Research briefing

Working with natural processes for woodland creation

Key messages from recent research

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Increasing interest in adopting natural processes to create woodland

Woodland expansion is one of the principal nature-based solutions adopted by the UK and its devolved governments to address the biodiversity and climate crises. Each nation in Great Britain has ambitious tree planting targets, which are backed through actions such as the Tree Planting Taskforce and grants administered by Defra, the Forestry Commission, Natural Resources Wales, and Scottish Forestry. Private organisations also support tree planting initiatives for carbon offsetting and as an indicator of corporate social responsibility. However, tree planting is only one way to expand woodland cover, with natural processes presenting an alternative or complementary approach.

Harnessing natural processes can help to expand tree cover, increase connectivity across treescapes, and restore biodiversity. It may also create resilient woodlands by enabling adaptation to local site conditions. There is increased interest in adopting natural processes to create woodland. For example, Scotland's Forestry Strategy 2019–2029 mentions natural regeneration as a way to maintain and enhance biodiversity, and the Woodlands for Wales strategy (2018) commits to consider how and where to encourage greater use of natural processes. Meanwhile, the Forestry Commission has provided grant support for natural colonisation in its England Woodland Creation Offer (EWCO).

However, despite the policy appetite for natural colonisation, uptake among land managers is relatively low, and understanding of the ecological process and outcomes of this approach is evolving. Private land managers and large land-owning organisations will ultimately have to deliver most of the government's woodland expansion targets. Therefore, the decision-making of land managers around woodland expansion approaches and the factors influencing their choices is critical to not only meeting targets, but also to understanding the ecological consequences and timescale of expanding tree cover.

Over the past three years, a multi-disciplinary team of researchers working across three projects have explored the ecological outcomes of woodland creation using natural processes and land managers' social perceptions of the approach:

- The UKRI TreE PlaNat project (2023–2025) studied stakeholder perceptions and socio-ecological consequences of treescape expansion through planting and natural colonisation.
- The Defra-funded TWF-07 Social Dimensions of Natural Colonisation project (2022–2025) investigated why land managers may or may not adopt natural colonisation for tree expansion.
- The Defra-funded TWF-08 Ecology of Natural Colonisation project (2022–2025) assessed the efficacy, biodiversity, carbon impacts, and ecology of natural colonisation as a means of establishing new woodland.

This report presents ten key insights about working with natural processes for woodland creation that have emerged from that research.

Insights from recent research

Our recent research has together provided new ecological, social, and socio-ecological insights into working with natural processes for woodland creation. Our findings are based on extensive ecological field research in 28 woodland creation sites in lowland agricultural areas, over 100 interviews with land managers, a national survey undertaken across all three nations of Great Britain with 542 responses, and three focus groups and four workshops with land managers and their advisors. We also held eight 'Knowledge User Board' meetings with 20 practitioners and policy-makers (the intended end users of our work), who provided feedback on the ongoing research and helped the research team understand their knowledge needs.

Our key messages are listed below and discussed in more detail, including the methods relevant to each message, in subsequent pages. An overview of project resources is provided at the end of the report.

Key messages:

1. Natural processes can be used in multiple ways to create woodland.
2. Land managers see benefits of using natural processes and want to include them, but need guidance.
3. Confusing language limits understanding and adoption of natural processes to support woodland creation.
4. Natural processes can successfully create woodland, but are highly variable and outcomes are difficult to predict.
5. Land managers think hybrid approaches (combining natural processes with some planting) reduce risks and increase beneficial outcomes.
6. Hybrid approaches can reduce some uncertainty and variability of outcomes.
7. Benefits from adopting natural processes depend on land manager objectives.
8. Adaptive management that steers woodland development is essential to maximise benefits, and simple monitoring can guide this.
9. The complex and evolving grant landscape is challenging to navigate and may be limiting uptake.
10. There is a need for collaborative research and knowledge exchange with and for land managers about woodland expansion approaches.

Message 1: Natural processes can be used in multiple ways to create woodland

This is important because it provides flexibility and opportunities that can be tailored to land management objectives and local site conditions. Passive approaches (adopting natural processes for woodland expansion through seed dispersal and suckering) can be combined with active planting and sewing of trees and shrubs through different hybrid approaches. However, the diversity of possible approaches can be confusing for land managers.

The increased interest in adopting natural processes for woodland expansion has highlighted the false dichotomy between active and passive approaches and a growing awareness of a management continuum between active planting and allowing natural succession gradually to result in canopy closure (Figure 1).

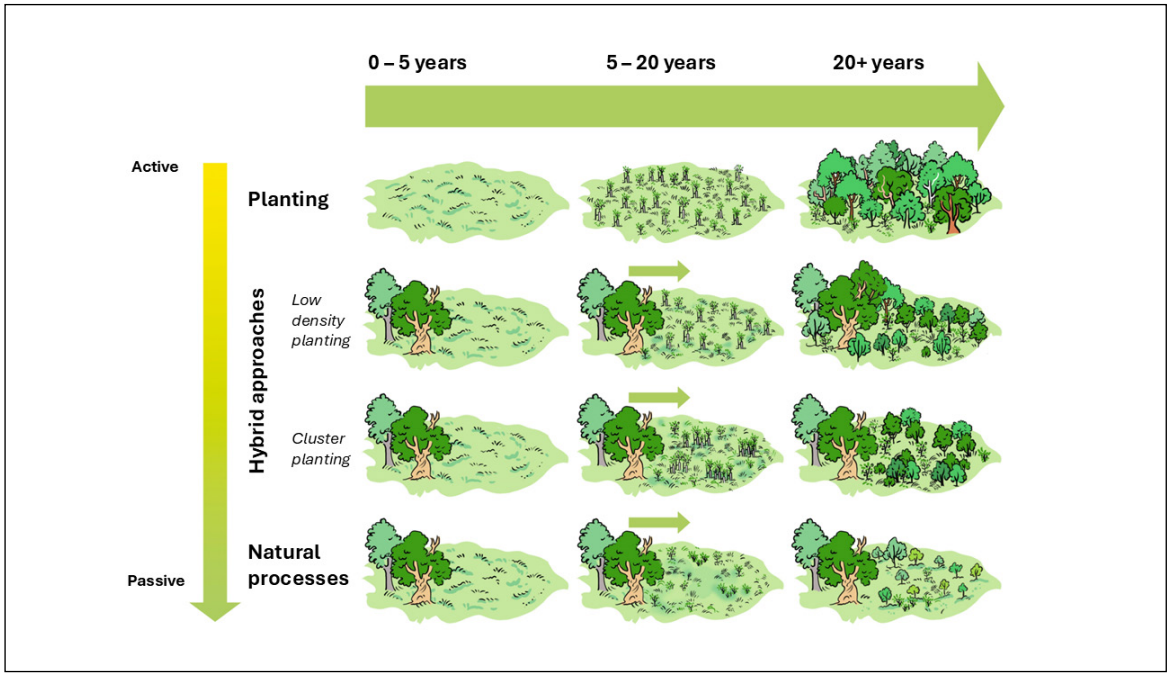

Figure 1 Comparison of tree planting, natural processes, and hybrid methods (low density planting and 'applied nucleation', where small clusters of trees are planted) in a lowland context. Image credit: TreE PlaNat project and the Woodland Trust.

Natural colonisation is defined as the creation of woodland through natural processes on an area of 'open land' which has not been covered by woodland in the recent past. This stands in contrast to the term 'natural regeneration', which applies to areas of regeneration by trees within a woodland, or across land that was recently covered by woodland where there is likely to be an existing tree seed bank.

Hybrid approaches that allow for some form of planting and management as the woodland establishes can kickstart woodland creation and are particularly useful where tree seed

sources are scarce. Low density ‘facilitation planting’ can be carried out at much lower densities than typical stocking across large areas to leave space for areas of natural processes in between. Planting can also be done in more distinct patterns such as small dense clusters (also called ‘applied nucleation’ or ‘cluster planting’). At later stages, planting can be used to add desired species that have not established through natural processes (also called ‘supplementary planting’).

Methods

Meetings with the ‘Knowledge User Board’, which consisted of 20 practitioners (Fleiss et al., 2025), increased understanding of how natural processes and hybrid approaches are used in practice, resulting in a portfolio of case studies and a set of illustrations that explain different woodland expansion approaches.

Message 2: Land managers see benefits of using natural processes and want to include them, but need guidance

This is important because it shows a willingness among land managers and advisors to adopt new approaches to achieve desired outcomes, while identifying a priority need to improve knowledge about natural processes that would support increased uptake for woodland expansion in the UK. Most land managers recognise that all approaches to increasing tree cover are important as they can deliver different benefits and objectives. Land managers are least confident about implementing hybrid approaches.

Most land managers understand the benefits and trade-offs between natural colonisation, tree planting, and hybrid approaches, and take a balanced view in their implementation of tree cover expansion strategies. A majority (Figure 2) stated that natural colonisation, hybrid approaches, and tree planting all play an important role in meeting national ambitions and individual objectives. Fewer land managers indicated a preference for just one approach; land managers perceive each approach to meet differing objectives with contrasting benefits and disbenefits. Natural colonisation tends to be viewed as a useful approach on land that is difficult to work (e.g. steep and inaccessible areas or land prone to waterlogging), being more cost-effective due to lower initial input costs, as well as providing a 'nature-led' approach important to some land managers' values.

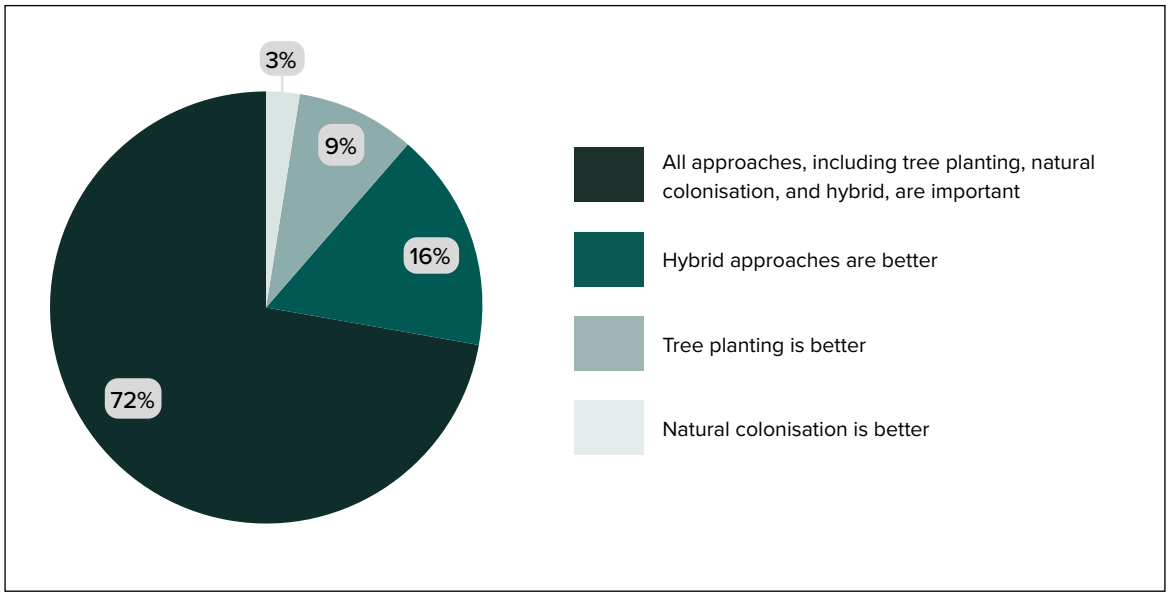

Figure 2 Answers to the question '*When thinking about which approaches to use to increase woodland or tree cover, which of the following statements do you agree with most?*' n=542. Source: TreE PlaNat survey, 2023/24.

Land managers' confidence in implementing the different approaches varies. Whilst many are confident about tree planting (80% in a Great Britain wide survey), fewer are confident about natural colonisation (63%) or hybrid approaches (55%). Land managers highlighted the importance of expert guidance to build confidence in their decision-making, particularly as natural colonisation outcomes are highly context dependent and hybrid approaches

are novel and developing. Some stated that they had received misleading advice, such as being encouraged to use natural colonisation in unsuitable conditions. Therefore, advisors, as well as peers with experience of using natural colonisation and hybrid approaches, have a critical role to play in supporting land managers in navigating the ecological challenges.

Methods

Interviews and focus groups with 100+ land managers (2021–2023) reported in Ambrose-Oji et al. (2025a) were used, as well as a survey of land managers conducted across Great Britain between December 2023 and February 2024. The purposive quota sample stratified by land management objectives realised a total of 542 valid responses (Ambrose-Oji and Orchard, paper in prep). A total of 35 semi-structured interviews with purposively selected land managers validated the survey results ((Ambrose-Oji and Orchard, paper in prep). Additionally, in-depth case studies (n=12) in August–October 2024 explored the diverse pathways that land managers take when using natural colonisation, offering valuable lessons for future woodland expansion strategies (Ambrose-Oji et al., 2025c).

Message 3: Confusing language limits understanding and adoption of natural processes to support woodland creation

This 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. Ensuring consistency in language across advisory bodies, including government agencies, will reduce confusion. 'Natural processes' was identified as a good term, and therefore is adopted in this report.

Advisors and land managers are aware of, and use, different terms to describe natural processes. The terms 'natural colonisation', 'natural regeneration', and 'rewilding' lack clear formal definitions, so their use is often ambiguous, and they can create both positive and negative reactions among land managers with different values and objectives. Table 1 summarises land managers' perceptions of these terms. We found clear differences in preference, with the term 'natural regeneration' the most acceptable term overall. The use of 'natural colonisation' was acceptable in technical discussions but not for broader engagement, and 'wilding' was a more palatable alternative to 'rewilding' to some land managers. The terms associated with hybrid approaches (such as cluster planting and low density planting, illustrated in Figure 1) are not well known, so there is a need to develop language that reflects these alternative methods for tree cover expansion.

Table 1 Land managers with different objectives' views on language and terms for natural processes (n=41; the sample shown includes focus group and validation workshops respectively).

Term	Conservation managers (n=6+7)	Productive managers (n=8+7)	Amenity managers (n=6+7)
Natural colonisation	Negative (technical, exclusionary)	Negative (colonial connotations, land loss fears)	Negative (imperialism associations)
Natural regeneration	Positive (clear, well understood)	Positive (widely used, practical)	Positive (marketable, accessible)
Rewilding	Mixed/Negative (divisive, vague)	Negative (politically charged, misunderstood)	Mixed (public-friendly but lacks clarity)

Methods

A rapid evidence review on the impact of language and messaging on woodland expansion was followed by three focus groups with 19 purposively recruited land managers that held different key objectives (6 conservation, 7 productive, 6 amenity) in autumn 2023. Three validation workshops were held with 22 additional participants (7 conservation, 8 productive, 7 amenity) in spring 2024 (reported in Ambrose-Oji et al., 2025b; 2025c).

Message 4: Natural processes can successfully create woodland, but are highly variable and outcomes are difficult to predict

This is important because evidence and experience of successful woodland expansion through natural processes will encourage uptake and justify grant support. However, widespread adoption will rely on understanding the variability of outcomes and developing management approaches and grants to address these uncertainties.

There is growing evidence that natural processes can successfully be used to create woodland in Great Britain across a range of contexts, spatial scales, and timescales (Fleiss et al., 2025). However, natural colonisation is a relatively slow process and establishment success depends on many factors, mainly proximity to existing seed sources (restricted to ~100 m around existing trees; Bauld et al., 2023) and herbivory pressure. The outcomes of natural colonisation are highly variable among sites, depending on, for example, former land use, but generally resulting in low tree densities (Figure 3; Bauld et al., 2023). Other structural attributes (e.g. canopy height) also show high variability, with much greater variation observed among naturally colonised sites compared to hybrid and planted sites (Hughes et al., 2025). This variability makes it hard to accurately predict the outcomes of natural colonisation.

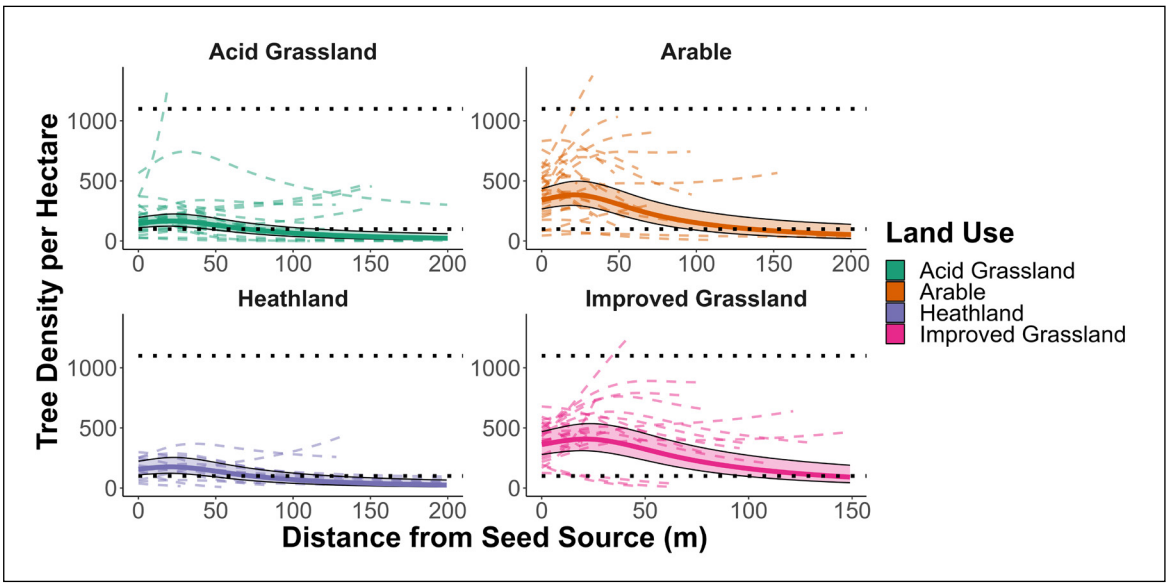

Figure 3 The association of tree density with distance from seed source and former land use, across 90 sites in England which attempted to use natural processes to create new woodlands (taken from Bauld et al., 2023).

Methods

A compilation of 15 case studies was produced which spanned upland and lowland areas across a range of spatial scales (0.5–1000+ ha) and timescales (2–70 years since woodland establishment) throughout Great Britain (Fleiss et al., 2025). LiDAR data was used to examine spatial patterns in tree density and height across 90 sites that had attempted to use natural colonisation to create new woodlands (20–30 years since establishment) in agriculturally dominated landscapes in England (Bauld et al., 2023). Additionally, high resolution LiDAR data and field surveys were used to calculate structural complexity metrics of nine naturally colonised, twelve hybrid and seven planted woodlands (13–43 years since establishment) across England (Hughes et al., 2025).

Message 5: Land managers think hybrid approaches reduce risks and increase beneficial outcomes

This is important because current policies and grants mainly focus on active planting. Given the strong views and emerging practice among land managers, policies should recognise and support hybrid approaches as a practical, scalable solution.

Land managers have clear perceptions of the benefits and disbenefits associated with natural colonisation, tree planting, and hybrid approaches which influence their decision making, as summarised in Table 2. Across all of our research, hybrid approaches consistently emerged as an approach likely to combine the benefits of natural colonisation and tree planting (see 'Natural processes can be used in multiple ways to create woodland'), and are perceived to allow more control over ecological outcomes and thereby enable land managers to better meet their objectives. For example, many land managers believe that the benefits from natural colonisation are often more readily achieved if natural processes are assisted by supplementary seeding, thinning, and fencing to prevent browsing.

Table 2 Summary of land managers' perceptions of the benefits and disbenefits associated with different approaches to expanding tree cover.

Perceived outcomes	Natural colonisation	Tree planting	Hybrid approaches
Biodiversity	Benefit ✓	May provide benefits or disbenefits ✗✓	Benefit ✓
Carbon sequestration	Unclear ?	Benefit ✓	Unclear ?
Resilience	Benefit (assumed adaptation) ✓	Unclear ?	Benefit (assumed adaptation) ✓
Visual impact	May be a benefit (naturalistic) or disbenefit (messy) ✗✓	Disbenefit (unnaturalistic, tree guards are unsightly) ✗	May be a benefit (naturalistic) or disbenefit (messy) ✗✓
Income generation	Disbenefit (products and services unlikely) ✗	Benefit (timber and other products) ✓	Benefit (timber and other products) ✓
Time to establish	Disbenefit (lengthy) ✗	Benefit (quick to establish) ✓	Benefit (speeds natural establishment) ✓

Land managers with over 10 years' experience in using natural colonisation acknowledged the benefits they realised from hybrid approaches using supplementary low density planting, particularly where this had allowed grant conditionalities around tree stem density targets to be met in cases where natural processes did not achieve them in the required timeframes.

Whilst there is an awareness of the benefits of hybridity, the lack of understanding about how to apply hybridity emerged as a key issue and one which contributes to the lower confidence scores for this approach.

Methods

Land managers' attitudes towards natural colonisation in upland and lowland farming contexts were explored in interviews with 67 diverse land managers between 2021 and 2023 (Fitzgerald et al., 2023; Ambrose-Oji et al., 2025a). A national survey (n=542) and follow-up interviews (n=35) (Ambrose-Oji and Orchard, paper in prep), as well as case studies (n=12) of land managers who had at least 10 years' experience using natural colonisation and hybrid approaches provided further insights and triangulation (Ambrose-Oji et al., 2025b; 2025c).

Message 6: Hybrid approaches can reduce some uncertainty and variability of outcomes

This is important because the outcomes of natural colonisation are difficult to predict (see 'Natural processes can successfully create woodland, but are highly variable and outcomes are difficult to predict'), providing uncertainty that management objectives will be achieved. Practitioner experience and empirical evidence indicates that hybrid approaches can lead to quicker and more predictable outcomes, providing land managers greater control and flexibility.

Hybrid approaches give more control over species mix, stem density, and speed of woodland development than natural processes alone. Planting can kickstart the woodland creation process, reducing time needed to create a closed canopy, and may provide perches for birds that can act as seed dispersers. Hybrid methods also offer the opportunity to introduce tree species that reflect local woodland character and which may be lacking in the existing seed source (if they are poor dispersers), or to meet specific objectives (like fruit or nut production).

Supplementary planting can be considered at any point in the process if the woodland is not developing as planned. For example, if the site is slow to progress towards required densities, planting within the first 2–3 years can ensure objectives or funding requirements are met. Similarly, supplementary planting can be considered when desired species fail to colonise the site. This flexibility allows land managers control in developing structurally complex and diverse woodlands that provide desired objectives and are more resilient to environmental stresses.

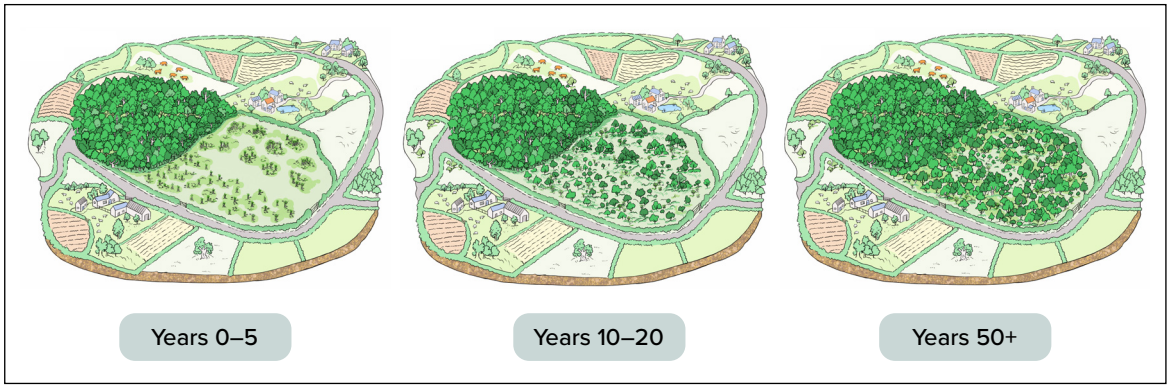

Figure 4 Woodland expansion through hybrid approaches combining passive natural processes and active planting (low density and cluster planting). Image credit: TreE PlaNat project and the Woodland Trust.

Methods

There is limited academic evidence about the benefits of hybrid approaches in Great Britain, but land managers have been experimenting with hybrid approaches for several decades. A transdisciplinary research approach was therefore adopted, working with land managers to understand their experience and knowledge gaps (Fleiss et al., 2025). This approach included: holding eight quarterly meetings with a 'Knowledge User Board' consisting of 20 practitioners; compiling 15 detailed case studies focusing on woodland creation through natural colonisation; and conducting a survey involving 21 individuals who each had practical and academic experience using natural colonisation. This comprehensive research approach enabled triangulation with the limited evidence in the literature and emerging evidence from new ecological research in our project to understand how hybrid approaches can reduce uncertainty and variability of outcomes.

Message 7: Benefits from adopting natural processes depend on land manager objectives

This is important because different woodland creation approaches have different outcomes, each of which may be better suited to specific objectives. Adopting natural processes will be better suited when the objective is nature recovery, enhancing spatial heterogeneity and increasing biodiversity, or when the end goal is flexible. Tree planting is the better option when biomass accumulation is the primary goal. Hybrid approaches offer intermediate outcomes and, by controlling how much of a site is left to natural processes, practitioners can balance between biomass accumulation and structural heterogeneity to meet diverse objectives.

Creating woodland through natural processes can provide numerous environmental and societal benefits. Adopting natural processes will (at least initially) create a mosaic of open and closed habitats with a high degree of spatial variability (Hughes et al., 2025) likely to enhance biodiversity by allowing the coexistence of woodland and open habitat species. Naturally colonised woodlands may also increase habitat connectivity and buffer existing woodland from surrounding land use impacts and climate extremes. Additionally, the establishment of trees from local seed sources is expected to conserve genetic diversity and allow local tree populations to adapt to site conditions and environmental change by natural selection, enhancing woodland resilience (Fleiss et al., 2025).

Figure 5 Illustrative image: *Lymantria monachal* (Black Arches), is a woodland moth commonly caught in our field surveys.

Planted woodlands accumulate basal area and canopy height quickly and have few canopy gaps, making tree planting well suited for objectives including quick biomass accumulation (e.g. for timber production or above-ground carbon storage). Planted woodlands, particularly those with high structural complexity, can provide habitats for numerous woodland species (e.g. Waddell et al., 2024).

Woodlands created through hybrid approaches offer intermediate values of biomass accumulation and structural complexity (Hughes et al., 2025). Additionally, preliminary analyses indicate that hybrid woodlands host more biodiverse moth and plant communities (Braunholtz et al., in prep) (Figure 5**)**. By controlling how much of a site is left to natural colonisation, land managers can direct the woodland creation process to balance between biomass accumulation, structural heterogeneity, and biodiversity benefits according to their objectives.

Methods

A literature review was conducted and practitioners' knowledge and experience of natural colonisation across Great Britain was synthesised (Fleiss et al., 2025). Using high resolution LiDAR data and field surveys, we calculated structural complexity metrics of woodlands across England that had been established 13–43 years prior (nine naturally colonised, twelve hybrid, and seven planted). At the same sites, field surveys were conducted to compare biodiversity and ecological functions (Braunholtz et al., in prep).

Message 8: Adaptive management that steers woodland development is essential to maximise benefits, and simple monitoring can guide this

This is important because regardless of the approach used, woodland creation is a 20+ year process that should transition into ongoing woodland management. This establishment period should encompass early management interventions which can steer woodland development towards good ecological condition and to meet desired objectives.

While natural colonisation is considered a passive approach to woodland creation, management interventions are likely required as the woodland establishes. The timings of these actions are site-dependent, but simple monitoring can inform when and how to make interventions, which could include: supplementary planting, managing high browsing pressure from deer or small herbivores, removing invasive or non-native species, introducing domestic grazing, and aiding community development through assisted colonisation of flora, fauna, and mycorrhizae.

Figure 6 Deer browsing pressure can prevent or limit woodland expansion through natural processes. Image credit: Vanessa Burton.

Monitoring should be guided by the site objectives. At minimum, it should record the tree and shrub species present, including count and age or stage (e.g. seedling, sapling). After that, there are options for what to measure depending on the main objectives of the site. Monitoring guidance developed provides suggestions on what to measure and possible management interventions.

Methods

The monitoring guidance was informed by discussions with the 'Knowledge User Board' of 20 practitioners in eight quarterly meetings and an in-person workshop (Fleiss et al., 2025) and at a training event in the National Forest organised by the Woodland Trust in summer 2024.

Message 9: The complex and evolving grant landscape is challenging to navigate and may be limiting uptake

This is important because despite land manager interest and the beneficial outcomes of adopting natural processes, 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.

A review of grant offers that support natural colonisation in England showed that they fell into two groups: one with a focus on woodland expansion, the other on nature recovery. Differences in this presentation alongside the degree of support given by delivery organisations were factors influencing the likelihood of landowners to take up grant options and employ natural colonisation. The availability of the different grants depends on location and, as Figure 7 illustrates, this landscape is complex, which some land managers said they found difficult to navigate. Most options for natural colonisation are available in northern England.

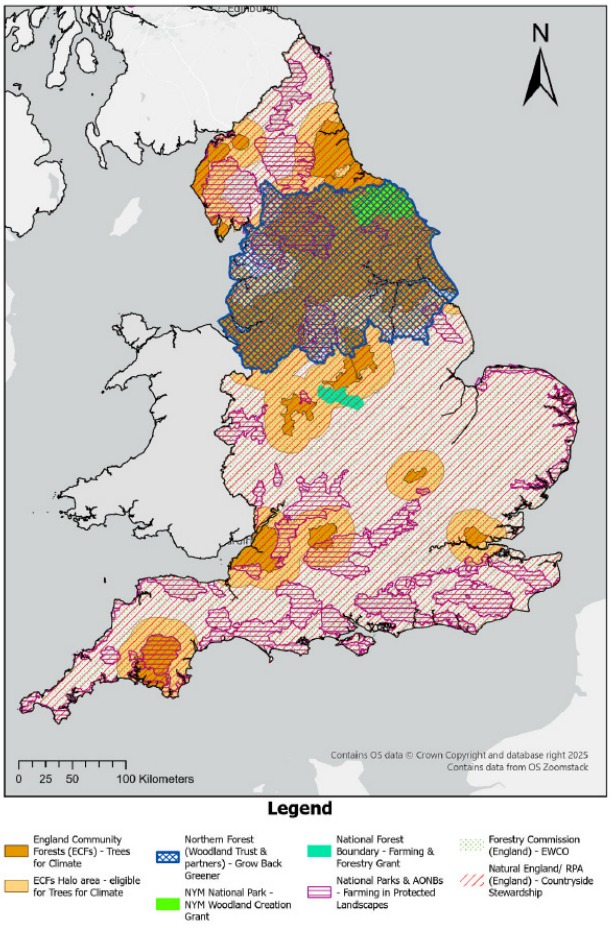

Figure 7 Map of different natural colonisation support schemes with colour coding for geographical areas where some schemes are exclusively available. Data correct as of June 2024. Please note that EWCO and Countryside Stewardship are available across England.

Examination of the records for three of the largest grants supporting natural colonisation in England (EWCO, Trees for Climate, and Grow Back Greener) showed that between April 2017 and August 2024, less than 1% of grant-funded woodland creation was for natural colonisation. However, the use of natural colonisation has been increasing year on year. Most grant-funded natural colonisation is a small part of larger tree planting schemes, with natural colonisation areas averaging between 2.2 and 2.7 ha.

Land managers and advisors suggested that grant offers supporting natural colonisation could be improved by:

- including options for hybrid approaches (i.e. combining natural colonisation with planting);
- including options for management of natural processes (e.g. ground preparation methods and wildlife pest management);
- aligning conditionalities with other grants and schemes (e.g. Woodland Carbon Code);
- increasing visibility and promotion of the natural colonisation options;
- ensuring woodland officers are able to provide specialist advice about natural colonisation.

Methods

A desk-based study in summer 2023 identified grant offers available. Uptake data was gathered from the funding organisations and standardised for analysis, including area per year and applicant type. Focus groups and a validation workshop in March 2024 (34 participants in total) provided insights into the factors influencing grant uptake and suggestions for improvement to grant design (Ambrose-Oji et al., 2025b; 2025c).

Message 10: There is a need for collaborative research and knowledge exchange with and for land managers about woodland expansion approaches

This is important because addressing land managers' knowledge gaps requires collaboration between practitioners and researchers, through long-term collaboration and effective knowledge sharing. Researchers need to understand land managers' knowledge needs and long-term access to woodland expansion projects to develop scientific understanding of woodland expansion approaches to ensure new knowledge is useful, usable, and used.

Land managers want to better understand the factors influencing natural processes for woodland creation, the outcomes and benefits, and how best to achieve aims of woodland expansion through hybrid approaches. Current understanding of natural colonisation is limited by its variability, the importance of individual site context, limited British examples to date (particularly with long-term records), and an apparent bias in reporting woodland creation successes rather than 'failures', where woodland does not establish in a certain timeframe. Informed decision-making and effective adaptive management using natural processes are hampered by a plethora of knowledge gaps, spanning ecological processes affecting natural colonisation, the outcome that can be achieved, the effectiveness of management interventions, and the societal perceptions and benefits (Box 1).

Box 1 Knowledge gaps related to the outcomes of using natural processes

Fleiss et al. (2025) describe 34 knowledge gaps identified by practitioners and researchers, identifying the need for collaboration between researchers and land managers to address gaps related to driving factors (e.g. seed source dispersal, herbivory, competing vegetation, ground disturbance and local ecological factors), outcomes of using natural processes, hybrid approaches, and social benefits and public perceptions. Examples of knowledge gaps related to the outcomes of using natural processes include:

- What is the potential tree density achievable through natural processes under different conditions?
- Can we predict the outcomes of natural processes?
- How can we assess the progress of a site undergoing woodland expansion through natural processes?
- How can we use natural processes to maintain favourable conditions for woodland development in the long-term?
- What are the opportunities for production from naturally colonised woodlands?
- What is the carbon balance of natural colonisation through time, including impacts on soil carbon?

To ensure future research addresses these knowledge gaps, there is a strong need for collaborative research and monitoring with and for land managers, to help informed decision-making and effective adaptive management. We recommend that researchers:

- establish collaborations with land managers and advisors to undertake long-term monitoring and recording of individual sites, and share and report both failures and successes;
- include management intervention options in future research (e.g. grazing and herbivore presence/densities, ground preparation, supplementary planting, or seeding);
- develop pragmatic trial designs that can be implemented in operational management systems, to test interventions under replicated, controlled, long-term experiments;
- collaborate with land managers and advisors to develop operational indicators and monitoring protocols to understand the process of natural colonisation.

Methods

Eight quarterly meetings were held with the 'Knowledge User Board' (consisting of 20 practitioners) in order to better understand land managers' current experience and knowledge gaps regarding woodland expansion methods (Fleiss et al., 2025). Additionally, 15 detailed case studies were created and compiled, focusing on woodland creation through natural colonisation, and a survey conducted involving 21 individuals who each had practical and academic experience using natural colonisation.

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Project resources to support knowledge exchange

Project website

The TreE PlaNat website includes links to all project resources, along with nine blogs describing the research and recordings of the seven project webinars.

Example blogs:

- A union of research and practice - how knowledge exchange has deepened understanding of woodland creation
- Working with woodland advisors to champion natural processes
- Lasering trees for science – how we use LiDAR technology to understand woodland ecology

Example webinars:

- Can natural processes help to scale-up woodland creation?
- From field to forest – Why people choose natural processes for woodland expansion?
- How to fund natural colonisation?

Magazine articles

Two magazine articles were published as part of our knowledge exchange activities. Both articles can be accessed through and downloaded from the TreE PlaNat website.

The Woodland Trust published a 4-page feature with the title ‘Running Wild’ in the Spring 2025 issue of Broadleaf, the magazine for members of the Woodland Trust. A second article, titled ‘Best of Both’, was published in collaboration with the Institute of Chartered Foresters in the Spring 2025 issue of their members magazine TREES (Figure 8).


FEATURE

Susannah Fleiss, Post Doctoral Research Assistant, University of Edinburgh

BEST OF BOTH

HOW HYBRID APPROACHES CAN SUPPORT WOODLAND CREATION

New collaborative research investigates the potential roles of tree planting, natural colonisation and hybrid approaches in creating new woodland in Britain.

Woodland creation involves a range of active (i.e. tree planting), passive (i.e. natural colonisation) and mixed or hybrid approaches. These approaches can be broadly grouped into spatially mixed, such as low-density planting, and spatially distinct, which includes tree planting and natural colonisation in different areas across a landholding or woodland creation site.

However, which approach is best for successful woodland creation? This question is explored in a series of studies to better understand how natural colonisation and hybrid approaches can be utilised in woodland creation and expansion. It is an interdisciplinary partnership between the Universities of Stirling, Edinburgh

creation methods along the continuum from planting to natural colonisation, and ecological research.

This compared the biodiversity (trees, ground flora, birds, terrestrial mammals, bats and moths), ecosystem functioning (herbivory by insects and mammals, predation pressure on insects, tree pests and diseases) and woodland structure (through both ground-based and drone-mounted LiDAR measurements) of young woodland sites in England.

Tree planting isn't the only option

There are ambitious targets for native woodland creation across the UK, and so far, woodland expansion has mostly taken

Ecological fieldwork showed that woodlands created through hybrid approaches can hav

Figure 8 Summary article for forestry professionals published in the Spring 2025 issue of the Institute for Chartered Foresters magazine TREES.

Case studies portfolio

We collated 15 case studies of woodland creation through natural colonisation across Great Britain (nine in the uplands and six in the lowlands), to address a key knowledge need highlighted by discussions with the practitioners.

Case studies were provided by our collaborators and contacts from the project's extended network (Figure 9). Natural colonisation at the case study sites spans 0.5–1000+ ha and 2–70+ years. Natural colonisation was chosen as an approach to woodland establishment in most case studies to restore biodiversity, often as part of a wider initiative, often combined with tree planting. Many case studies highlight the importance of a nearby seed source and low levels of herbivory (particularly by deer) for successful seedling establishment. However, outcomes were highly variable, both among and within sites, with a broad range of lessons learned and knowledge gaps highlighted reported by Fleiss et al. (2025).

Uplands – Case study 3
Gait Barrows NNR, North Lancashire
Publicly accessible
Grid ref. SD478768
Case study provided by Jim Turner, Natural England and Bill Grayson, Morecambe Bay Grazing Company

Aims of the natural colonisation: Woodland creation is not a primary objective of the management of the site, but blurring ecotones (supporting transitional areas between habitats) to positively impact biodiversity is a part of the management plan. This has led to natural regeneration of scrub and some woodland species in areas of semi-improved grassland.

Site description: 122 ha nature reserve, predominantly calcareous grassland, with alkaline fen, woodland, and limestone pavements.

Year that natural colonisation began: 2020

Other methods of woodland creation: None

"There is a risk in the form of reducing the diversity of vascular plants in the meadows due to the shift in grazing, scrub colonisation and ranker sward."

Seed sources for natural colonisation: Nearby established woodland of hawthorn, blackthorn, hazel, ash, oak, sycamore, yew and other species. The site includes ancient woodland and mature hedgerows.

Preparation actions prior to the natural colonisation: None

Maintenance during establishment of natural colonisation: Deer management across the site, and winter cattle grazing.

Which species have successfully colonised? Blackthorn and hawthorn are frequent pioneers with seedlings/saplings of oak and hazel also often found

Is natural colonisation proceeding in line with expectations? Scrub colonisation has occurred faster than anticipated but is broadly in line with expectations.

Dominant drivers of natural colonisation: The grazing pattern of the cattle are the dominant pressures. The natural colonisation is largely due to shifting from late summer grazing to winter grazing and has enabled the blurred ecotones and scrubby regeneration.

Successes and reasons behind them: Given the close seed sources and switch to winter grazing, scrub establishes easily, starting the process of transition to woodland.

Failures and reasons behind them: For this site it may be that we are losing too much of the species rich grassland habitat to scrub and may need to revise grazing patterns/management to take this into account.

Images - Top: Gait Barrows at around 1900, looking Southwest from an area that has now formed closed-canopy woodland through natural colonisation; middle: view of scrub/pasture looking North to South (Bill Grayson); bottom: reverse view looking South to North, showing mature woodland following ~100 years of natural colonisation (background) and pastures kept open prior to the switch to winter grazing in 2020 (foreground; Jim Turner).

4

Figure 9 Example of a case study summarising practical experience of natural colonisation (Fleiss, 2023).

Illustrations of alternative woodland creation methods

We produced a set of illustrations to provide a visual way of communicating alternative creation methods to policy makers, advisers, and land managers.

There are three sets of illustrations:

- **Definitions:** this set defines the difference between natural colonisation and natural regeneration, and provides definitions of creation methods from active approaches (planting), through hybrid approaches, to passive approaches (natural processes).
- **Woodland development through time:** for each method (planting, hybrid, natural processes) these show how a woodland might develop through time at three time points (0-5 years, 10-20 years, 50+ years) (Figure 10).
- **Management interventions:** these vignettes outline possible management actions that might take place as a woodland establishes.

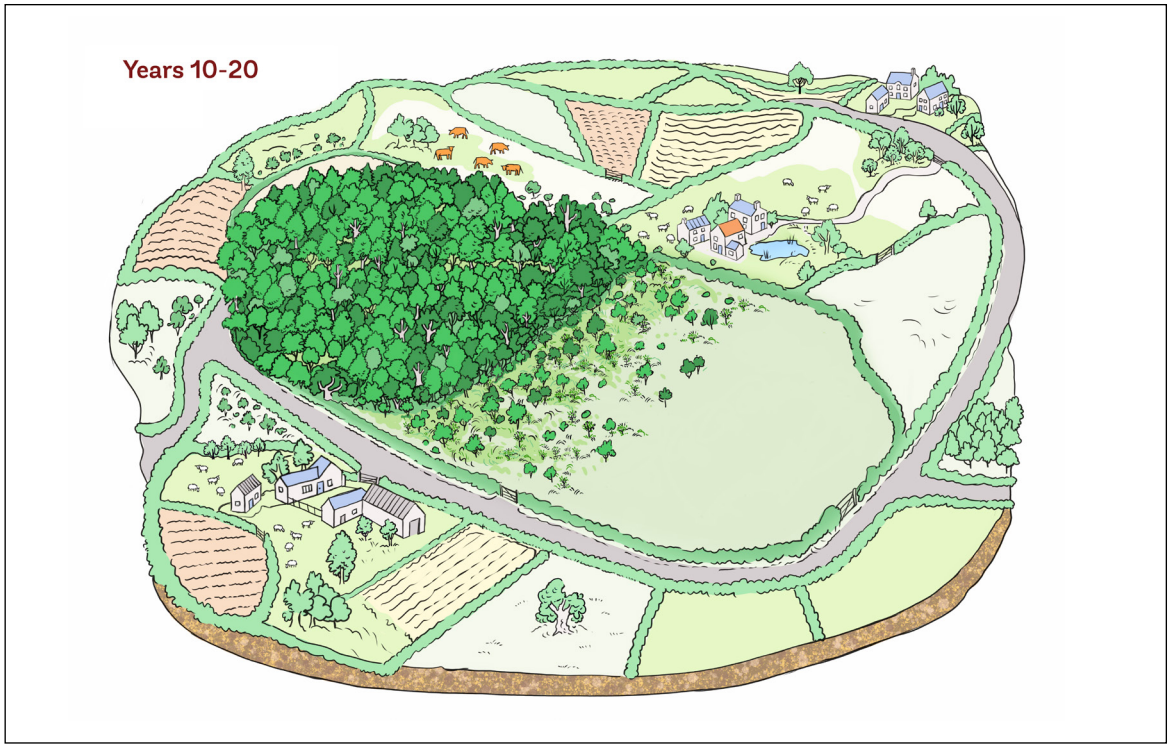

Figure 10 One of the 'woodland development through time' illustrations, showing how natural colonisation might look at years 10–20.

Frequently Asked Questions (FAQs)

We collated current evidence and knowledge into a set of FAQs on woodland creation carried out using natural processes.

The FAQs were developed through discussions with practitioner experts (the KUB and Project Advisory Group) (Figure 11) and incorporate the best available evidence from leading academics. The intention of these FAQs is to share current knowledge about natural processes and hybrid approaches, and to help land managers and advisers make informed decisions when creating woodlands.

Figure 11 Members of the Knowledge User Board and Project Advisory Group inspecting an area set aside for natural processes during a workshop to develop Frequently Asked Questions on using natural processes for woodland creation.

Monitoring guidance for natural processes and hybrid methods

We developed a short guidance document describing how to collect robust data on the progress of natural processes.

From discussion with land managers, it became clear that simple and adaptable monitoring guidance aimed at advisers and land managers would help to both increase uptake of natural processes and confidence that uptake will be successful if management actions can be informed and timely. We adapted an established survey design from the research team and collated input on which indicators would be useful to monitor (Figure 12) from the Knowledge User Board.

Table 1. Suggestions for indicators to measure at each stage of woodland development.

Year		Essential	Optional
0-5		Tree/shrub ▪ ID – species ▪ Count - by species ▪ Stage – seedling (<50cm tall), sapling (>50cm, <150cm tall) Herbivory presence - % of seedlings/saplings in the plot with evidence of browsing	UK Habitat Classification *
10-20		All measures above, + any optional indicators (see right hand column) Tree/shrub age distribution – by species, count within the following categories: seedling, sapling, mature, ancient **^&	Horizontal complexity * (see Appendix) Diameter at breast height (DBH) $ &
20+		Decaying wood presence - % of the plot with decaying wood *	Disease presence - % of the plot with trees/shrubs affected ^ Herbivore damage via Herbivore Impact Assessment (HIA) or alternative ^

Objectives key
* Nature recovery
$ Wood products
& Carbon sequestration
^ Resilience

Figure 12 A summary of suggestions of essential and optional indicators to measure in a natural processes site at each stage of woodland development.

Training events for practitioners

TreE PlaNat funded the inaugural two-day training event on natural processes aimed at advisers and land managers, in collaboration with the National Forest Company. To find out more, contact ConservationTraining@woodlandtrust.org.uk.

These events combined sharing the latest research findings with providing a framework for assessing sites for their suitability for natural processes and making decisions on tree species and method choice (Figure 13). Learning has since been incorporated into the Woodland Trust's Conservation Training Programme, with two further events running in collaboration with Natural England in 2025. These events will likely continue to be part of the programme in future years.

Figure 13 Advisers and land managers assessing a National Forest woodland creation site for suitability for natural processes. Image credit: Elisa Fuentes Montemayor.

Demonstration site

We established a new natural colonisation demonstration site to allow practitioners to visit, observe, and discuss natural approaches to woodland creation. To find out more, contact enquiries@nationalforest.org.

Uptake of natural colonisation within new woodland planting schemes in the National Forest has historically been low, meaning there are few examples of its success across the Forest. The National Forest Company (NFC) were therefore keen to create a new scheme that demonstrates to local land managers how natural processes can be used alongside tree planting to maximise woodland creation benefits.

The new demonstration site lies close to Measham village in North West Leicestershire, and forms part of a larger complex of new woodlands known as Minorca Woods and owned by the NFC. The demonstration site itself is 21 ha in total, the majority of which was formally a single large arable field (Figure 14). When designing this scheme, the NFC Estate Officer wanted to incorporate woodland creation methods less common throughout the National Forest, to show land managers the range of options available. Here, land managers can see examples of short rotation forestry, amenity tree planting, wetland creation, and natural colonisation.

The area given over to natural colonisation is a 2 ha strip adjacent to the neighbouring existing woodland. The maximum distance from the seed source is ~75 m to match in with national grant offerings. Since the purpose of the site is demonstration, the NFC was keen to ensure the options reflected what is currently available to land managers through national funding mechanisms. One hectare of the area was left without any planting, and the other hectare was sparsely planted (100 stems/ha). There is also a compartment of native broadleaf planting adjacent to the existing woodland, meaning the NFC can monitor and compare these methods over time.

The site has already hosted over 50 visitors keen to understand what success looks like in the National Forest. This includes teams from the Department of Environment, Farming and Rural Affairs (Defra), Forestry England, and National Landscapes. Further visits for local land managers and guests from the Royal Forestry Society are planned in the near future.

Figure 14 The natural colonisation demonstration site at Minorca Woods near Measham in the Leicestershire, managed by the National Forest Company. Image credit: the National Forest Company.

The importance of language

We created an illustration explaining the importance of language for engagement around woodland expansion approaches.

The illustration explains what terms are most widely understood and used by different groups of people: farmers, foresters, and ecologists (Figure 15). The aim of the illustration is to help all stakeholder groups to improve communication between different groups by encouraging them to consider which terms their audience is most familiar with to enable positive interaction on the topics. The content of the illustration is informed by focus groups with 19 land managers that held different key objectives, and three validation workshops with 22 additional participants (reported in Ambrose-Oji et al., 2025b; 2025c).

Figure 15 Language is important for engagement around woodland expansion approaches. Image credit: Crown copyright, Forest Research.

StoryMap

We created a StoryMap that brings together findings from across our research project, including case-studies and interviews with land managers.

The StoryMap presents research findings from all three projects on what factors land managers consider when deciding which woodland creation approach is right for their landholding and for their objectives alongside the findings from our ecological research on the process of natural colonisation (Figure 16). This includes a set of 26 case studies of natural colonisation or hybrid approaches from across Great Britain, including video interviews with 3 land managers about their experiences.

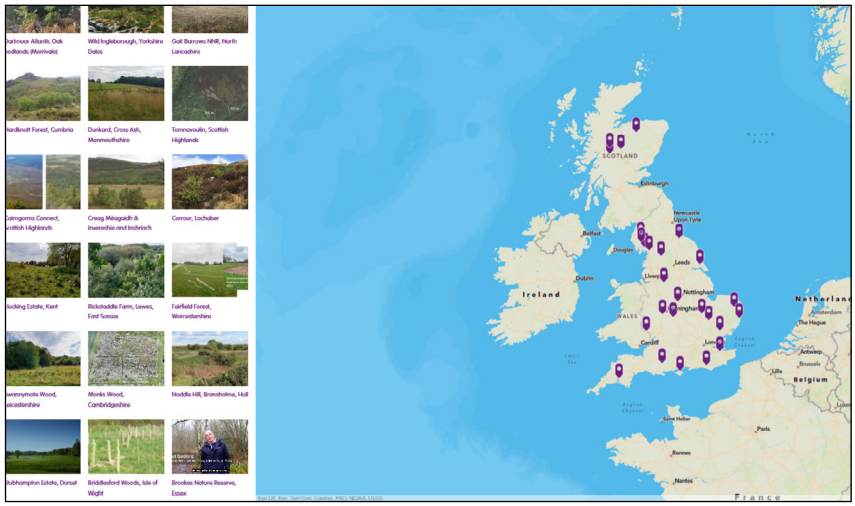

Figure 16 Our StoryMap includes 26 case studies of natural colonisation, including video interviews with land managers.