

# 10. Maintaining a restoration project

To maximise success, you will need to maintain the site and its plants for several years (typically 3-5 years). It is important to be committed to this, and not to undertake more planting than you can look after. Retain additional funds for maintenance, as unexpected problems will inevitably arise, e.g., plant losses from unseasonable weather, browsing or grazing. Inspect sites regularly to identify maintenance requirements.

## Caution

It's better to plant a few plants and look after them properly, than to plant a lot and lose most of them.

## WEED CONTROL

On-going weed control is essential to reduce competition, especially from grasses. For slower growing species, weeding may be needed for up to 3 years (Porteous 1993). Mulching is the main method of weed control until the native plants are well established (see **section 9, Mulching**). During this period replace mulch as needed. Other weed control methods may still be necessary, but you should minimise the use of herbicides as many people are concerned about the use of toxic chemicals (see **section 8, Herbicides**). Planting contractors sometimes use pre-emergent sprays like Simazine and Gardoprim to provide longer weed control.

- Apply regular weed control to minimise competition - this may be necessary every month in the growing season (Meurk, Lucas Associates and Christchurch City Council (undated)).
- Use grubbers, slashers, sickles and weed eaters with extreme care.
- Spot-spray carefully with biodegradable herbicide if needed.

### Caution

Poorly managed weed control is a major cause of native plant death.

- Weedeaters can ring-bark planted trees.
- Grubbing can damage sensitive roots.
- Native plants are sensitive to herbicides, especially podocarps.
- Spray drift can easily destroy an expensive plant, wasting time, effort, and money.



Planted pingao and NZ blue euphorbia/ waiūatua beginning to form a natural dune gradient in former marram grass at New Brighton, Christchurch. However, African ice plant threatens to invade the establishing pingao.

## ANIMAL PESTS AND STOCK

Animal pests can destroy your efforts if you do not take precautions. Refer to **section 3, Animal pest control** for control methods. Poison baits for controlling rabbits and possums are listed in **Table 8** below.

Where trapping, shooting or poisoning is inappropriate, animal repellents are a useful alternative for discouraging browsing by rabbits, hares, possums and goats. They are non-toxic, easy to apply and they normally reduce plant losses by over 50% (Montague 2000). There are at least six repellents on the New Zealand market (see **Table 7. Agricultural suppliers** for a list of products and suppliers). Cost ranges from 7.5 to

25 cents per 30-cm seedling. Repellents applied at or before planting time will give protection for about 3 months, depending on rainfall (Montague 2000). Some repellents may reduce plant growth. Some require mixing, though two come as ready-to-use liquids and all are sprayed onto plant foliage. You can make your own repellent by mixing 5 fresh eggs, 150 ml of acrylic white paint and 600 ml of water (Canterbury Regional Council (undated<sup>1</sup>)).

Shields or protective sleeves can be used around stems/trunks – do **not** enclose the foliage, as small plants may suffer heat stress. This also reduces damage by native birds such as pukeko.

Dead gorse branches laid around young plants may offer temporary protection against browsing by rabbits and hares.

- Inspect and repair fences regularly.
- Re-apply animal repellents if necessary.
- Control animal pests.

### Caution

If something can go wrong it will – avoid disappointment and plan for disaster.  
Pests will destroy your efforts if precautions are not taken.

**Table 8. Animal pest control poisons**

Poison	Product Brief	Precautions	Recommended Uses
<b>Campaign Pellets</b> (Distributed by Key Industries)	Cereal based bait, for killing possums. Active ingredients cholecalciferol, vitamin D3 (calcium). Cholecalciferol mobilises stores of calcium from the bones into the bloodstream: elevated blood calcium will cause death within a few days. A single feed of 10 - 15 g will be lethal to possums.	Low toxicity to bird-life and humans, but potentially hazardous to dogs (or cats used to dry foods). Insoluble in water and degrades in the presence of heat, light and oxygen. Follow manufacturer's handling recommendations.	Controls possums. Must be used in bait stations only, out of reach of children, stock and pets. Use 100 g - 200 g per station per 100m or per hectare. Inspect and replace until no more bait is taken.
<b>FeraCol</b> (Distributed by Feral Control)	Oil-based peanut flavoured paste containing cholecalciferol, vitamin D3 in a concentrate form, toxic to possums (low tolerance to calcium). See above for poison effects.	Pets and farm dogs should be discouraged from eating poisoned carcasses. Low risk to the environment and non-target species as it is metabolised and is completely biodegradable. Follow manufacturer's handling recommendations.	Use biodegradable bait bags provided; nail to a wooden frame away from the reach of children and domestic animals. Position the bait in an obvious area of possum activity.
<b>Pindone Possum Pellets and Pindone Rabbit Pellets</b> (Distributed by Pest Management Services)	A poisonous cereal based bait, dyed green to discourage birds. Contains Pindone in the form of a bait. A slow-acting anti-coagulant that must be consumed for several days. The toxin reduces blood clotting resulting in internal haemorrhage. Death occurs 4-11 days after consumption.	Avoid contamination of any water supply with bait or empty container. Handle with extreme care; follow manufacturer's handling recommendations. Remove all stock from the area being treated and withhold for 4 weeks.	Use enough bait to feed for two days and repeat if necessary. Use bait stations for possums and broadcast according to instructions for rabbit control. Do not bait if heavy rain is expected within 1 day, unless protected from rain.

*Poisons and bait stations are available from horticultural and farm supply outlets. Only licensed operators can apply other poison baits. For a list of operators, consult your regional council, district/city council or DOC.*

## PLANT REPLACEMENT/BLANKING

Plant losses will be inevitable. Reasons for losses include: poorly conditioned plants, using the wrong plants for the site, grazing/browsing, lack of maintenance, ring barking by weed eaters, spray drift and vandalism or theft. You may also lose plants to natural causes such as unseasonable drought/frosts, insect epidemics (caterpillars), and disease (root rot and cabbage tree sudden death). You can help improve restoration techniques by recording information about your project performance.

- Replace dead plants to maintain vegetation density.
- Clarify and document the reasons for plant death.

## SECONDARY SPECIES

Your initial plantings will be fast-growing species that form the framework of the future ecosystem. This framework will provide suitable conditions for 'secondary species', those that need shelter and nurturing (e.g., frost-tender trees, ferns, vines and some animals), though this may take several years. Colonising plants provide shelter in which you can underplant secondary species. They also improve the soil and build up biomass, allowing ferns, mosses, lichens and animals to establish naturally, thus increasing biodiversity. Transferring animals from other sites can accelerate this process, but you may need agreement from others, such as DOC and iwi.

- Plant secondary species once shelter has been established by hardier colonisers, or existing vegetation.
- Remember to budget for secondary species.

## REMOVING SHELTER

Gorse and broom will eventually be shaded out, so you do not need to remove them, except along boundaries with other properties. It takes 10-20 years for gorse to be suppressed naturally in moist environments.

If introduced trees, such as sycamore eventually threaten to suppress the planted natives or are likely to spread, you should remove them. Sometimes ringbarking large trees and leaving them to die and collapse in situ may avoid the need for felling, but keep public safety in mind. There is merit in using professional tree fellers to remove large trees so that damage to other plants and safety risks are minimised.

You need to be aware that the sudden removal of a nurse canopy may check the growth of desired plants by increasing exposure to sunlight, frost and weed growth.

- Remove exotic nurse plants only if necessary.
- Remove wind cloth shelters once colonisers are established

## MONITORING AND ADAPTING MANAGEMENT

Restoration in New Zealand is a relatively recent endeavour and we still have much to learn. Inevitably you will find the unexpected and learn useful lessons. Careful observation, trial and error and more formal field trials will all contribute to increased knowledge. If you monitor your restoration project, you will help clarify the requirements of different species and the effectiveness of various management techniques. Specialist monitoring input may be needed to clarify complex issues, such as the role of animals and microbes in succession. In either case, your project can contribute to improved knowledge on restoration. See **Section 3, Monitoring** for an outline of monitoring methods.

Refer to “Eco Track”, the NZERN webpage method of storing data on plant performance in restoration sites (see <http://www.bush.org.nz>). It is expected to be available in some form, by about June 2001.

- Establish regular monitoring.
- Keep good records.
- Refine restoration techniques using information obtained from monitoring or from other projects.

### Further reading

A guide for planting and restoring the nature of Waitakere City. Lucas Associates and Stephen King 1997. *[Book - provides an overview and guidelines for restoration, based on underlying ecosystems, and information about invasive weeds]*

An illustrated guide to common weeds of New Zealand. Roy B, Popay I, Champion P, James T and Rahman A 1998. *[Book - photographs and descriptions of a wide variety of weeds. A number of native plants are listed as weeds, but little explanation is given for their selection. We do not think they should be described as weeds]*

Christchurch waterway maintenance plant guide. Weeds, and how to tell them from similar looking plants. McCombs K, Meurk C and Morland K 1999. *[Book, available on request from Christchurch City Council- contains clear photographs and descriptions for easy plant identification]*

Coast Care Bay of Plenty Programme, brochures 1-6. Environment Bay of Plenty (undated). *[Pamphlets - outline coast care concept, sand dune functioning, foredune vegetation, pingao, spinifex, dune usage and protecting dunes]*

Coastal sand dunes, form and function. Hesp PA 2000. *[Booklet - describes the different types of dunes, their functioning and dynamics, erosions issues and the importance of coastal dunes]*

Gully restoration guide. A guide to assist in the ecological restoration of Hamilton's

gully systems. Wall K and Clarkson B 2001. *[Booklet - a step by step guidebook on gully restoration. Includes a gully profile, information on soils, native plants to use, and weed identification and control]*

Managing riparian zones: a contribution to protecting New Zealand's rivers and streams. Collier KJ, Cooper AB, Davies-Colley RJ, Rutherford JC, Smith CM and Williamson RB 1995. *[Two books - volume 1 outlines why riparian zones are important, and the natural processes affecting rivers and streams; volume 2 provides guidelines for specific problems like bank instability, grazing and increasing habitat diversity. Note –for ecological restoration, we recommend the use of cabbage trees, NZ flax, toetoe, kōhūhu (Pittosporum tenuifolium), karamū (Coprosma robusta) and lowland ribbonwood for erosion control, rather than exotic trees]*

Managing waterways on farms: a guide to sustainable water and riparian management in rural New Zealand (draft). Ministry for the Environment 2000. *[Book - outlines what a healthy waterway is, the impacts of agriculture and forestry, managing problems and restoring riparian vegetation; includes 16 case studies. Note –for ecological restoration, we recommend the use of cabbage trees, NZ flax, toetoe, kōhūhu (Pittosporum tenuifolium), karamū (Coprosma robusta) and lowland ribbonwood for erosion control, rather than exotic trees]*

Motukarara nursery plant catalogue 2001. Department of Conservation. *[Booklet - outlines site preparation, planting and maintenance, and lists plants according to their form, size and provenance. Plants are recommended for different sites and purposes]*

Native forest monitoring. A guide for forest owners and managers. Handford, P. 2000. *[Book - provides detailed information on methods, fieldwork, data analysis, indicators of forest health, and the level of skill and precision needed for the methods used]*

Native forest restoration. A practical guide for landowners. Porteous T 1993. *[Book - comprehensive coverage of managing remnants, with detailed restoration techniques]*

Natural areas of Christchurch: Evaluation and recommendations for management as heritage. Meurk CD, Ward JC and O'Connor KF 1993. *[Book - contains management guidelines for wetlands, grasslands, shrublands, woodlands, dune slacks, salt marshes and sand dunes]*

New Zealand's wetlands. A management guide. Buxton R 1991. *[Book - describes different types of wetlands and their functioning, and provides management and restoration guidelines and summaries]*

Otipua wetland Saltwater Creek, Timaru. A community project. Lucas Associates 1997. *[Book - an example of restoring an estuarine ecosystem from former farmland]*

Regeneration of native forest on Hinewai Reserve, Banks Peninsula. Wilson HD 1994.

*[Paper in journal – describes natural succession under gorse and broom based on a minimum interference policy. Outlines monitoring, successional trends and the importance of removing browsing pressure]*

Rehabilitation of coastal foredunes in New Zealand using native sand-binding species. Bergin DO and Kimberley MO 1999. *[Book, available from DOC Science Publications – covers pingao, sand tussock and spinifex, which are separately addressed in other references by Bergin]*

Resource Management Act 1991. *[Part I,3; Part II, 5(2)(c)]*

Restoring Avoca Valley Stream - a community model. Lucas Associates and Christchurch City Council 1998. *[Book, which has been distributed widely to other councils - contains generic stream restoration guidelines, including planning of restoration, tangata whenua values, waterway enhancement and biodiversity values]*

Review of information on riparian buffer widths necessary to support sustainable vegetation and meet aquatic functions. National Institute of Water and Atmospheric Research 2000. *[Book – site visits were made and native vegetation was considered to be more sustainable over the long term than exotic vegetation]*

Riparian zones. A guide to the protection of Canterbury's rivers, streams and wetlands. Canterbury Regional Council (undated<sup>3</sup>). *[Pamphlet, available from Environment Canterbury – outlines erosion control, habitat values, pollution control and riparian planting. Note – for ecological restoration, we recommend the use of cabbage trees, NZ flax, toetoe, kōhūhu (Pittosporum tenuifolium), karamū (Coprosma robusta) and lowland ribbonwood for erosion control, rather than exotic trees]*

Streamside planting guide. What to plant and how to maintain native plants along freshwater streams in Christchurch. Meurk C, Lucas Associates and Christchurch City Council (undated). *[Pamphlet, available from Christchurch City Council – outlines the main planting steps, stream bank zones and provides a species list]*

The coastal lands of Waimakariri-Rakahuri (Ashley). A preliminary report developing a community vision. Lucas Associates 1998. *[Book – provides an overview and guidelines for restoration, based on underlying ecosystems]*

The natural succession option. A strategy to replace gorse and broom on Canterbury's marginal pastoral lands with native forest. Canterbury Regional Council (undated<sup>2</sup>). *[Pamphlet, available from Environment Canterbury – outlines natural succession by native woody species, and factors affecting succession potential. It is based on the booklet by McCracken 1993, which is straightforward and provides more detail]*

Using native plants in Canterbury. Canterbury Regional Council (undated<sup>1</sup>). *[Pamphlet, available from Environment Canterbury – outlines selecting and obtaining native plants, site preparation, planting, keeping a diary and maintenance]*

