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Restoration of native woodland on clear-felled conifer sites through natural regeneration

Key Messages

- Natural regeneration on clear-felled conifer sites creates new native woodland with an average of 3300 saplings per hectare.
- Regeneration is diverse with up to 13 native tree species, dominated by birch, rowan and willow.
- Natural regeneration ensures local provenance of tree saplings, reduces pressure on tree nursery stocks and removes need for plastic tree guards.

Introduction

Conifer plantations are an important source of timber, but native woodlands provide greater environmental services such as carbon storage and biodiversity. Restoration of clear-felled conifer sites to native woodland may be suitable where conifer plantations are uneconomic or where the environmental benefits of native woodlands are prioritised by the land manager.

Restoration (restocking) of clear-felled conifer plantations can be achieved either through planting of native trees or through natural regeneration (also known as natural colonisation). Natural regeneration is where trees disperse naturally from mature trees and establish without tree planting.

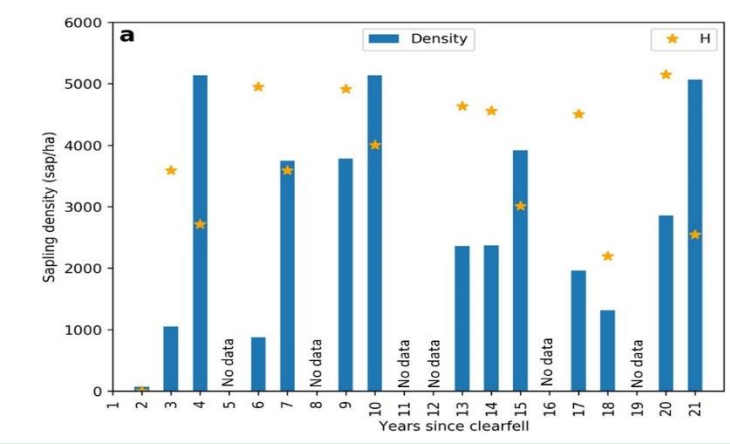
Methods

We studied the capacity for natural regeneration to restore clear-felled conifer sites in the UK.

We recorded natural regeneration of native trees on 15 clear-felled conifer sites across Northern England and Scotland. Sites had been clear-felled 1 to 21 years before the study, allowing us to examine the rate of tree recovery. In each site we identified the number and species and measured the diameter of regenerating saplings along transects.

We calculated the sapling density (saplings per hectare), the species diversity of saplings, and calculated the growth rates and biomass storage in above ground vegetation.

Sapling density

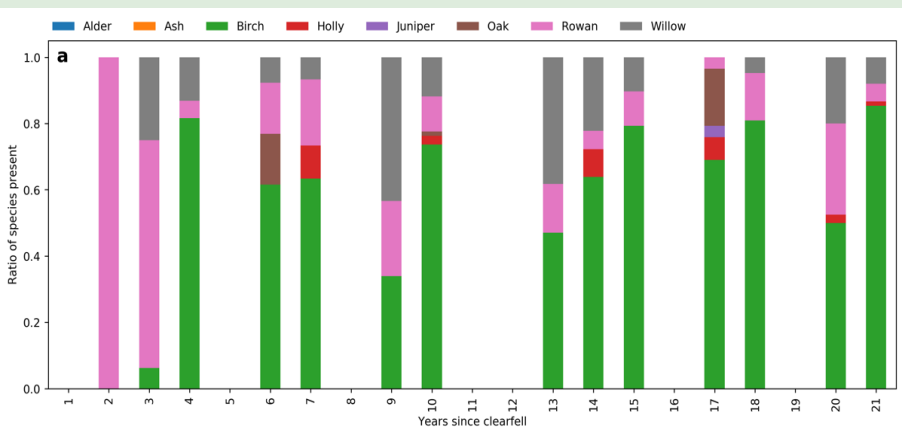


Naturally regenerating saplings establish quickly with more than 1000 saplings per hectare three years after clear-felling.

The average density of native tree saplings across clear-felled sites was 3300 saplings per hectare. Tree density remains high for at least 20 years after clear fell.

3300 native saplings per hectare

Sapling species diversity

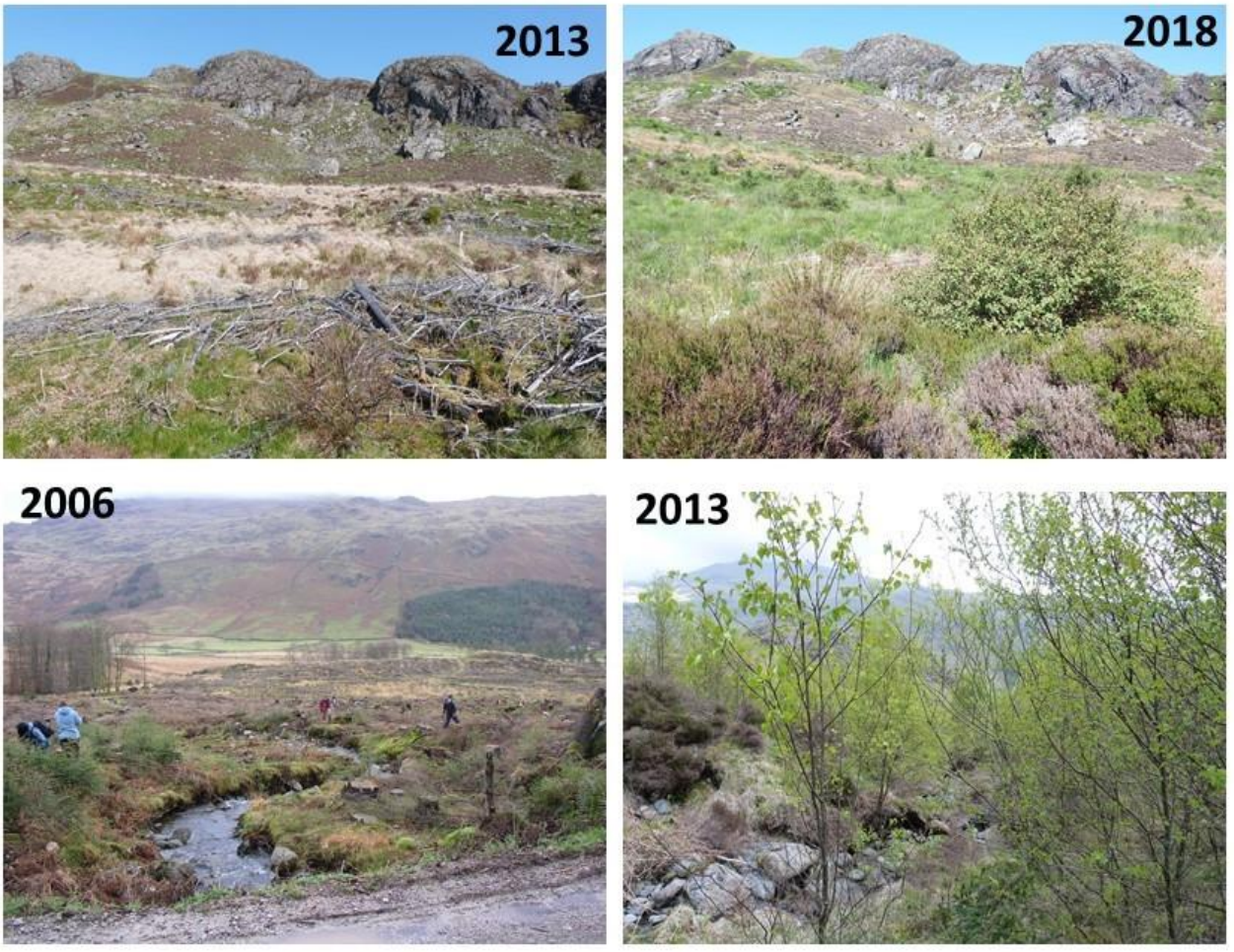


Natural regeneration is dominated by birch (80%), rowan (8%) and willow (8%).

A total of 13 regenerating native trees were recorded including oak, alder, holly, and juniper.

13 native tree species regenerating

Fixed point photography



Fixed point photographs at two different sites taken 5 to 7 years apart shows naturally regenerating trees and rapid recovery of bilberry, heather and other ground flora. Both sites are carefully managed to ensure site boundaries are stock proof, deer numbers are controlled and regeneration of non-native conifer species are removed.

Carbon sequestration

Sapling height is 3 to 4 m after 21 years. The new native woodlands store 70 tonnes of above ground biomass per hectare, with an average sequestration rate of 5 tonnes of CO_2 per hectare per year.

Clear-felled conifer versus moorland sites

Natural regeneration on clear-felled sites (3300 per hectare) greatly exceeds natural regeneration on adjacent moorland (64 saplings per hectare). Clear-felled plantation sites provide excellent conditions for natural regeneration - the bare soil after clear-fell is ideal for seedling establishment and plantation sites often have remnant mature broadleaf trees providing a local seed source.

Management interventions

Clear-felled sites need to be carefully managed to ensure successful establishment of new saplings: deer management to control browsing pressure; fencing to prevent livestock ingress; removal of naturally regenerating conifer saplings to prevent them dominating the new woodland.

Benefits of natural regeneration

Natural regeneration creates woodlands without the need for tree planting and has a number of important advantages. Naturally regenerating trees are sourced from local provenance mature trees ensuring they are well matched to site. Creating new woodlands without tree planting reduces pressure on nursery tree stocks, reduces chances of spreading tree disease and removes the need for plastic tree guards.

Policy implications

In the UK, most new woodlands are created through tree planting. Until recently there has been less interest and no grant support for natural regeneration.

Our work demonstrates natural regeneration is an effective way of restoring conifer plantations to native woodland. New funding mechanisms are needed to help land owners and land managers deliver natural regeneration on these sites. In particular funding is required to cover costs of fencing, deer management and removal of non-native conifer regeneration.

This policy note is based on: Spracklen, et al., Regeneration of native broadleaved species on clear felled conifer plantations in upland Britain, *Forest Ecology & Management,* 310, 204-212, 2013; Smith et al., Creation of native forest on plantation forest sites using natural regeneration, in prep.
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