

## Restoring a Lowland Forest Remnant

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### BACKGROUND

In Nelson Province there has been a systematic destruction of the forest cover from the time of settlement. This destruction, particularly of the coastal and lowland forests and beech forests at lower altitudes on more accessible sites, has resulted from timber milling and farm development.

Forest clearance continued until recently in Nelson and Marlborough with the felling of beech forests and associated podocarps for the export of wood chips.

Extensive areas of forest have been set aside for protection in national forests, maritime parks, and other reserves. However, much of this protected land is mountainous beech forest with lowland coastal and wetland plant communities poorly represented.

Many landowners today recognise the value of the remaining bush remnants and wish to see them protected. This is possible through agencies such as the QEII National Trust or the Department of Conservation but legal protection alone may not be enough to ensure the survival of the bush and active management may be required.

### MANAGING LOWLAND FOREST REMNANTS

The three main options for managing forest remnants are: natural regeneration, regeneration using nurse trees, and revegetation.

**Natural Regeneration.** Where livestock and fire are excluded, natural regeneration may be sufficient to ensure the survival of a forest remnant. The regeneration will occur through the growth of seedlings of trees within the remnant and to a lesser extent by birds carrying seeds in from nearby areas of bush. However, problems can arise where there are openings in the canopy or around the edges as these are sites likely to be invaded by weeds, particularly old-man's beard.

Providing that the remnant is largely intact and there are few openings in the canopy then natural regeneration is a realistic option.

**Regeneration Utilising "Nurse" Plants.** Nurse plants can be utilised for accelerating the natural process of regeneration by creating a favourable microclimate for the germination and growth of native seedlings. This approach is most useful on exposed sites where the nurse plants provide shade and shelter.

Examples of nurse plants, both indigenous and exotic, assisting regeneration can be seen throughout the Nelson region.

- Pine plantations at Spooners Range and Rai Valley are developing a strong understory of wineberry, kohuhu, karamu, mahoe, and fivefinger.

- Eucalypt plantations at Milnethorpe have created a favourable environment for regeneration on a harsh coastal site.
- Gorse throughout the region is being succeeded by native forest. There are good examples in Abel Tasman National Park.

Utilizing nurse plants to assist regeneration is one option to be considered but the technique does have limitations. In the case of pines and eucalypts, there is the problem of damage to the emerging forest if the trees are to be harvested, and with highly flammable nurse plants, such as gorse, there is always the risk of fire occurring before the new forest has become established.

**Revegetation.** Revegetation or restoration can be described as new or supplementary planting to accelerate the natural process of regeneration. This is often the best approach in managing small forest remnants where the bush has become open to sunlight and exposed to the wind because of milling, grazing, or windthrow. In these situations the natural process of regeneration may take a very long time even if browsing animals are excluded because the site will be invaded by grasses and other weeds such as old-man's beard.

Revegetation using quick growing trees that occur naturally in lowland forest communities will suppress the grasses and other weeds by excluding the light and allow the process of succession to proceed.

Revegetation may also make it possible to form a more complete plant community by including plants from nearby stands that no longer occur in the remnant being replanted.

## REVEGETATION PLAN

Although different sites will have different solutions, the principles remain the same when preparing a revegetation plan.

**Study the Brush Remnant.** When preparing a revegetation plan, first study the bush remnant to understand its structure and composition. This will reveal not only the species that make up the forest but also how they are spatially arranged to form the canopy, understory, and ground cover.

Investigate nearby remnants to see if there are important species absent from the site to be planted. They may need to be incorporated in the plan.

**Investigate Physical Characteristics.** Investigate the site and learn something about its physical characteristics. Study the soil type, soil depth and drainage; exposure to the wind and to frost, and the general aspect. These factors which may vary across the smallest sites will help determine the siting of different species.

**A Revegetation Project.** Because of site variations, it is not possible to give a blanket prescription for all lowland forest revegetation. However, the next section describes in some detail a revegetation project at Waimea West that would apply to many Nelson Province sites.

**Background—Revegetation at Titoki, Waimea West.** Revegetation of a small remnant of lowland forest at Titoki, Waimea West has been underway for the past 6 years.



Typical of other forest remnants on the Waimea Plains, this 1.0 ha site was logged for kahikatea and matai in the early days of European settlement and then grazed until the present. The result is an open stand of totara and titoki together with scattered kowhai, ribbonwood, lacebark, mahoe, rohutu, and ngaio. Grazing has destroyed the understory and native ground cover which has been replaced by grass.

**Revegetation Technique.** Because of the open nature of the stand it was decided to plant quick growing species that would soon form a "closed canopy" and suppress the grass by excluding light. These quick growing species which all occur naturally in lowland forest throughout the Waimea Basin include:

<i>Aristotelia serrata</i>	wineberry
<i>Cordyline australis</i>	cabbage tree
<i>Coprosma robusta</i>	karamu
<i>Dodonaea viscosa</i>	ake ake
<i>Hoheria angustifolia</i>	narrow-leaved lacebark
<i>Kunzea ericoides</i>	kanuka
<i>Meliccytus ramiflorus</i>	mahoe
<i>Myoporum laetum</i>	ngaio
<i>Pittosporum eugenioides</i>	lemonwood
<i>Pittosporum tenuifolium</i>	kohuhu
<i>Plagianthus regius</i>	lowland ribbonwood

Since planting, all the trees have established well and are growing quickly—in the case of wineberry and ngaio up to 1.0 m per year. In earlier plantings grass is already showing signs of suppression and will soon allow the second stage of revegetation to begin.

In the second stage plants will be chosen from species that occur naturally in the Waimea Basin and will include:

<i>Alectryon excelsus</i>	titoki
<i>Beilschmiedia tawa</i>	tawa
<i>Dacrycarpus dacrydioides</i>	kahikatea
<i>Nestegis montana</i>	narrow-leaved maire
<i>Pennantia corymbosa</i>	kaikomaka
<i>Podocarpus totara</i>	totara
<i>Prumnopitys taxifolia</i>	matai
<i>Pseudopanax ferox</i>	lancewood
<i>Sophora microphylla</i>	kowhai

They are planted at this later stage because they are mostly species that do not compete strongly with grass weeds and may not establish quickly in full light or when exposed to strong winds.

Natural regeneration will supplement this second stage of planting and the forest can be expected to develop further over time. Ultimately, it should become largely self-maintaining although weeds, such as old-man's beard, will continue to be a threat.

**Revegetation Program.** The revegetation plan will take many years to complete because of the scale of the project and the need to maintain the plants while they

are becoming established. An annual program is followed and up to 500 trees are planted out each year.

1) Raising Plants . The plants are nursery raised and grown in containers called "Tinus rootainers". Plants raised in containers and in an open growing environment transplant with less shock than wildings collected from the bush.

The seed is collected locally from lowland bush within the Waimea basin to ensure genetic purity. This seed, collected and sown in the autumn, will germinate and grow into seedlings 400 to 500 mm high which are ready for planting the following winter.

2) Site Preparation. The area to be planted is prepared in the autumn, first by hard grazing and then fencing to exclude stock. The planting sites are marked at 2.5 m × 2.5 m spacings and sprayed with the herbicide 'Permazol SDA' at 250 g/100 m<sup>2</sup>. A sprayed circle of 0.5 m diameter is adequate and gives effective weed control for the first year.

3) Planting. Planting may be carried out anytime during dormancy providing soil moisture levels are adequate. However, planting in autumn is recommended if there is a risk of early summer drought.

4) Planting Pattern. The pattern of planting is determined by the characteristics of the site. Kanuka, akeake, ngaio, and kohuhu are dominant on the exposed sunny free-draining sites; lemonwood, mahoe, and karamu the more sheltered areas; and cabbage trees, flax, and kowhais along the flood channel.

5) Maintenance. Little maintenance has been required other than an annual herbicide spray to control weed seedlings such as old-man's beard.

In some years the young tree seedlings have been release sprayed with "Round-up" although the benefits have been marginal.

No promotion of tree growth from fertilizer application either at planting or later as a side dressing has been observed.

Blanking has not been necessary so far because of the high establishment rate. Any gaps will be filled in later years with the second stage planting or by natural regeneration.

## LANDSCAPE DESIGN

Native bush remnants need not be considered in isolation from other farm plantings and uses. Rather, it should be possible through creative design to integrate the more "productive" land uses with the natural resource. How this is achieved will vary according to the site and land use—different solutions will be required for a hill country property compared with say, a property on the plains.

At Waimea West an 8 ha property is being developed as an economic unit by growing horticultural crops. Typical of many properties in Nelson Province the land was subdivided from a larger farm that had a long history of arable and pastoral farming. The land is flat and the natural features are the bush remnant, a river boundary, and good views of the mountains.

In developing the property the design philosophy has been to regard the bush as the central or "core" area and to create a series of enclosed fields throughout the farm by planting a network of shelterbelts that extend outwards from the bush.

These shelterbelts, necessary to provide shelter for the horticultural crops and to create pleasant working and living conditions, also form wildlife habitats and

corridors. Furthermore by using trees that occur naturally in the area, species such as kanuka, ribbonwood, lacebark, kohuhu, karamu, and cabbage tree the landscape is enhanced and the character of the bush extended to the whole farm.

This planting theme can be developed further to include the homestead site where a bush garden can be created by using the same species to form the basic tree framework.

## CONCLUSION

Although the site is small, a little over 1.0 ha, the same restoration principles could be applied successfully to a much larger project.

The first objective is to quickly establish a primary cover of native plants to suppress the weeds and to create a good environment for supplementary planting and for the process of natural regeneration. The best way to achieve this is to:

- Select quick-growing locally occurring, native species
- Raise the plants in containers, preferably "Tinus rootainers"
- Exclude fire and browsing animals
- Control weeds before planting
- Plant in May after autumn rains have recharged soil moisture.
- Release plants from competing weeds until they have become established.

Second phase planting with supplementary species should be delayed until about the time of "canopy closure". At this stage natural regeneration will also play a part in the process of restoration and ultimately the bush will become largely self-maintaining.