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Native Forests for our Future | Hereherea te Wao-nui-a-Tāne

Establishing Native Forests

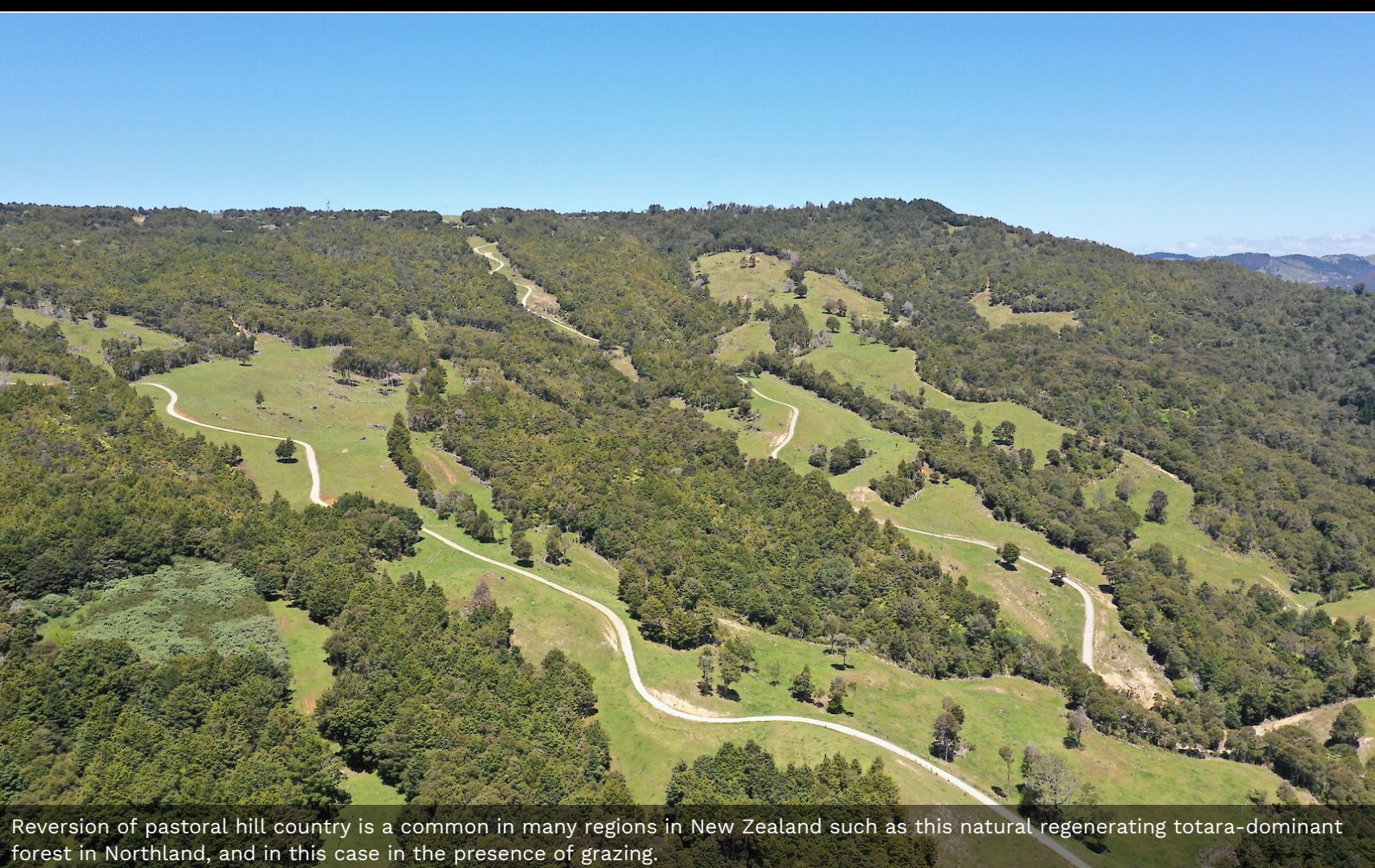
TĀNE'S TREE TRUST FACTSHEET SERIES

Natural regeneration of native forests

FACTSHEET 6, 2022 – by David Bergin

Refer to the [other factsheets in this series](#) for more about successfully establishing native forests.

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Reversion of pastoral hill country is a common in many regions in New Zealand such as this natural regenerating totara-dominant forest in Northland, and in this case in the presence of grazing.

Introduction

Regeneration or reversion of native forest is the process by which land reverts either naturally, or with human assistance, back to a vegetation cover dominated by native species.

This factsheet considers the opportunities to work with nature to establish native forest. While the success of regeneration can be site-specific, there are options for landowners to encourage regeneration of native forest. Successful regeneration requires a nearby seed source, birds to spread seed, and typically involves exclusion of livestock by fencing, control of animal pests, and where necessary, selective control of potentially aggressive and persistent brush weeds such as blackberry. Supplementary planting is another management option that can speed up regeneration.

Marginal low productivity pasture

- Given the high cost of planting natives, strategies that encourage natural regeneration are likely to be more practical than wide-scale planting to achieve an ecologically sustainable permanent forest. This is particularly relevant for the restoration of native forest over large areas of low productivity pastoral land, regarded often as marginal hill country.
- There are estimates of over 1 million hectares of marginal pasture lands, much of it in remote back country, which have the potential to revert to native forestry following livestock removal and control of pest animals.
- However, the rate of natural regeneration is highly variable depending on region, site, proximity of seed sources, presence of grazing stock and pest animals, and presence of weed species - all of which can prevent or hinder recruitment of native shrubs and trees for decades.
- Where regeneration does occur, surveys indicate plant densities can vary from scattered trees to highly stocked stands in the first few decades of reversion, some in excess of many thousands of stems per ha (Bergin and Kimberley 2014); over-stocked stands rapidly reduce in density due to intense competition 40 or more years after establishment.

Benefits of natural regeneration

- Encouraging regeneration can be substantially less cost and effort than planting – while estimates of costs are highly site-specific, blanket planting can often cost \$20,000 or more per hectare whereas managing regeneration may only be a few thousand dollars per hectare.
- As with planted native forestry, regenerating native forestry has many co-benefits; it provides a wide array of social amenities along with cultural as well as environmental benefits such as increased biodiversity, reduced erosion and improved water quality.
- Allowing and encouraging natural regeneration takes away the need to second-guess the right species for the right site; given a local seed source and a bird population to spread seed, regeneration will see the development of natural successional processes over time, from early pioneer shrubland through to high forest communities.
- In some situations, planting can complement reverting land, especially re-introducing a seed source for species that have been lost from the area or have become locally scarce.



Managed natural regenerated beech forest including trapping lines to reduce possum damage, Oxford Canterbury.

Regeneration takes time!

Excerpt from Miles Giller, QEII National Trust, Canterbury

- Sometimes it might be safer to be patient and just allow nature to take the lead. It is a pity that for something that is free, patience always seems to be in such short supply.
- Given enough time and a little encouragement in the form of pest and weed control, maybe nature can deliver the best results.
- The natural regeneration process is much less likely to disturb existing ecological values. It too will usually benefit from good weed control and pest animal control; however, with patience and good seed availability this is usually less demanding, though possibly more prolonged.

Selecting land for reversion

- Changes in land management can promote natural regeneration of native shrubland which can eventually succeed to permanent native forest.
- Reversion is slow taking many decades; and depending on the site, previous management history, and presence of both exotic and native vegetation, it can take several different successional pathways.
- Reversion tends to be slower in regions with dry climates (e.g., Wairarapa, Canterbury) compared to high-rainfall regions (e.g., Taranaki, Westland).
- Identifying areas of marginal land that could be reverted to native forest may be challenging given that pastoral landowners are often locked into maintaining grass cover.



Sustainably managed natural regenerated black beech forest, Oxford Canterbury.

- Encouraging natural regeneration as an alternative land use is a viable option in many parts of New Zealand's hill country. Pastoral farming on steep hill-country is often marginal and the land is prone to severe erosion. Clear-fell plantation forestry can also be problematic due to environmental problems and the extraction of timber can be uneconomic, particularly from remote areas. Where exotic plantation forestry is viable in hill country, native forest can act as a buffer to reduce impacts of clear-felling.
- Other factors to consider, in selecting areas for natural regeneration, is to protect and enhance existing forest remnants such as:
 - Retiring areas that are close to existing seed sources of remnant native forests.
 - Selecting areas that will act as corridors for biodiversity by joining up existing remnants.
 - Improving the integrity and shape of existing remnants.

Incentivising landowners to change

Identifying areas of marginal land that could be reverted to native forest may be challenging given that farmers are often locked into maintaining grass cover. It can be a big mindset change for landowners to consider land use change from low productivity grazing to permanent forest cover. It is likely some landowners will be spending 90% of their farm maintenance budget on the least productive 10–20% of their land such as clearing or spraying gorse, blackberry or other aggressive brush weeds that can colonise steep hill country.

Providing incentives to landowners along with clear information on the benefits of retiring their most erosion-prone hill country will be required to compensate them for:

- loss of production from grazing, even if this is regarded as marginal,
- fencing retired areas from grazing stock
- managing natural regeneration as required including pest animal control, supplementary planting of natives on some sites, and
- providing support long term to maintain retired and restored native forest in good condition.

Requirements for natural regeneration

Actions that landowners can undertake to promote natural regeneration include:

- **Remove grazing stock** – fence out domestic stock to allow regeneration of native shrubs and trees.
- **Control pest animals** – reduce or if practical eliminate any pest animals that are a major cause for halting natural regeneration, e.g., deer and goats.
- **Undertake selective weed control** – target the most aggressive exotic weeds that can dominate or permanently occupy a site and prevent reversion; active management of exotic scrub generally diminishes as taller native species assert increasing site dominance. Large-leaved muehlenbeckia is an example of a weedy native that can dominate sites and cover other natives and may need to be controlled. For more information on weeds refer to [Weedbusters](#).
- **Enhance existing remnants** – protect and enhance any natural forest close to your planting site; regeneration is reliant on both wind- and bird-dispersed seed so protect existing local seed sources.
- **Integrate with predator control programmes** – rodent, mustelid and possum control will help increase bird populations (vectors for spreading seed) as well as increase flowering and seeding, which will build up seed banks leading to more regeneration; other native fauna can also be closely involved in seed production and dispersal, therefore, they too need to be protected from pest animals.



Regeneration success is a package of measures

Natural regeneration of native forest requires action on many fronts. While browsing animals hinder development of seedlings and saplings, it is the presence of rodents that also often impede development of a diverse regenerating native forest. Impacts of rodents are two pronged:

- they (along with mustelids and possums) decimate bird populations, the key vectors of seed dispersal, and
- they reduce seed banks by feeding on the seeds of fruit bearing trees and shrubs.

Successful regeneration that will see a diverse range of species (not just wind dispersed species like manuka and kanuka) requires a package of measures including controlling browsing animals, reintroducing locally extinct key plant species, and integrating with predator control programmes to protect birds and increase seed banks of natives.

Options for natural regeneration

Selection of the most appropriate option to encourage reversion will depend on scale and resources.

Enrichment planting

- Many previously cleared farm areas have reverted to scrub cover often dominated by manuka and kanuka or exotic weeds like gorse.
- Enrichment planting involves the inter-planting of selected native tree species within the existing shelter but options will depend on height and density of scrub, and the commitment and resources to undertake these often labour-intensive operations.
- Where practical, use natural gaps or hand-cut lines or gaps for planting native tree species within existing regenerating scrub.
- Spacing trees at 3 – 6 m apart in lines 8 m apart will give an overall stocking of 200 - 400 stems per hectare.
- Cutting lines and gaps can be very labour-intensive, along with hand cutting required for several years after planting to control invading aggressive weeds within gaps. Overtopping canopy needs to be constantly opened up to keep planted natives from being shaded out.



Totara was inter-planted in gaps and on open grassy areas within naturally regenerating kanuka in a hill country block, 10 years ago in the Hawkes Bay.

Planting seed islands

- Planting a diverse range of native trees and shrubs as ‘seed islands’ across parts of reverting marginal land can supplement seed sources from adjacent bush areas, and re-introduce tree species that are locally scarce or lost.
- Select easily accessible sites 10 - 50 m across where establishment of natives is likely to be most successful; fencing may be required if grazing or pest animals cannot be completely controlled.
- Plant later-successional, high-forest species that would eventually assist with infilling open areas and increase the diversity of surrounding reverting shrubland on less accessible sites. Refer to [Tane’s Tree Trust tree species profiles](#).
- Hardy early successional shrub species such as kanuka and manuka can be planted to provide shelter for interplanted tree species if sites are exposed or to reduce weed control.
- Depending on the size and characteristics of each ‘seed island’, plant 10 - 50 seedlings at a spacing of 1.5 – 2.0 m apart, with tree species spaced at 4 m apart within a matrix of native shrub species.
- Match appropriate mixtures of native conifers and tree hardwoods appropriate to the site, e.g., kahikatea and pukatea on lower slopes and moist flat ground, totara on drier mid slopes.
- Undertake regular monitoring and maintenance to ensure planted natives are not suppressed by aggressive grass and weed growth, and pest animals are not causing damage.

Establishing native tree groves

- Establishing high-value native timber tree species in plantations is an option for some landowners.
- Plant mixed or single-species plantations of timber tree species either with or without early successional shrub species such as manuka and kanuka for initial shelter.
- Selection of sheltered sites with optimal after-planting care and silviculture provides the best opportunities for good growth and tree form leading to good wood quality.
- Trees can be planted on sheltered sites without nurse species. On sites that remain in grass, releasing until trees are above the grass may be required for the first 1-2 years. Where aggressive exotic brush weeds like blackberry invade, then weed control may be required until canopy closure.
- Planting trees within a nurse cover of usually faster growing shrub species can form a canopy cover quickly reducing weed growth and the need for long-term weed control. Side shelter of nurse species can improve the stem form of inter-planted tree species reducing multiple leaders and coarse lower branching.



Stand of natural second growth kahikatea, Waikato.

Reversion through exotic shrubland

- Some exotic shrubby woody species can be useful as a nurse crop for regenerating native shrubs and trees.
- [Hinewai Reserve](#) managed by Hugh Wilson and his team on Banks Peninsula is a well document example of gorse and broom being used as an effective nurse along with natives for establishment of a diverse native forest over time.
- However, reversion using exotic-dominated shrubland can take decades on some sites for native species to appear and for natural succession to high native forest to commence. Where gorse is interlaced with scramblers such as blackberry or other vigorous vines, then succession to native can be extremely slow and may not occur if persistent.
- Regenerating exotic shrubland can also be fire prone as in sites dominated by gorse where fire will reset succession to native forestry backwards decades.

Grazing as a tool for reversion

- On some sites, the presence of domestic grazing stock can promote regeneration of key early successional shrubs and trees that are relatively non-palatable such as manuka, kanuka and totara.
- Grazing can be effective in reducing rank grass competition to allow germination of these natives on marginal hill country but removal of stock will be required eventually to allow regeneration of a diverse forest with more palatable broadleaved species.
- Some non-forest associations such as tussock land species can benefit from a degree of ongoing grazing, depending on species composition and the long-term aspirations of the landowner.

Role of regeneration in replacing pines

- There is considerable interest in reverting pine forest to native after the pines have been clear felled. Steep remote hill country with long haulage distances to sawmills and log export ports are making productive exotic forest marginal in some regions.
- Methods for replacing pine plantations with permanent native forest depends on the site, degree of disturbance after logging, proximity to native forest as a local seed source, and presence of aggressive weeds such as pampas, gorse, broom, blackberry, honeysuckle, etc..
- Promoting regeneration of a diverse native forest is likely to be the most effective albeit long term option for many sites especially at scale.
- While removal of the pines usually destroys most native understorey, some coppicing of smashed natives such as mahoe, *Pittosporum* and *Coprosma* species can be expected if they were present.
- However, the likelihood of aggressive weeds quickly dominating clear felled sites can be very high. Selective weed control including cutting or poisoning wilding pines that inevitably infest recently logged pine sites will be required.
- Planting sheltered sites with groups of key native trees that can be easily accessed for monitoring and maintenance can supplement natural regeneration.



Dame Anne and Jeremy Salmond, owners of Waikareru (Longbush Ecosanctuary), Waimata Valley, Gisborne, have been actively managing natural reversion of kanuka-dominant shrubland over the past 20 years through exclusion of grazing, weed control, bird predator control and supplementary planting of native tree species (see hillside on the left). In contrast, the landowner of the hillside on the right continues to manage steep hill-country in pasture by spraying herbicide on regenerating kanuka.



Naturally regenerated mixed podocarp pole stand, Greymouth, West Coast.

Native forest factsheets series

These factsheets on establishing native forest have been compiled by Tāne's Tree Trust with funding from Te Uru Rākau's One Billion Tree Partnership Fund with support from The Tindall Foundation and Trees That Count. Others providing information and undertaking peer review include Scion, Auckland University of Technology, Northland Totara Working Group, iwi, landowners and selected local authorities and government departments.

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Cite this factsheet as: Bergin D. 2022. Natural regeneration of native forests. Establishing Native Forests factsheet series, Factsheet No. 6. Tāne's Tree Trust. 8 pp. <https://docs.tanestrees.org.nz/1151>