



Preparing Gorse, Broom and Blackberry Sites for Planting Natives

INTRODUCTION

Parts of New Zealand's productive landscape are dominated by a dense cover of exotic woody shrub or scrambling species, sometimes termed brushweeds, the most widespread of which are gorse (*Ulex europaeus*), broom (*Cytisus scoparius*) and blackberry (*Rubus fruticosus* agg.). All three species can form dense monocultures or can occur in mixtures that colonise open and disturbed sites. Blackberry will also persist in partial shade under a developing forest cover. Prolific seeding of all three species ensures they can spread readily, and in the case of the legumes gorse and broom, seed can remain viable in the soil for many decades.

Eradication of gorse, broom and blackberry is near impossible even on localised sites. Where these species are present, they spread rapidly on reverting pastoral hill country, retired riparian areas and wastelands, and especially where intensity of grazing and fertiliser inputs has been reduced. Similarly, areas clearfelled of exotic timber trees that are not replanted can also become dominated by these woody weeds.

While this article focuses on gorse, broom and blackberry, the general principles of site preparation and control of problem woody weeds are likely to be relevant to many other problem woody and scrambling weed species throughout New Zealand. Comprehensive information on control of a wide range of major weed species within each region can be found on websites and with pest plant control officers of local councils.

CHALLENGES

Management of dense stands of exotic woody species is a significant challenge for landowners and managers wanting to establish native trees and shrubs. Poor site preparation of such sites most often leads to vigorous regrowth of problem brushweeds that will seriously compromise early survival and growth of any planted native trees and shrubs.

Factors influencing the preparation of sites for establishing natives include the scale of the proposed planting programme, resources available to undertake the planting, the commitment to post-planting weed control and a wide range of environmental and site factors such as soil and drainage characteristics, degree of exposure and local climate. Other important factors in preparing sites for planting natives, that apply to all sites, including the exclusion of domestic grazing stock and the control of animal pests, are covered in other Technical Articles in this Handbook.

While the focus on site preparation in this article is on exotic brushweeds and scramblers, there are a few native plant species that are sometimes attributed the status of a 'weed'. Probably the most widespread 'weedy' native is bracken (*Pteridium esculentum*) which is often in mixture with gorse, broom and blackberry. Esler (1988) points out that the New Zealand flora has few annual species to act as weeds and that bracken is perhaps the most serious perennial native weed species.

OPTIONS FOR SITE PREPARATION

Combination of spraying and clearing

Sites dominated by exotic brush weed species will normally require complete removal of the vegetation cover by a combination of spraying and mechanical methods before natives are planted. In general, this involves spraying scrub cover with appropriate herbicide followed by clearing.

Methods for clearing dense scrub areas will depend on the scale of the planting to be undertaken. Hand methods such as knapsack spraying and use of scrub cutters are practical options for preparing small areas or where sites are inaccessible for machines.

For large areas, aerial applications by helicopter may be feasible. However, for most sites, ground-based high-pressure sprayers which can access the site will be sufficient. The choice of herbicide will depend on the species present and information is best sought directly from suppliers along with careful consideration of manufacturer's recommendations. Regional Councils also provide information on the use of herbicides for particular vegetation types.

There are many options for mechanical clearance of sites dominated by woody exotic species depending on the species present and the size of dominant plants. These vary from crushing, mulching, slashing or clearing using tractors, excavators or bulldozers.



Once accessible areas of dense exotic brushweeds have been sprayed, clearing by machines is likely to be the most effective method especially for large areas.

It takes time!

Thorough site preparation of dense exotic scrub sites takes time. Good site preparation will ensure greater success of the native planting programme through less post-plant weed control and significantly less downstream costs.

For difficult sites it is wise to allow up to two years before planting to prepare woody weed-infested sites and ensure vigorous weed species have been controlled. This will vastly improve the chances of successful establishment of native trees (Bergin and Gea 2007). This involves:

- 1. First year** – spraying of the brushweeds with herbicide to achieve a maximum kill followed by clearing the site of sprayed weed growth; and
- 2. Second year** – re-spraying vegetative regrowth and any regeneration from seed of problem weeds.

Poor site preparation, particularly of sites that have been dominated by vigorous brushweeds and scramblers, will consign managers and landowners to years of weed control and often leads to complete failure of native species planting projects (Bergin and Gea 2007).

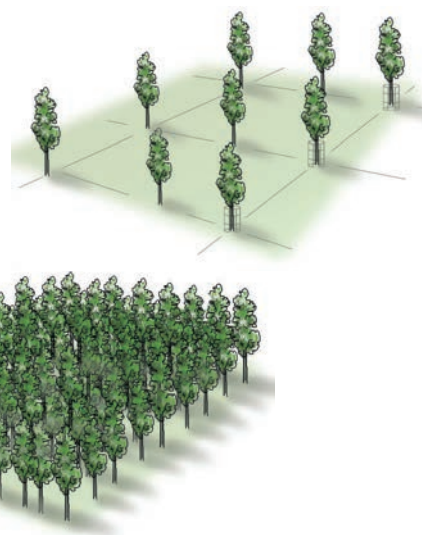
High vs low density planting

Planting natives, particularly relatively fast-growing shrub hardwoods, at high density is likely to give a canopy cover within 2-3 years of planting to shade out regrowth on

potentially difficult weed-infested sites (Bergin and Gea 2007). However, this should not be relied upon without thorough site preparation. The more problem weeds are controlled before planting, the less problems will occur after planting.

With lower density spacing, or where there is low survival without replanting, adequate canopy coverage with planted natives will take four or more years, increasing opportunities for regrowth of problem brushweeds. In addition to thorough site preparation, vigilance will be required to ensure regrowth of gorse, broom or blackberry does not become established before the planted natives provide a near complete cover of vegetation.

Planting natives on sites cleared of problem brushweeds at low density will require a longer period of weed control compared to higher density planting where canopy cover by the natives will be more rapid.



One strategy for large-scale revegetation of difficult weed-infested sites over several years is to convert recently cleared areas to grass to help suppress regrowth of problem weeds.

Temporary conversion to grass

Areas of gorse, broom, blackberry and other problem brushweeds that have been thoroughly cleared by machine or by hand will leave bare mineral soil where regrowth of the same problem species will occur from root systems or regeneration from the often significant weed seed banks in the soil. Such cleared sites can be sown with vigorous grasses, and fertilised as appropriate, to encourage a temporary cover of grass (Ledgard and Henley 2009). A dense sward, which should develop in a couple of years, will help suppress woody weeds prior to delayed planting

of native trees and shrubs in subsequent years. This staged strategy of site preparation may be appropriate for large-scale planting programmes where difficult weed-infested sites are cleared in one operation, sown in grass, and then planted in natives over several years while the grass cover keeps problem weeds at bay. As areas in grass are to be planted, site preparation involving spot or blanket spraying of the grass with herbicides will allow establishment of natives (refer to Technical Article No. 7.3 in this Handbook).

MAJOR EXOTIC WOODY SPECIES

As gorse, broom and blackberry are arguably the most widespread problem woody weed species in New Zealand, specific information on the characteristics, ecology and control measures for each of these species is provided. This has been based on information provided in several Regional Council websites including www.em.govt.nz and www.embof.govt.nz.

Specific information for each region will be available on local Regional Council websites.

GORSE

Characteristics and ecology

Gorse (*Ulex europaeus*) is a native of western Europe, and is now widely spread in temperate regions throughout the world. It is a woody, deep-rooted perennial legume capable of growing to four metres high. Numerous small green trifoliate leaves form hard spines up to five centimetres long.

Gorse produces distinctive yellow pea-like flowers in autumn and spring. Plants produce large quantities of brownish-black flattened seedpods. The hard-coated seeds are spread up to six metres by an explosive opening of the pods in mid-summer. Seed can also be spread by soil and water movement or by contaminated machinery. Gorse seed remains viable in the soil for more than 30 years, forming seed banks of up to 20,000 seeds per square metre of soil.

As a legume it is able to fix nitrogen which in part assists it in rapidly colonising low-fertility disturbed sites. Successive cohorts of seed can germinate, stimulated if stands are cleared by burning. The plant is frost and drought tolerant but intolerant of shade.

Gorse hosts the nitrogen fixing *Rhizobium* and can improve soil fertility. As gorse has a short lifespan of about 20 to 30 years it does provide a natural nurse crop for native regeneration and can also be actively managed for this purpose (discussed later).



Widespread weed

Introduced to New Zealand as a hedge plant by early British settlers, gorse was recorded by Charles Darwin during his voyage through New Zealand waters in 1835 as growing in hedges in the Bay of Islands (Worsley 1999). It rapidly spread from its original plantings and is now widespread. Three decades ago it was estimated that gorse covered 700,000 hectares at varying densities, a total of 5% of the land area of New Zealand not occupied by existing indigenous forest, vegetated sub-alpine and alpine areas (Blaschke et al. 1981).

Gorse aggressively invades rough pasture and, once established, rapidly forms dense infestations. It occurs in scrub and forests, shrubland, fernland and riverbed communities, coastal habitats and wasteland. Dense patches can also present a fire hazard as the foliage of gorse can become dry. Gorse can also provide cover for pests such as rabbits and possums.

Control methods

Control of established infestations of gorse is expensive and due to the long-lived nature of the seed, needs to be ongoing to prevent re-infestation. In some regions gorse is classified as a boundary control pest plant whereby land occupiers may be required by local councils to control gorse within a certain distance of any property boundary.

Effective gorse control is likely to require a combination of herbicide spraying and mechanical clearing methods. All gorse control operations for the planting of natives will require follow-up treatment for the best results.

Mechanical Control

Mechanical clearance of dense gorse by tractor and rotary slasher, or by larger equipment such as bulldozers and roller-crusher, can be effective on a large scale, but expensive.

Cutting large areas of dense gorse by chainsaw, motorised scrub cutter or slasher can be particularly labour intensive and is likely to be more practical on small infestations and isolated bushes. If stumps of cut gorse are not treated immediately with a herbicide (see stump treatment below), re-growth will occur. Large areas of slashed stumps can be left to grow to 0.5 metres in height and then sprayed with herbicide.

Stump Treatment with Herbicide

Cutting gorse with a scrub cutter or chainsaw and treating the stumps with a herbicide mix, although labour-intensive, is an effective method for eradicating isolated plants. Plants should be cut as close to the ground as possible. Freshly-cut surfaces and all remaining bark can then be treated with the mix applied through a spray bottle or knapsack sprayer. The addition of a surfactant (e.g. Pulse® or Boost®) will aid the penetration of herbicide.

Suitable herbicides and dilution rates for stump treating of gorse are:

- Tordon Brushkiller® or Grazon® 1 part to 20 parts water (50 ml/litre water)
- Glyphosate (e.g. Roundup®) 1 part to 5 parts water (200 ml/litre water)

Foliage Spray Application

A number of herbicides are available for the treatment of extensive dense areas of gorse. The most suitable herbicide will depend on the time of year, the stage of growth of gorse and the chosen application method. Generally the most reliable results are obtained when gorse is sprayed between November and February.



Hand methods using chainsaws, motorised scrub bars or slashers for clearing of gorse, particularly if laced with blackberry, can be daunting for large infestations.

Herbicides can be applied by knapsack or mistblower for smaller infestations, pressurised gun and hose units for larger infestations, and aerial application where warranted. When spraying herbicide it is important that good coverage is obtained. All foliage through to the centre of the plant should be wet to the point of runoff. Marker dyes can be used to indicate the level of coverage. Again, to improve herbicide uptake, use of penetrants such as Pulse® or Boost® in the herbicide is highly recommended.



Vehicle mounted-pressurised spray equipment is a practical option on accessible sites for herbicide spraying of dense areas of exotic brushweeds such as gorse, broom and blackberry.

Herbicides for gorse

Some herbicides are not effective on gorse because of the shape of the leaves and the thick cuticles on the spines, which help prevent absorption of herbicides. However, gorse can be killed using such herbicides as *Grazone*[®], *Tordon*[®] Brushkiller, *Escort*[®] and *Roundup*[®] (Table 1).

Hard grazed gorse or recently slashed gorse is difficult to control because of reduced foliage to take up herbicide and as general rule the new regrowth of most species provides the best avenue for herbicide uptake. Biosecurity plant pest officers based at local councils can give advice on the timing and method of application best suited to local situations.

Table 1: Suitable herbicides and application rates for controlling gorse and broom (based on plant pest factsheets and information available from www.ew.govt.nz and www.envbop.govt.nz).

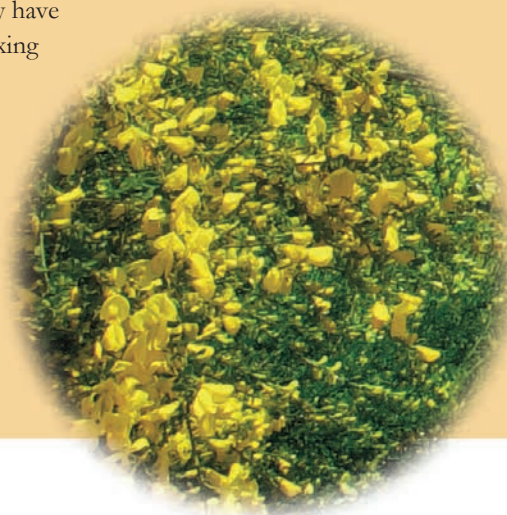
Herbicide	Knapsack application	Handgun application
Glyphosate (e.g. Roundup [®])	100 ml per 10 litres of water	1 litre per 100 litres of water
Grazon [®]	60 ml per 10 litres of water	200-300 ml per 100 litres of water
Tordon [®] Brushkiller	60 ml per 10 litres of water	250-300 ml per 100 litres of water
Metsulfuron-methyl (e.g. Escort [®] ; Meturon [®])	5 g per 10 litres of water	20 g per 100 litres of water
Trounce [®] Gorsekiller		350 g per 100 litres of water

BROOM

Characteristics and ecology

Broom (*Cytisus scoparius*), a native of northwestern Europe, is an erect deciduous shrub growing up to 3 metres in height. It has pliable, upright, ridged green stems that may have small leaves, but may also be leafless. Broom is a nitrogen fixing legume tolerating a wide range of soils, light conditions and temperatures.

The yellow flowers bloom from September to December, although flowering can occur later in cooler areas. Seed pods are similar to gorse. Broom seeds prolifically - there are in excess of 2000 pods per bush with each pod containing several seeds. Consequently the persistent seed forms a substantial seed bank in the soil.



Weed status

Broom was introduced into New Zealand as an ornamental plant, but like gorse has become naturalised and an invasive weed due to its aggressive seed dispersal. It is very difficult to eradicate from disturbed sites. The seeds can be spread by movement of gravel, mud, water, animals, agricultural produce, machinery and by people along tracks, railroads, roads.

It is an agricultural plant pest that is relatively unpalatable, often inhabiting poorly grazed areas. Broom also causes problems in forestry and inhabits waste-lands, along road and rail sides, braided rivers and protected natural areas. Broom is particularly a problem in the open tussock grassland of the North Island central plateau.

Control methods

Mechanical control

Young plants can be hand pulled or grubbed which ideally should be carried out before they seed. Small bushes can be slashed by hand or using motorised scrub bars, as can isolated small infestations.

As for gorse, hand clearing of broom on a large scale is likely to be impractical. Tractor-operated rotary slashers or heavier machines with mulchers can be used on accessible sites.

Herbicide control

Chemical control of broom is effective. A blanket-spray during the full leaf stage (spring to early summer), followed by maintenance spraying of any further growth is effective.

All the herbicides suggested for controlling gorse (Table 1) can be used to control broom. The use of penetrants will increase effectiveness of control. Local biosecurity plant pest officers located at most local councils can give advice on the timing and method of application best suited to each region.

BLACKBERRY

Characteristics and ecology

Blackberry (*Rubus fruticosus* agg.) consists of a number of closely related species, all European in origin, and has become widely established in many temperate parts of the world. It is a scrambling perennial shrub with spiny, suckering stems up to eight metres long growing from a crown at or near ground level. The arching stems can become entangled with other vegetation forming thickets up to 2-3 metres high.

The dark green leaves of blackberry are shed in winter. White or pink flowers occur from November through to April. The edible fruit is a berry, which ripens to black in autumn. Arching stems can root on contact with soil and seed is spread by birds, animals, water and soil movement. Blackberry is partially tolerant to shade and poor drainage, preferring high rainfall areas and medium-to-high soil fertility.



Weed status

Blackberry is a well-known nuisance weed in both urban and rural situations throughout New Zealand where there has been settlement or significant disturbance of vegetation

cover. It can rapidly establish and, if early control is neglected, will grow to form impenetrable thickets. It is particularly prevalent on lightly grazed areas and waste land in higher rainfall areas as a plant of scrub and forest margins, shrubland, fernland, riverbeds, road and rail sides, and wetlands.

Heavy infestations restrict access to streams and provide an ideal harbour for pests such as rabbits and possums. Dense blackberry colonies can hasten deterioration of fencelines and during dry spells can present fire hazards. In forestry situations blackberry competes with new plantings as well as restricting access for any management operations. Even established natives up to 3 m high can become covered in blackberry as stems scramble over tree crowns.



In riparian areas retired from farming, dense blackberry can rapidly form an impenetrable thicket either side of streams, prohibiting access.



Months after spraying, canes of blackberry can persist potentially harbouring further weed invasion.



*Without adequate weed control, vigorous growth of spiny stems of blackberry can scramble over well-established native trees and shrubs and interlaced with other exotics such as willow (*Salix* spp.) can be formidable to those interested in restoring riparian zones.*

As with gorse, blackberry can be classified as a boundary control pest plant in some regions whereby land occupiers may be required by local councils to control it within a certain distance of any property boundary.

Mechanical Control

Hand clearing of blackberry thickets with interlaced arching stems is difficult. Motorised scrub bars can be used on small infestations but is labour intensive. The long reach of scrub bars will allow easier cutting of sprawling stems than with chainsaws. Grubbing of root systems will prevent re-sprouting but again this is labour intensive. Inevitably, blackberry will quickly invade from regrowth of cut stems and from new regeneration. This will require spraying with herbicide once leaves have formed.

Where practical, herbicide spraying of blackberry several weeks before clearing will reduce regrowth from cut stems.

For large scale areas using machinery, such as tractors

with rotary slashers or excavators with mulching units, is likely to be the most practical method for clearing dense blackberry. Again a programme of follow-up spraying with herbicides will be required to prevent re-infestation.

Herbicides for blackberry

A number of herbicides are suitable for the control of blackberry (Table 2). Herbicides may be applied by knapsack or mistblower for smaller infestations, or handgun and hose units for larger infestations.

Choice of herbicide will depend on the location of the infestation, the proximity of desirable species and the application method chosen. Spraying should be undertaken during periods of active growth, generally from late November through to April. When applying herbicide it is important that good coverage is achieved. Marker dyes may be useful in helping indicate the level of coverage and to avoid misses and overlaps. Follow-up treatment is advisable on dense stands to maximise initial control, including after clearing where regrowth from root crowns and suckers is inevitable.

Table 2: Suitable herbicides and application rates for controlling blackberry (based on plant pest factsheets and information available from www.ew.govt.nz and www.envbop.govt.nz).

Herbicide*	Knapsack application	Handgun application
Glyphosate (e.g. Roundup®)	100 ml per 10 litres of water	1-1.5 litres per 100 litres of water
Grazon®	60 ml per 10 litres of water	300 ml per 100 litres of water
Tordon® Brushkiller	60 ml per 10 litres of water	500 ml per 100 litres of water
Metsulfuron-methyl (e.g. Escort®; Meturon®)	5 g per 10 litres of water	35 g per 100 litres of water

*Other herbicides that will give control of blackberry include Amitrole®, Velpar®, Touchdown®, Tordon 2G® and Trounce®.



Spraying blackberry regrowth as sufficient leaves emerge for uptake of chemical.



Herbicide spraying of dense blackberry before clearing commences should reduce regrowth from cut stems..

CARE WITH HERBICIDES

Herbicides can be hazardous and require careful handling and use. Before purchasing or using any herbicide, product labels and Safety Data Sheets provided by suppliers and manufacturers should be read carefully. Many local authority websites also offer advice on choice and use of herbicides. There are various recommendations when using herbicides, listed by PorteOus (1993) and others, including:

- Follow manufacturer's recommendations carefully for determining the correct chemical, handling instructions and application methods, and quantities of herbicide;
- Use protective clothing as needed;
- Determine the most appropriate equipment including spray nozzle;
- Become familiar with safety warnings, precautions and first aid measures;
- Following recommended precautions to avoid spray drift to neighbouring properties and contaminating waterways;
- Spray only in calm conditions when rain is not expected for several hours; and
- Protect non-target species on the site from spray drift.



Follow manufacturer's instructions in the handling and use of chemicals including wearing protective clothing.

ALTERNATIVES TO CLEARING

Biological Control

Biological control is a long-term control method, that reduces the vigour of infested plants, involving the introduction of plant-specific insects that will control particular exotic plants. Any potential introductions are thoroughly researched and screened to ensure native plants will not be affected.

Biological control agents are being trialled by Landcare Research and a number of insects have been introduced into various regions for the control of gorse and broom. Insects are being spread as they become available and can be obtained by contacting a pest plant officer at the local regional council who will advise on their suitability for any particular infestation.

For instance, six separate biological control agents for gorse have been released within the Waikato region. The most successful of these has been the gorse spider mite. Four broom agents have been released including the broom seed beetle, broom twig miner and broom psyllid.

Manaaki Whenua Landcare Research runs a national biological control programme, often in collaboration with local Regional Councils. Refer to the Landcare Research website for more information on bio-control agents www.landcareresearch.co.nz.

The effectiveness of biological control agents in reducing the vigour and spread of gorse, broom and blackberry locally can be explored. However, relying on biological control to prepare brushweed-infested sites for the planting of natives (in the foreseeable future) is likely to be impractical. For landowners and managers keen to establish natives, the need for site preparation of weed-infested sites as described in this article, comprising a mix of herbicide spraying and physical clearing, is likely to remain the most practical option.

Inter-planting in gaps and lines

While this article focuses mainly on control by herbicide and clearing of woody exotic weed species to allow establishment of native shrub and tree species, the option of using selected brushweed species as a nurse cover for newly planted native species, or to encourage natural regeneration of natives, may be a practical option in some cases. Inter-planting natives into the shelter of existing scrub within any natural gaps, or in cut gaps or lines may be particularly advantageous on difficult exposed sites.

Options and methods for inter-planting gorse and broom are similar to inter-planting within seral native shrubland often dominated by manuka (*Leptospermum scoparium*) and

kanuka (*Kunzea ericoides*). Site preparation and planting existing shrubland, either dominated by exotic scrub or native species, is covered in a later article in this Handbook.

Managing succession through brushweeds

Retaining brushweeds such as gorse and broom as a nurse crop may be feasible in some circumstances for regeneration of native trees and shrubs. However, scramblers such as blackberry are not desirable nurse crop species. The persistence of blackberry, often in mixture with bracken, and its vigorous sprawling stems can prevent regeneration of native species for decades.

Native trees and shrubs can succeed gorse, broom and other selected shrub weeds if certain conditions are met (Davis and Meurk 2001). Native forest can develop by natural succession in 10-20 years, though dry sites distant from seed sources will take longer. The brushweeds initially form a dense canopy that suppresses grasses and weeds, and later protects seedlings and saplings of native plants.

The density of gorse and broom affects the rate of succession. As dense stands age, they become more open and move more quickly to succession, especially in the absence of grazing or browsing.

This technique is working successfully and within a short time frame on Banks Peninsula (Wilson 1994). This process,

involving minimal intervention, is a possible option for large-scale reversion of marginal grazing land.

A “minimum interference management regime” of encouraging natural regeneration in gorse and broom sites could therefore involve:

- Controlling other weeds, especially around edges or in open patches;
- Undertaking restoration planting around edges to provide a screen, to fill in open areas or to provide linkages if needed;
- Excluding all domestic and wild animals by fencing or other means;
- Preventing fire, as regeneration of broom and gorse from the inevitable large seed banks in the soil, will be stimulated by fire; and
- Clearing property boundaries of gorse and broom to meet statutory requirements.

If local seed sources of key native tree species are not present, then the option of establishing small groups or copses of these species scattered throughout exotic scrub areas could be contemplated. These groves of selected podocarp and tree hardwood species could be planted within gaps in the gorse and broom, and if established in accessible areas, can be monitored and maintained in early years to ensure high survival and growth.



In the absence of fire and grazing, gorse and broom will eventually be replaced by a range of native seral species from local seed sources. This however takes several decades prompting many to speed the process up by clearing the exotic brushweeds and planting natives, and an ongoing commitment to controlling regrowth of weeds.



From gorse and broom to natives! A case study – Banks Peninsula



Over one thousand hectares of gorse and regenerating native vegetation in the south-east sector of Banks Peninsula are being managed for the protection and restoration of native vegetation and wildlife under a policy of minimum interference (Wilson 1994). The reserve was completely forested in pre-human times but, as with much of Banks Peninsula, the forest cover was severely reduced, especially after European settlement. Only about 4% of this old-growth forest survives.

Since the removal of grazing stock and control of wild animals, the transformation from open pasture and gorse to native vegetation has occurred rapidly. The area is a diverse mosaic of successional vegetation, in addition to a small area of old-growth forest. Approximately 30% of the total area in closed-canopy second-growth native forest, about 53% under scrub of naturalised gorse and broom and the remaining 13% under pasture, fernland, and native tussockland.

The predicted cover 50 years hence, assuming that fire can be excluded, is 95% second-growth native forest, 4% old-growth forest, and 1% tussock, shrubland, and scrub which will persist on bluffs. Successional pathways are diverse, involving both native and naturalised species.

Monitoring of vegetational change since the late 1980s shows that in the absence of grazing animals and fire, regeneration of native forest is rapid, especially through gorse and broom scrub, and by the vigorous establishment of native seral hardwoods, especially kanuka.

WARNING / DISCLAIMER

The information on selection, rates and use of herbicides in this article, is based on information reviewed from a range of sources, but must be assessed on a case by case basis and/or specific technical advice sought. It is recommended that users of herbicides follow manufacturer's instructions at all times.

Accordingly, Tāne's Tree Trust will not be liable for any loss, claim, liability or expense arising from or due to any errors, omissions or advice provided within this article or from the use of herbicides or consequences arising from the use of herbicides.

References:

- Bergin, D.O.; Gea, L. 2007: Native trees – planting and early management for wood production. *New Zealand Indigenous Tree Bulletin No. 3*. Revised Edition. New Zealand Forest Research Institute. 44p.
- Blaschke, P. M.; Hunter, G.G.; Eyles, G.O. and van Berkel, P.R. 1981: Analysis of New Zealand's vegetation cover using land resource inventory data. *New Zealand Journal of Ecology* 4: pp 1–19.
- Davis, M; Meurk, C. 2001: *Protecting and restoring our natural heritage – a practical guide*. Department of Conservation, Christchurch. 94p.
- Esler, A.E. 1988: *Naturalisation of plants in urban Auckland*. DSIR Publishing, Wellington.
- Ledgard, N.; Henley, D. 2009: Native plant establishment along riparian margins of the Sherry River, Motueka catchment. 'Best bet' guidelines. Report produced as part of the Integrated Catchment Management (ICM) Programme for the Motueka River. Scion, Christchurch. Unpubl. 10p.
- Porteous, T. 1993: Native forest restoration. A practical guide for landowners. Queen Elizabeth II National Trust, Wellington.
- Wilson, H.D. 1994: Regeneration of native forest on Hinewai Reserve, Banks Peninsula. *New Zealand Journal of Botany*, 32: 373-383
- Worsley, K. 1999: Pest plants and their control. In: New Zealand plants and their Story. *Proceedings of Royal New Zealand Institute of Horticulture Conference*, Wellington, 1-3 October 1999.

Author: David Bergin, Scion

Contact: Tāne's Tree Trust

Website: www.tanestrees.org.nz



Tāne's Tree Trust promotes the successful planting and sustainable management of New Zealand native trees and shrubs for multiple uses.