

Scottish
Environment
LINK

The case for natural regeneration of woodlands

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Photo: John MacPherson

Executive Summary

Natural Regeneration and Colonisation, or NRC, is a “light touch” approach to woodland management and expansion, working best where there is an existing seed source near to hand. It accounts for the overwhelming majority of the world’s forests. However Scotland makes little use of NRC for a range of reasons, not least grazing pressure, particularly from deer.

NRC can play a particularly important role in habitat restoration, especially in biodiverse Ancient Semi Natural Woodlands where it has long been recognised as the best management approach, in Continuous Cover Forestry and in native woodland expansion.

Given the short timescale that we have to reach our net zero commitment woodland expansion by NRC could provide a cost-effective route to create ecologically-rich and long-term natural carbon stores for the future. It can also assist with climate adaptation, making existing woodlands more resilient, and generating ecosystem services including enhanced water quality and natural flood management.

There are some good examples of NRC being applied at a landscape scale in Scotland, such as Cairngorms Connect. However there is real scope to embrace the approach much more widely, as experience in South West Norway demonstrates.

Certain conditions are required for NRC to succeed. These include environmental factors such as the availability of seed sources, the appropriate management of herbivores, and appropriate soil conditions.

However socio economic factors also play a part, with a forestry and land use culture which favours the more straightforward approach, and more tangible short term outcomes, that are available from using tree planting rather than NRC. Scottish Government regulatory influence and support from the Forestry Grant Scheme can change this situation, as can other support mechanisms such as the Woodland Carbon Code. NRC’s role as a cost effective and ecologically preferable alternative to planting presents considerable opportunities that Scottish Government can unlock.

LINK has made policy proposals which are aimed at encouraging the increased prevalence of NRC. In addition to LINK’s recommendation that at least 50% of tree cover expansion comprises native woodlands for nature’s recovery (i.e. 9,000ha of new native woodlands per year currently), LINK also proposes that 50% of this native woodland target should be delivered by NRC, with a particular focus on NRC around existing Ancient Semi Natural Woodlands. This approach will help to improve the condition of these rich habitats, as well as delivering short term savings in the grant budget as deer management costs substitute for fencing and planting costs. There will be ongoing costs associated with NRC, particularly relating to deer management, and this will deliver ongoing benefits for nature recovery, Scotland’s carbon budget and land-based employment.



1 What is Natural Regeneration and Colonisation

Natural Regeneration and Colonisation (NRC) is nature's process for woodland to establish and maintain itself by the dispersal of tree seeds from nearby mature trees. This process has led to the establishment of the overwhelming majority of the world's "old growth" and "secondary" forests (forests which have re-established themselves on sites previously occupied by old growth forests). Old growth and secondary forest account for 93% of the world's remaining forest cover,¹ with plantations accounting for the majority of the balance, and 33% of the world's industrial timber.² In Scotland, Ancient Semi Natural Woodland (ASNW) is the nearest equivalent to old growth and secondary forest, and it accounts for under 5% of Scotland's forest cover.

NRC is a "light touch" approach to woodland management and expansion, working best where there is an existing seed source near to hand, and where the existing ground vegetation layer is not dominated by very competitive species such as bracken. In today's landscapes, it almost always requires some form of human intervention, usually herbivore management, the removal or regulation of animals that will eat young trees.

This report uses the term NRC because in much of the literature and among practicing foresters there has been a tendency to use the term "Natural Regeneration" in a broad way to cover both the establishment of a new generation of trees within an existing woodland (the narrow definition of Natural Regeneration), and the expansion of woodland by seed dispersal rather than planting (which is more correctly defined as Natural Colonisation). Combining the two into one aims to simplify the language of the report, however where an external party is quoted the report respects their use of language. Further, natural regeneration has previously been used to include non native species in the context of Continuous Cover Forestry (CCF). However in this document, with the exception of Box 2 which covers CCF, NRC is used specifically for native species.



¹ FAO Global Forest Resources Assessment 2020 (FRA 2020). <https://www.fao.org/interactive/forest-resources-assessment/2020/en/>

² Mishra A et al, Estimating global land system impacts of timber plantations using MAgPIE 4.3.5, 2021 [https://gmd.copernicus.org/articles/14/6467/2021/#:~:text=Out%20of%201150%20Mha%20\(million,feed%2C%20livestock%20and%20timber%20production.](https://gmd.copernicus.org/articles/14/6467/2021/#:~:text=Out%20of%201150%20Mha%20(million,feed%2C%20livestock%20and%20timber%20production.)

2 Different approaches to creating and managing woodlands

NRC has a role in a variety of situations in Scotland, including habitat restoration, Continuous Cover Forestry and woodland expansion.

2.1 Habitat restoration and resilience

ASNW are widely recognised as particularly important habitats:

*ASNWs in good ecological condition are more biodiverse than other types of forest and are particularly important for rarer and specialist woodland-associated species.*⁴

Surveys continue to show that many of our existing ASNWs (the nearest thing that Scotland has to old growth forests, and often our richest terrestrial habitats) have a very poor age profile, often with too few young trees becoming established to secure the future of the woodland.⁴ The UK Government Forestry Standard (UKFS) recognises the importance of NRC in addressing this:

*Restoration of former habitats is most beneficial where the original features survive and the re-establishment and management of a functional ecosystem over the longer term is a practical possibility. It normally involves enhancing remnant native ecological features by NRC.*⁵

NRC is associated with biodiversity gains.⁶ In addition the climate adaptation potential of NRC is also recognised.^{7,8} The Woodland Trust sets out the core benefits of NRC as:

- 1. Natural regeneration provides a variety of different habitat structures in young woodland for a wide range of wildlife.*
- 2. Scientific evidence shows that the UK's native tree species have a wide genetic diversity, which can enable adaptation to climate change (and other threats such as tree disease). Natural regeneration supports genetic mixing and the natural selection of the fittest.*

- 3. Natural regeneration can help to reduce the need for importing tree stocks. Imported trees carry an increased risk of introducing new pests and diseases.*⁹

NRC can create woodlands which are “near natural”, offering distinct biodiversity gains over planted native woodlands which involve far greater human intervention in endeavours to simulate the conditions of ASNW:

*Ecological conditions are canalized in the production of one resource. NRC offers an antithesis. Land is not treated as a homogenous tabula rasa but instead is understood as patches of multispecies history. Circumstances are implemented for new ecological gatherings to emerge.*¹⁰

The benefits of NRC have long been recognised, and in 2000 one of Britain's foremost woodland ecologists, George Peterken, summarises some of the other reasons why NRC is important and appropriate:

*Native woodland boundaries tend to be diffuse, particularly in the Highlands. This is partly due to the prevalence of shade-intolerant trees, which generate ‘mobile woods’, degenerating in closed stands, but regenerating in open areas. It is also due to the historical prevalence of woodland pasturage, which generated a low-definition landscape of intimately intermixed trees, shrubs, grassland and mire.*¹¹

³ The UK Forestry Standard, 5th edition 2023 <https://cdn.forestresearch.gov.uk/2023/10/The-UK-Forestry-Standard.pdf>

⁴ Forestry Commission Scotland Woodlands Results from the Native Woodland Survey of Scotland, 2012 <https://cdn.forestresearch.gov.uk/2014/01/fcms126.pdf>

⁵ The UK Forestry Standard, 5th edition 2023 <https://cdn.forestresearch.gov.uk/2023/10/The-UK-Forestry-Standard.pdf>

⁶ <https://royalsociety.org/news-resources/projects/biodiversity/can-we-allow-nature-to-regenerate-without-intervention/>

⁷ <https://www.forestresearch.gov.uk/climate-change/adaptation-measures/using-natural-regeneration/#:~:text=Natural%20regeneration%20can%20refer%20to,Wildfire%20risk>

⁸ <https://www.forestry.gov.scot/natural-regeneration>

⁹ Emergency Tree Plan, Woodland Trust, 2020 <https://www.woodlandtrust.org.uk/media/47692/emergency-tree-plan.pdf>

¹⁰ Stanley T, Regeneration, Environmental Humanities 2025 <https://read.dukeupress.edu/environmental-humanities/article/17/2/540/401630/Regeneration>

¹¹ Peterken G, Developing forest habitat networks in Scotland, in “The Restoration of Wooded Landscapes” Conference Proceedings, ed Jonathan Humphrey et al, Forestry Commission 2000



Cairngorms Connect

The Cairngorms Connect initiative views the restoration of native woodlands to areas where they have been lost as a key element for tackling the nature and climate crises, and consider that NRC offers the potential to achieve this cheaply and at scale. However browsing ungulates like deer can inhibit this or alter the pattern of NRC.

30 years of regeneration monitoring in the Cairngorms show a consistent, large-scale expansion of native woodland, largely through NRC following deer culling, without the use of fences.

This was achieved across the partnership, despite differing management histories and land-managing organisations.

During peak periods of woodland expansion, the area of new woodland (i.e. exceeding 100 trees per hectare) increased by 1.2% to 6.0% annually in the four landholdings' NRC zones, equating to a total of approximately 164 ha annually of new woodland.

NRC is however patchy and hard to predict. Higher levels of management intervention can be needed to increase species that are rarer, more palatable or further from seed sources.¹²

¹² Gullett P et al, Woodland expansion in the presence of deer: 30 years of evidence from the Cairngorms Connect landscape restoration partnership, Journal of Applied Ecology 2023.



2.2 Woodland expansion

NRC can provide an effective means of expanding woodlands, especially where biodiversity is the main driver for expansion. A recent John Muir Trust and Trees for Life report found that 320,000ha of woodland expansion could be achieved by NRC if Scottish Government were to take the necessary steps to encourage more active deer management to achieve deer numbers that would allow natural processes to occur.¹³

2.3 Assisted NRC

This hybrid approach is a mixture between relying on NRC and planting some trees. Trees may be planted for a number of reasons, for example, to introduce tree species which are not represented in the local seed tree population, to ensure that a denser woodland becomes established across the site, and to allow for a mix between conservation and timber production objectives.

This is an approach that was supported by a recent Forest Research¹⁴ study, which found that many land managers increasingly favour this hybrid approach. However many would consider that time should be given for NRC before deciding to adopt a hybrid approach.

2.4 Balance between planting and NRC in Scotland

Both NRC and planting have a place in Scotland's approach to woodland expansion, but it pays to look at the balance between the two. There is considerable scope to increase the amount of NRC, while also recognising that there are many places where tree planting will remain the best approach, for example where there are insufficient seed sources, and where tree planting provides important opportunities to engage people with nature.

¹³ https://www.johnmuirtrust.org/assets/000/004/125/National_Deer_Management_Plan_V2.3_original.pdf?1747923113

¹⁴ <https://www.forestresearch.gov.uk/research/natural-colonisation-as-a-strategy-for-woodland-creation-and-expansion/social-dimensions-of-natural-colonisation>

Continuous Cover Forestry (CCF)

Scotland's forestry plantations are mostly comprised of non native conifers which are managed on a clearfell and restock basis (a crop of trees is planted, left to grow and then cut down in large blocks when the trees have reached the desired size). Elsewhere in Europe this approach (or Rotational Forest Management) is increasingly being replaced by alternative systems, such as Continuous Cover Forestry (CCF). CCF relies on manipulating the canopy of mature trees to create space for NRC (albeit often of non native species) to occur.

“Alternative methods of forest management to Rotational Forest Management (RFM) have been implemented for over a century. These methods are based on a set of five silvicultural principles: partial harvesting rather than clear-felling; preferential use of NRC; developing structural diversity and spatial variability within forests; fostering mixed species stands and avoidance of intensive site management practices. In Europe this is known as CCF or as close-to-nature forestry.”¹⁵

It is estimated that less than 1% of Scotland's plantations are managed by CCF, whereas in European countries where the practice is established the average is nearer 30%.¹⁶ Many of Scotland's plantations are on exposed upland sites, where high winds can be a constraint. However Coillte, the Irish equivalent of Forest and Land Scotland, recently announced that it would increase the share of state forest managed by CCF to 30%, despite having many plantations that are also on exposed upland sites.

The Forest Policy Group commented:

“Coillte's decision to expand Continuous Cover Forestry marks an inspiring shift toward biodiversity-rich, climate-resilient woodlands that produce high quality timber. This is an exciting development which Scotland can follow.”¹⁷

¹⁵ W.L. Mason et al, Continuous Cover Forestry in Europe: usage and the knowledge gaps and challenges to wider adoption, Forestry 2022, <https://doi.org/10.1093/forestry/cpab038>

¹⁶ W.L. Mason et al, Continuous Cover Forestry in Europe: usage and the knowledge gaps and challenges to wider adoption, Forestry 2022, <https://doi.org/10.1093/forestry/cpab038>

¹⁷ <https://www.forestpolicygroup.org/news/press-release-scotland-should-punch-above-its-weight-by-joining-ireland-in-shift-to-nature-forestry-says-independent-thinktank/>

3 The contribution Natural Regeneration and Colonisation can make to:

3.1 Climate mitigation

The impact of tree establishment on carbon stocks is complex and contentious.¹⁸ However there is evidence that NRC involves less soil disturbance than new planting, and thus results in less carbon dioxide release where organic soils predominate.¹⁹ This is especially critical for short term carbon balances, and as it is only 20 years until 2045 our net zero commitments require that we focus on these short term carbon impacts. The closer we get to 2045, the more unlikely it is that newly planted sites will have recovered from initial soil carbon losses by sequestration of carbon in the biomass of growing trees.

3.2 Climate adaptation, including ecological resilience

NRC is particularly appropriate where existing woodlands have a poor age structure, with too few young trees. NRC can result in diverse age classes, as well as a more diverse ground and shrub layer, while also allowing expansion around the woodland edge, potentially forming habitat networks where this expansion links existing woodland fragments. This process is critical to improving nature's ability to adapt to climate change, enhancing opportunities for wildlife to move in response to short term extreme weather as well as longer term change. The reduction in herbivore impacts required to encourage NRC can also allow for the restoration of natural processes across the landscape and thus improve resilience.²⁰

CCF can also deliver economically productive forests which are more robust in the face of disease and climate change by diversifying species mixes and age structures.²¹

3.3 Biodiversity

ASNW are among the most complex ecosystems in Scotland, having an ecology that is richer than more recently established woodland,²² and is described by Scottish Government as "irreplaceable".²³ NRC has long been regarded as the most appropriate way of maintaining and buffering this habitat. For example, in 1995 the Forestry Commission's Guide to Upland Oakwoods stated:

Management proposals should be geared to sensitive and low-key methods which are suited to the natural dynamics of these woodlands. Natural Regeneration will be preferred to planting wherever practicable.²⁴

The two main threats to the biodiversity status of ASNWs are inappropriate herbivore levels, particularly deer pressure, and the impact of Invasive Non Native Species.²⁵

To encourage a natural wild Highlands, while minimising unsightly fences, we have reduced our deer at Corrour from 15.8 per square kilometre in 2006 to 6.8 in 2017. Already we are seeing the landscape greening and blossoming, and our deer carcasses are on average 36% heavier.²⁶

¹⁸ Friggens N et al, Tree planting in organic soils does not result in net carbon sequestration on decadal timescales 2020 <https://doi.org/10.1111/gcb.15229>

¹⁹ Fletcher T et al, The carbon sequestration potential of Scottish native woodland, 2021. <https://iopscience.iop.org/article/10.1088/2515-7620/abf467/pdf>

²⁰ Paris D et al, Climate change and the natural environment: How Scotland should adapt, unpublished 2025

²¹ Stokes V and Kerr G, The evidence supporting the use of CCF in adapting Scotland's forests to the risks of climate change, Forest Research 2009. https://cdn.forestresearch.gov.uk/2022/02/ccf_and_climate_change_report.pdf

²² Native Woodlands of Scotland, Forestry Commission 1998

²³ <https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2014/06/scottish-planning-policy/documents/scottish-planning-policy/scottish-planning-policy/govscot%3Adocument/scottish-planning-policy.pdf>

²⁴ The Management of Semi-natural Woodlands, Forestry Commission Practice Guide 2003.

²⁵ Forestry Commission "Scotland's Native Woodlands" 2014

https://www.forestry.gov.scot/sites/default/files/pub-documents/PDF_Biodiversity_Results_Native_Woodland_Survey_of_Scotland_012014.pdf

²⁶ <https://www.corrour.co.uk/wilderness/wildlife/deer/>

3.4 Wider ecosystem services

As Scotland enters a period of increased climate uncertainty, NRC becomes an increasingly important mechanism for forestry to deliver ecosystem services, particularly with regard to natural flood management. Rainfall has already increased and become more concentrated,²⁷ and

*“in future, the changes we are already experiencing both in Scotland and across the world are projected to intensify, with more extreme rainfall and associated flooding and more intense and frequent heatwaves”.*²⁸

NRC reduces soil disturbance, thus reducing run off that poses a risk to water courses and water quality.

Case Study: South West Norway²⁹

South West Norway and Scotland have similar climates, geology and landforms, and at the start of the 20th century they both had very little woodland cover. During the last 125 years SW Norway has taken a dramatically different land management path to Scotland, and this has resulted in different outcomes in the 21st century.

Deer are managed with more concern for habitat, and a higher percentage harvest of (heavier) red deer is taken every year. Deer management is part of a more community based approach to hunting, and deer fencing is not required for forestry purposes. There are also welfare benefits for the deer, with far lower winter mortality rates.

The result has been a dramatic increase in woodland cover by NRC. Between 2005 and 2012 NRC in West Norway (approximately equivalent to the combined area of Highland, Grampian and Perth & Argyll Conservancies) delivered more than 100,000ha of new woodland, or over 14,000ha per year. This far surpasses the total woodland expansion for all of Scotland during this period, which relied very heavily on grant aided planting and fencing.

Statistics Norway also estimates that the volume of hardwood trees in West Norway, all derived from NRC, has more than doubled in the last 20 years. This represents a considerable contribution to carbon sequestration.

Industrial forestry has also benefitted from this approach, and NRC now **“dominates even in purely commercial stands”**.³⁰

Achieving the same rate of woodland expansion in the area of upland Deer Management Groups as has been observed in West Norway (0.65% increase per year) would result in more than 16,000ha of new woodland per year. If this rate of reforestation were to be achieved in Scotland, by 2030 it could sequester carbon equivalent to 5% of the GHG emissions target for Scotland set for that date. Research done in the 1990s showed it would be possible to have a large decrease in numbers of female red deer (hinds) without a loss of revenue from stalking stags.

²⁷ <https://www.transport.gov.scot/publication/transport-scotland-s-approach-to-climate-change-adaptation-and-resilience/overarching-context/#:~:text=How%20has%20Scotland's%20climate%20changed,start%20of%20the%2020th%20century.>

²⁸ <https://www.environment.gov.scot/our-environment/climate/changing-climate/>

²⁹ https://www.nina.no/Portals/NINA/Bilder%20og%20dokumenter/PDF%202023/Management%20of%20deer%20in%20Norway's%20cultural%20landscape%20-%20Duncan%20Halley%20Norwegian%20Institute%20for%20Nature%20Research.pdf?ver=aWv24w0q7yx_pcljzG3K6Q%3d%3d

³⁰ https://www.nina.no/Portals/NINA/Bilder%20og%20dokumenter/PDF%202023/Management%20of%20deer%20in%20Norway's%20cultural%20landscape%20-%20Duncan%20Halley%20Norwegian%20Institute%20for%20Nature%20Research.pdf?ver=aWv24w0q7yx_pcljzG3K6Q%3d%3d



4 The impact of environmental and socio-economic factors on the use of NRC

Photo: Jill Donachie

This section describes some of the main barriers to a more general use of NRC in both conservation and forestry in Scotland.

4.1 Environmental considerations

NRC relies on existing mature trees to supply the seed source for woodland renewal and expansion. Different tree species have different means of dispersing seed, normally by gravity, by wind or by the actions of a third party (for example jays can spread acorns).

Other influences include grazing pressure, soil condition, rainfall and temperature,³¹ the timing of good seed or “mast” years,³² the condition of the ground vegetation (lighter seeds such as birch and willow are less likely to thrive when there is a dense grass layer, and bracken reduces germination of all tree species).³³

4.2 Economic considerations

Land use is influenced by economic factors, and land managers often rely on grant funding and/or a monetary return when seeking to expand or manage woodland. NRC relies upon natural processes, and does not produce the time bound and predictable results that tree planting can.

“Echoing other stakeholders... the senior executive of a rewilding NGO explained to me that although “Natural Regeneration is the holy grail,” tree planting provides “more guaranteed income.” Planting trees produces a “nature that capital can see,” stands of trees that are relatively easy to count, measure, and subsequently attribute carbon credits. Surviving ASNWs can be engulfed within new plantations or left to die while new plantations, often of the same tree species, are created to generate carbon revenue.”³⁴

³¹ Crouzeilles, R et al, Achieving cost-effective landscape-scale forest restoration through targeted natural regeneration, Journal for Society of Conservation Ecology, 2020

³² <https://treesforlife.org.uk/into-the-forest/trees-plants-animals/trees/oak/oak-facts/>

³³ Ghorbani J. et al, Effects of the litter layer of Pteridium aquilinum on seed banks under experimental restoration, Applied Vegetation Volume 91

³⁴ Stanley T, Regeneration, Environmental Humanities 2025 17 (2) <https://doi.org/10.1215/22011919-11713478>

4.3 Social and cultural considerations

4.3.1 The socio-economics of deer management

Over the past 150 years, upland land use in Scotland has been heavily influenced by a sporting culture, with red deer trophy hunting playing a major role. Deer management continues to generate income for landowners while also creating rural employment and tips for stalkers. This has contributed to deer numbers reaching levels which have restricted the ability of diverse native woodland to regenerate or expand. In lowland areas increasing deer numbers cause similar issues while also generating income and employment, often in a less formulaic way.

Switching focus to a reduction in deer numbers to allow for NRC will require at least a short to medium term reduction in deer numbers, and thereafter a different blend of open range and stalking through trees than the traditional Scottish model. This reduction will have socio economic impacts on traditional land use and public support for this change will be essential for it to succeed.

4.3.2 Language

A recent report by Forest Research has done much to try to unpick the cultural considerations when addressing land managers while also finding that current policies and grants focus mainly on tree planting.³⁵

Forest Research usefully explore the impact that language can have on people who are making decisions on land management, whether as policy makers or as land managers. Decision making becomes more difficult where there is confusion, especially when some terms are seen by some stakeholders as having negative connotations.

Language is *“important because engagement and uptake of natural processes for woodland creation can be improved by tailoring communication to different land manager identities using clear and relatable terms. The term “natural colonisation” is not widely used or understood and “rewilding” disenfranchises many land managers.”*³⁷

Forest Research’s work also casts light upon the balance between natural processes and other social and economic processes:

*“The timescale of restoration projects can relate to human aspirations rather than ecological processes. Projects have to be seen to achieve outcomes – funding deadlines make it difficult to proceed with caution. This can lead to planting where NRC may arguably be as effective in the long-term.”*³⁸



Fig 1
The role of language in stakeholder engagement³⁶

³⁵ <https://www.forestresearch.gov.uk/research/natural-colonisation-as-a-strategy-for-woodland-creation-and-expansion/social-dimensions-of-natural-colonisation>

³⁶ <https://www.forestresearch.gov.uk/research/natural-colonisation-as-a-strategy-for-woodland-creation-and-expansion/social-dimensions-of-natural-colonisation>

³⁷ <https://www.forestresearch.gov.uk/research/natural-colonisation-as-a-strategy-for-woodland-creation-and-expansion/social-dimensions-of-natural-colonisation>

³⁸ Fenton J and York C, The National Trust for Scotland approach to woodland restoration, in “The Restoration of Wooded Landscapes” Conference Proceedings, ed Humphrey J et al, Forestry Commission 2000



Mixed regeneration inside a deer fence

4.3.3 The role of bureaucracy

Woodland creation and management in Scotland is directed and influenced by Scottish Ministers and their agencies, largely delivered and overseen by the regulatory oversight of NatureScot and Scottish Forestry, as well as the fiscal support provided by Scottish Forestry.

4.3.3.1 The role of Long-Term Forest Plans

Some forestry professionals are reluctant to use NRC because of the conditions imposed by Long Term Forest Plans. These documents provide the basis for sustainable forest management for the majority of actively managed forests in Scotland, and they encourage forest managers to provide a future model of the tree species that will be present in any forest area covered by the plan. This approach places a limit on forest managers' willingness to use NRC.

4.3.3.2 The impact of grant support and the Woodland Carbon Code

The main support mechanism for land managers engaging in NRC is Scottish Forestry's Forestry Grant Scheme (FGS). However successful NRC usually requires the management of deer numbers across several

landholdings, and collaborative funding requires an additional layer of complexity beyond that required for an already complex single property FGS application.

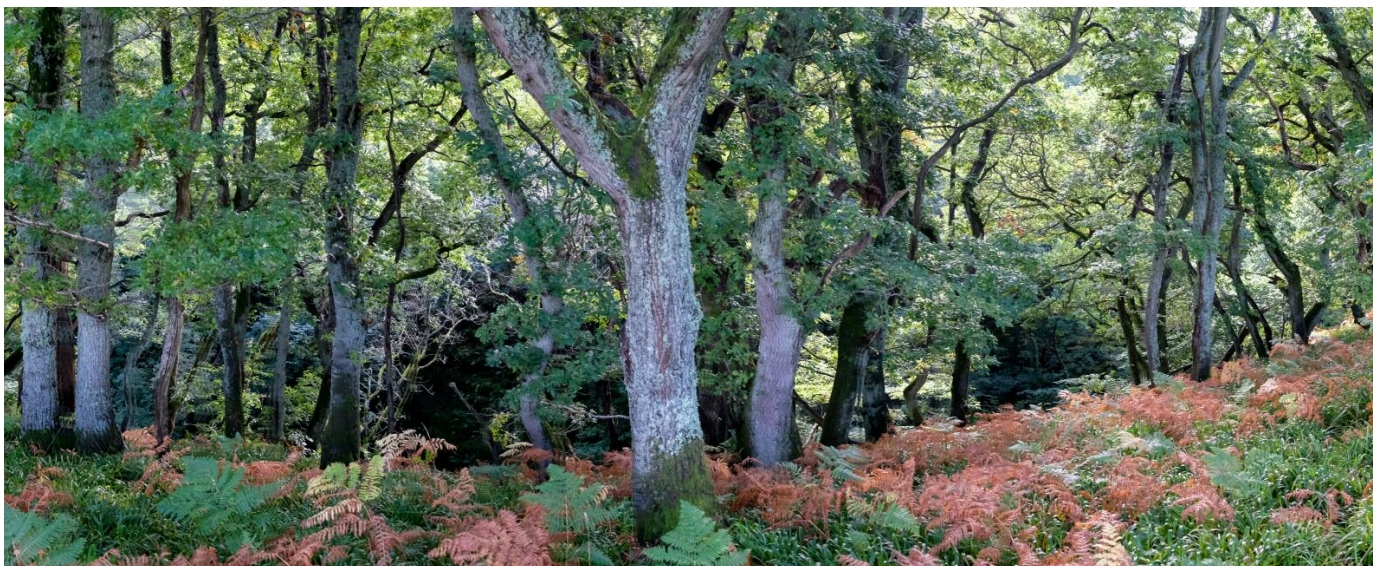
Forest Research has found that ***“the complex and evolving grant landscape is challenging to navigate and may be limiting uptake (of NRC) despite land manager interest and the beneficial outcomes of adopting natural process, the complexity of multiple overlapping schemes and lack of coordination between funders hamper uptake. Furthermore, many land managers are hesitant to commit due to uncertainties in woodland creation outcomes.”***³⁹

The issues around the additional complexities of collaborative landscape scale management (as is usually required for effective deer management) are captured in a John Hutton Institute report from 2024:

Farmer representatives, in particular, agreed that when funding is competitive many farmers simply will not bother applying, as the high cost of applications, combined with the high risk of failure, simply makes it not worthwhile.⁴⁰

³⁹ <https://www.forestresearch.gov.uk/research/natural-colonisation-as-a-strategy-for-woodland-creation-and-expansion/social-dimensions-of-natural-colonisation>

⁴⁰ Poskitt S, Gray R, Waylen KA, Begg G, Enabling collaborative landscape management in Scotland – the stakeholder view, The James Hutton Institute September 2024



4.3.4 The role of bureaucracy

“The potential for regeneration has been overlooked in national and international efforts to increase tree cover. Reasons include a lack of recognition that it is a viable restoration option; perverse incentives that favour the clearing of young tree growth for plantation development or other land uses; lack of support by government agencies and other organisations; lack of incentives for local communities; and uncertainty about processes and outcomes,” according to the UN’s Food and Agricultural Organization.⁴¹

4.3.4.1 Policy drivers and the culture of the forestry sector

Much the forestry agenda in Scotland is dominated by a culture that has focussed on rapidly increasing the amount of new planting and on producing low-cost softwood timber at scale. This can lead to a position where other legitimate approaches and more effective ways of delivering biodiverse and woodland cover are downplayed.

At an international level, it has been reported that: ***“Although Natural Regeneration has been shown to provide more cost-effective outcomes compared to active restoration, policy-makers and restoration practitioners often prefer active restoration methods.”***⁴²

This tendency is if anything amplified in Scotland, as illustrated at a 2025 meeting of the Scottish Parliament Rural Affairs and Islands Committee, where the Scottish Woodlands’ Business Development Director provided a summary:

“We can achieve tree establishment by regeneration but it’s not a solution to Scotland solving its biodiversity crisis... I’ve been involved in many regeneration (schemes)... and they work but they are very slow, the outcomes are incredibly difficult to determine... they are a really, really good way to try and preserve existing important habitats, but cannot be used as a proxy for forestry planting to sustain the industry.”⁴³

“Natural regeneration is sometimes criticised for looking “messy”, says Isabella Tree (Knepp Estate). “Humans are such control freaks. The more compelling the climate emergency becomes, the more we feel like we physically have to do something, and our instinct is often to tidy up”.⁴⁴

⁴¹ Restoring Forest Landscapes through Assisted Natural Regeneration 2019 <https://openknowledge.fao.org/server/api/core/bitstreams/ab7e7416-81cb-4b8f-b523-054ba8e63df2/content>

⁴² Crouzeilles R et al Achieving cost-effective landscape-scale forest restoration through targeted natural regeneration, Journal for Society of Conservation Ecology, 2020 <https://conbio.onlinelibrary.wiley.com/doi/10.1111/conl.12709>

⁴³ Scottish Parliament Rural affairs and islands committee, 15 Jan 2025 Round Table on Forestry <https://www.scottishparliament.tv/meeting/rural-affairs-and-islands-committee-january-15-2025>

⁴⁴ <https://www.bbc.co.uk/future/article/20210524-the-reason-wild-forests-beat-plantations>

5 A summary of LINK's policy proposals

LINK has consistently proposed three approaches to the better establishment and management of woodlands in Scotland. These can be summarised:

5.1 Shift the balance of the FGS towards managing and creating native woodlands

Scottish Government financial support has considerable influence on forestry matters. In the last two decades Scottish Government has had an increased focus on creating new woodlands. Under previous Woodland Grant Schemes expenditure was roughly split equally between woodland management and woodland creation at around 50/50, however under the FGS this has shifted to around 85/15 in favour of woodland creation. Around 1/3rd of total expenditure can be definitively ascribed to native woodland, with the balance either primarily focused on commercial woodland or mixed woodland types.

LINK asks that 50% of grant support is ring fenced for native woodland creation and management.⁴⁵

There should be an annual target of at least 50% of tree cover expansion comprising native woodlands for nature's recovery. Currently, that would mean at least 9,000ha of new native woodland per year, and half of this native woodland expansion, or 4,500ha per year, should be achieved by NRC. Funding is also urgently required to secure the future of Scotland's ASNWs, and place them at the heart of the 30x30 target. This will require a commitment of at least half of the FGS budget.

5.2 Increase the role of NRC in achieving woodland creation targets

Under the present FGS, from 2021 to 2024 NRC has delivered c4% of all woodland creation, with grant aid for each hectare of regeneration being less than 10% of the grant aid for each planted hectare. There is considerable scope to increase the contribution of NRC to woodland creation targets, however this will require enhanced rates to encourage uptake, a joined up approach to supporting deer management across land management mechanisms, and a longer funding period to allow time for successful regeneration and cover the ongoing management costs such as deer and squirrel management, and any enrichment planting.

LINK asks that natural colonisation should be the default woodland establishment approach in buffer zones around ASNWs and should comprise at least half of the native woodland created henceforth.⁴⁶



Photo: WTMIL

⁴⁵ <https://www.scotlink.org/wp-content/uploads/2025/04/LINK-Manifesto-Digital-Artwork.pdf>

⁴⁶ <https://www.scotlink.org/wp-content/uploads/2024/04/Natural-Environment-Bill-asks-briefing-.pdf>

5.3 Ensure that deer numbers are at a level which allows for NRC

Deer impacts on woodland are often the main barrier to achieving NRC. Achieving the right balance between diverse and resilient habitats and deer impacts will require financial support, and this support needs to be targeted at deer management as well as venison handling, marketing, supply chains, and the regulatory framework.

John Muir Trust and Trees for Life produced a paper, supported by LINK, which lays out the scope for deer management to deliver both cost savings when compared with the present approach to grant aided tree planting, as well as the scope to deliver enhanced public benefits.

“A fully funding National Deer Management Programme would cost less than current forestry subsidies and save close to £900 million of taxpayer money while tripling Scottish Government’s woodland expansion targets. Doing so will enable a Just Transition for the deer management livelihoods that are so essential to meeting the challenge of restoring nature and combating climate change in Scotland.”⁴⁷

A shift to funding deer management has scope to produce other benefits. It can generate longer term employment for local communities, and there is scope to increase the quantity of high quality meat for local consumption. Lower deer numbers will also assist farmers, who will see a reduction in damage to arable and forage crops, as well as less competition for grass with their domestic livestock. Appropriate deer numbers will also secure existing work done to restore peatlands, and reduce carbon emissions from peatlands that have not yet been restored.

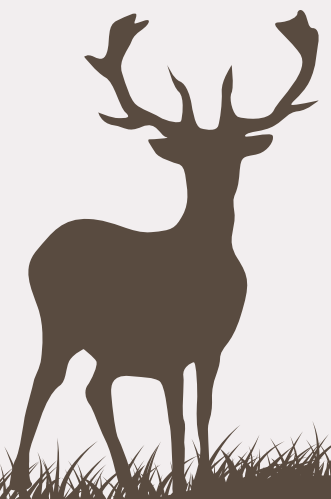
LINK asks for a reduction in deer densities nationwide to levels consistent with NRC, supported by targeted grant assistance.⁴⁸

“Experience in SW Norway has shown that reducing herbivory can substantially increase woodland cover through NRC. In Scotland, planned woodland expansion is almost entirely through planting behind fences, at substantial cost to the taxpayer. Evidence from Scotland suggests that red deer densities could be reduced substantially without compromising the number of stags that could be sustainably harvested. The Scottish Government and its agencies should assess the contribution that NRC could make to achieving woodland expansion targets, and the costs and benefits of such an approach”.⁴⁹

⁴⁷ Tripling woodland expansion targets while saving £900 million in taxpayer money: the National Deer Management Programme, John Muir Trust 2025
https://www.johnmuirtrust.org/assets/000/004/125/National_Deer_Management_Plan_V2.3_original.pdf?1747923113

⁴⁸ <https://www.scotlink.org/wp-content/uploads/2025/04/LINK-Manifesto-Digital-Artwork.pdf>

⁴⁹ Edwards, T, Herbivore Impacts, Upland Red Deer Densities, Carbon Sequestration and Storage in the Upland Red Deer Range – a Report for Scottish Environment Link’s Deer Task Force, 2019



6 Acronyms and Glossary

ASNW: Ancient Semi Natural Woodland comprises woods recorded as being of semi-natural origin on either the 1750 Roy maps or the 1st Edition Ordnance Survey maps of 1860.⁵⁰

CCF: Continuous Cover Forestry is a nature-friendly woodland management approach that maintains a forest canopy and an uneven stand structure by selectively felling individual trees or small groups, instead of clear-felling.

Enrichment Planting is the act of planting additional trees into existing NRC. This can establish tree species for which there is no local seed source, or increase stocking levels where management objectives require a denser woodland.

FGS: Forestry Grant Scheme is the main Scottish Government financial support mechanism for woodland creation and management, administered by Scottish Forestry

NRC: Natural Regeneration and Colonisation. Natural Regeneration is the establishment of young trees within an existing woodland by natural means, and is the way in which woodlands naturally perpetuated themselves before humanity became tree planters. Ninety-three percent of the forest area worldwide is composed of naturally regenerating forests.⁵¹ Natural Colonisation is the establishment of young trees onto open ground, the creation of new woodlands by natural processes: in British circles Natural Colonisation is often described as Natural Regeneration. NRC often refers solely to native trees, however in this paper in the section on CCF the term is extended to cover all trees.

Old growth or primary forests are “a naturally regenerated forest of native species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed.” An amended definition includes traditional activities of indigenous and local communities as part of old-growth forests.⁵²

PAWS: Plantations on Ancient Woodland Sites are Ancient Semi Natural Woodlands where non native species have been planted. These are often still important sites for biodiversity, particularly soil biodiversity, and forestry standards such as UKFS encourage the restoration of PAWS to native woodlands.

RFM: Rotational Forest Management, or clearfell and restock is the predominant means of producing timber in Scotland. Typically the system relies upon operations at scale, with the use of sophisticated machinery to clearfell even aged stands of conifer prior to transport to large scale processing mills. The process benefits from state encouragement that is reflected in both grant aid and tax advantages, and is increasingly moderated by the requirements of forestry standards such as UKFS.

Secondary forests are forests regenerating largely through natural processes after significant human or natural disturbance of the original forest vegetation at a single point in time or over an extended period, and displaying a major difference in forest structure and/or canopy species composition from the nearby primary forests on similar sites.⁵³

UKFS: United Kingdom Forestry Standard, is the minimum acceptable standard for forestry accepted within the UK, with measures to regulate the economic, social and environmental impact of forestry.



⁵⁰ <https://www.data.gov.uk/dataset/c2f57ed9-5601-4864-af5f-a6e73e977f54/ancient-woodland-inventory-scotland1>

⁵¹ <https://www.fao.org/interactive/forest-resources-assessment/2020/en/>

⁵² <https://www.fao.org/interactive/forest-resources-assessment/2020/en/>

⁵³ <https://www.fao.org/4/j0628e/J0628E29.htm>



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