horribly acidified and have low nutrients,” says Gilbert (2022, personal communication). “It’s tricky to

know where to place trees so that the trees will flourish.” Currently, TFL is diverting more efforts from tree planting to assisted natural regeneration, which is cheaper and removes the guesswork of where trees will and will not grow (D. Gilbert, 2022, personal communication).

Social resistance to large mammal reintroductions has led to a lack of political will and action. Despite the important role that top carnivores play, reintroductions are polarizing and many worry about attacks on livestock. It has taken ~20 years for TFL and other rewilding organizations to gain enough social traction to reintroduce beavers (A. W. Featherstone, 2022, personal communication), so reintroducing carnivores is unlikely to happen soon. In the Highlands, the key carnivore is the culturally demonized wolf (Featherstone, 2004). Introducing lynx may be a more tractable and less controversial pursuit (A. W. Featherstone, 2022, personal communication) that, combined with the gradual return of wolves across mainland Europe, may pave the way for wolf reintroductions.

Local communities are often detached from the land. Since the 1700s when the Highland Clearances occurred, many Scots have not owned their land: absent, foreign landowners do, and raising deer and sheep are often more lucrative than hosting tenants (A. W. Featherstone, 2022, personal communication).

Some are wary that conservation and rewilding could involve “throwing people off the land... this has serious resonances in Scotland that might not be so volatile elsewhere” (D. Gilbert, 2022, personal communication).

Many people view plantation forests as woodland. “When you talk to people about woodland...their image and what they’ve experienced is a planted sitka spruce plantation—and they love it, it’s really beautiful,” says Doug Gilbert (2022, personal communication). “Trying to persuade them that that’s not what we’re talking about—a native woodland, which is diverse and a tangle of brambles... That’s a difficult change to bring about in people’s minds. Also to point out the emergency of losing native forests... To them, there’s loads of woodland out here.”

## Enabling factors and innovations

Strong leadership and community played an essential role in getting Trees for Life off the ground. Founder Alan Watson Featherstone followed a calling to restore the Caledonian Forest and made it work through partnerships and persistence. The support of the Findhorn Foundation, which Alan Watson Featherstone was connected to, was also essential. This international community provided social support from all over the world, as well as a volunteer network which kept field operations running during the 1990s when they were unable to pay employees (A. W. Featherstone, 2022, personal communication).

Political and social support has also gathered in recent decades. Scotland gained some autonomy over land and resources, and among other initiatives in 2009, the Scottish government agreed to a 5-year trial period to reintroduce European beavers. This trial led to beavers being “an officially reinstated native species” in 2016 (Featherstone, 2019), the first large mammal reintroduction in the UK. Under the European Union’s Habitat and Birds Directive, the Caledonian Forest is a priority habitat, which has opened doors to funding through the EU’s Life Fund (Featherstone, 2019).

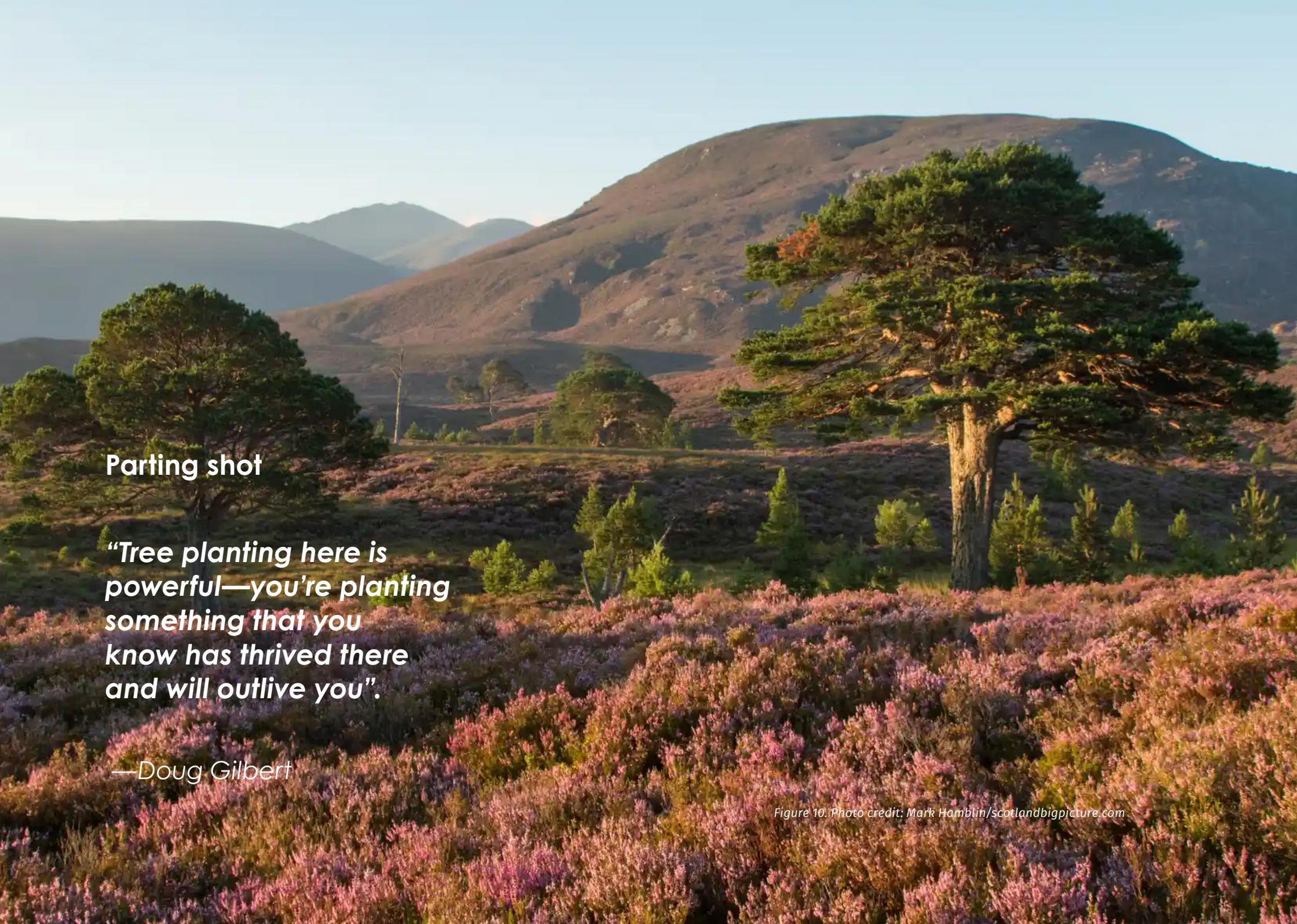
“There’s also been a real awakening of concern about forests in Scotland,” says Alan Watson Featherstone of the increased awareness that the Highlands were once forested with native trees. “More people have discovered the Caledonian Forest—it’s been publicized and the fact that it’s highly threatened...There’s been a lot of work done to raise awareness of the issue” (A. W. Featherstone, 2022, personal communication).

TFL’s innovative philosophy sees humans as catalysts in the restoration process. “Our goal then, is not to create some sort of “planned” new Caledonian Forest but rather to facilitate and enable the return of a large contiguous area of land to a self-willed condition—once we’ve got all the elements of the ecosystem back in place again, we’ll let Nature take over fully and will not do any further management, such as tree planting, fencing, etc” (Featherstone, 2019).

TFL also experimented with different ways of keeping deer away, including scare tactics. They showed that deer can be reasonably controlled in a relatively small (e.g., estate) area, an idea initially met with skepticism (A. W. Featherstone and D. Gilbert, 2022, personal communication).

Exclosures and individual fencing combined with general deer management allowed significant areas to recover and demonstrated how important controlling deer is. They also experimented with different techniques of propagating and replanting each native species and placing it in environments where it would be found in nature.

Conservation Weeks and training also provided a way to get the work done and created a network of passionate rewilding advocates. TFL’s next endeavor is to integrate local people more concretely into the vision for rewilding. “People have been a fundamental element of this landscape for thousands of years and remain so today. We want to give people stronger economic ties to the land through nature-based employment which sustains more livelihoods and puts communities on a stronger financial footing. This in turn can help to maintain rural populations and reinforce the precarious facilities and services that are essential to community life” (Trees for Life, 2022).



**Parting shot**

***“Tree planting here is powerful—you’re planting something that you know has thrived there and will outlive you”.***

*—Doug Gilbert*

*Figure 10. Photo credit: Mark Hamblin/scotlandbigpicture.com*



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# Key lessons learned

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- ▶ **Persistent, visionary leadership can go a long way towards making rewilding a reality.** The story of Alan Watson Featherstone's mission to rewild the Highlands demonstrates the power that individuals can have towards realizing outcomes. The pioneering and innovative work done by TFL over the past decades would not have happened without the perseverance of a charismatic leader able to engage and inspire others.
- ▶ **Reducing grazing pressure is critical for restoring the Scottish Highlands.** The imbalance of too many deer, no predators and tiny native forest remnants are the major impediment to forest recovery in the Highlands. Both lands planted with trees and areas that can regenerate naturally require long-term protection from grazers.
- ▶ **Deer populations can be reduced locally, allowing forests to recover.** Ideally, all landholders in a landscape would work together to reduce deer populations. But if that's not feasible, TFL showed that reducing deer numbers even on one estate made a marked improvement in forest recovery. Deer stayed away from culling areas, leaving forests to regrow.
- ▶ **Rewilding needs people.** Rewilding in concept is often associated with removing people from the landscape. The rewilding work by TFL aims to do the opposite: in a landscape dominated by absentee landholders and locals with little landownership, rewilding is a way to bring people back to the land to help it recover. Volunteers, visitors, and others are a vital part of starting and sustaining the work through their presence in the landscape.
- ▶ **Rewilding requires a mixed methods approach.** Where they can, let forests grow back. Where they cannot, planting native species can help.
- ▶ **Animal reintroductions are extremely difficult—and essential for long term ecosystem function.** Large predators—like wolves—are especially important to maintain diverse and functional ecosystems.
- ▶ **Incorporate the needs and culture of local communities into rewilding design.** Most people in the Highlands don't own large estates and are therefore reluctant to come forward with ideas or feel like they have agency (D. Gilbert, 2022, personal communication). For large scale rewilding, local people and landholders with different agendas and needs will have to be brought on board. TFL's next endeavor—Rewilding the Affric Highlands—aims to do just that—to engage all members of the community and help farmers and estate holders integrate nature into their landholdings and create connectivity across the landscape.



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Learn  
more

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## Further information and resources

### Websites

Trees for Life youtube channel

<https://www.youtube.com/user/Dundreggan/featured>

Rewilding Scotland documentary

<https://www.youtube.com/watch?v=RInYnVCAo1w>

Restoring the Ancient Caledonian Forest - Alan

Watson Featherstone - TEDxFindhorn

<https://www.youtube.com/watch?v=nAGHUKby2Is>

Dundreggan - History of a rewilding adventure

<https://www.youtube.com/watch?v=UUSDIHWjpl0>

The Reds Return

<https://www.youtube.com/watch?v=L93PFAPG3nM>

How to grow a forest

<https://www.youtube.com/watch?v=yZh9eTNtpS8>

Caledonian Pinewood Recovery

<https://www.youtube.com/watch?v=RCjhevMhbAY>

Webinar: A history of Dundreggan

<https://www.youtube.com/watch?v=UUSDIHWjpl0>

### Podcast

Conquering the Highlands: History of the

Afforestation of the Scottish Uplands

<https://www.environmentandsociety.org/mml/conquering-highlands-history-afforestation-scottish-uplands>

### Articles

Into the wild: Could lynx be reintroduced to Scotland?

<https://www.bbc.com/news/uk-scotland-highlands-islands-55857070>

Trees for Life blogs

<https://treesforlife.org.uk/about-us/news/>

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## Appendix 1: Trees for Life's guiding principles<sup>1</sup>

- ▶ *Work from areas of strength—the areas where the ecosystem is closest to its natural condition.*
- ▶ *Pay particular attention to keystone species—those on which many others depend.*
- ▶ *Re-establish ecological processes such as the use of pioneer species, natural succession, etc. to facilitate the rewilding process.*
- ▶ *Mimic nature wherever possible.*
- ▶ *Recreate ecological niches where they have been lost.*
- ▶ *Re-establish ecological linkages.*
- ▶ *Control and/or remove introduced non-native species.*
- ▶ *Remove or mitigate the limiting factors which prevent rewilding from taking place naturally.*
- ▶ *Pay special attention to species with limited ability to disperse.*
- ▶ *Reintroduce species that are unlikely or impossible to return by themselves.*
- ▶ *Re-establish essential ecological processes, such as predator-prey dynamics and natural disturbance, which are absent.*
- ▶ *Let nature do most of the work.*
- ▶ *The “green thumb” principle—love has a tangible, positive effect on all living things to which it is directed.*
- ▶ *Restoration is a natural process if we leave nature be or actively assist it, when we heal nature, we heal ourselves and our spirits.*

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<sup>1</sup> as developed by Alan Watson Featherstone

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