

Appendix 16 Guideline for native revegetation plantings

16.1. Introduction

These guidelines explain what specific information is needed for native revegetation plantings, why the information is necessary and why Council expects certain actions to be undertaken to ensure planning is successful. When applying to Council for consent to subdivide based on the replanting of native vegetation (see E39 Subdivision - Rural), Council requires the following:

- (1) pre-planting site assessment;
- (2) planting plan assessment; and
- (3) annual monitoring programme.

16.2. Pre-planting plant assessment

- (1) Plants are adapted to survive in specific areas. Not every plant will do well in the same environment. In order to ensure the survival of revegetation planting, it is important that the appropriate plants are selected for the site. There are two aspects to selecting appropriate plants for a site. They are:
 - (a) sourcing from the Ecological District (i.e. eco-sourcing):

New Zealand has been divided into ecological districts based on the underlying geology, landforms, and soils which affect the plant species found within an area. Within these ecological districts the same plant species often have slight variations, which are adapted to the specific conditions of the area. In order to retain these variations and in essence the genetic diversity, it is important that plants which are sourced in the specific ecological district are used.
 - (b) appropriate plants for the locality of the planting:

Plants grow best on sites for which they are best adapted. Therefore, in order to ensure the success of a revegetation programme it is important that plants which are used are appropriate to the following:

 - (i) slope (i.e. steepness affects the species which will survive);
 - (ii) characteristics of the soil (i.e. certain species do not grow well in certain soils);
 - (iii) wind (i.e. certain species are not wind tolerant);
 - (iv) aspect (i.e. direction the slope faces, as this affects the dryness of a slope);
 - (v) degree of shading (i.e. certain species are light intolerant (i.e. secondary succession plants such as nikau and ferns), whereas others cannot survive in low light conditions, (i.e. primary succession plants such as manuka and kanuka));

- (vi) distance from the coast (i.e. this affects salt spray and wind conditions. Many plants are not tolerant to salt spray and therefore struggle to survive in coastal environments);
- (vii) wetness of the site (i.e. many plants either do not grow in wet conditions (e.g. kauri) or only grow in wet soil conditions (e.g. kaihikatea); and
- (viii) frost zones (certain species are frost intolerant).

In order for the Council to ensure that appropriate plant species are being selected for planting the Council expects a Pre-planting Plant Assessment with the following information to be provided with each application for native revegetation plantings:

- (i) the ecological district of the site;
- (ii) the characteristics of the soil (i.e. clay, silt, loam etc.);
- (iii) soil drainage;
- (iv) topography and aspect of the area to be planted;
- (v) exposure of the site to wind, frost, sunlight and salt spray;
- (vi) extent of existing bush or native vegetation on the site and its species composition; and
- (vii) distance from established bush and the state of the established bush if there is none on the site.

16.3. Planting plan assessment

- (1) In order to assist Council in establishing whether the planting proposed is adequate a Planting Plan Assessment needs to be produced containing the following information:
 - (a) the purpose of the planting, which could include: hill country erosion control, stream bank erosion, habitat control, habitat restoration, ecological corridor creation, buffer planting to protect the edges of existing bush and/or water quality enhancement;
 - (b) location and extent of planting on a plan;
 - (c) site preparation for planting, including stock-proof fencing of areas, weed and animal pest control;
 - (d) site planting, including species to be planted, size of plants and where they are to be planted, density of planting, sourcing of plants and fertilisers; and
 - (e) maintenance of planting, including fertiliser, releasing plants, animal and plant pest control, and mulching.

- (2) The reasons for the detail required in the Planting Plan Assessment are discussed below under the following headings:
- (a) site preparation (including identifying and removing weeds, animal pest control, and stock control);
 - (b) site planting (including canopy closure and plant spacing, fertiliser, size of plants to be planted, time of planting); and
 - (c) site maintenance (including mulching and animal and plant pest control).

16.4. Explanation of required information

(1) Site preparation:

- (a) many of the areas that are to be replanted have relatively harsh conditions for native plants to grow because of animal pests, stock and weeds and grasses, which compete with the new plants. Therefore, it is important to ensure that the effects of these are minimised. This includes the following:
 - (i) identifying and removing weeds. Weeds compete with native plants which are planted by reducing moisture and nutrients available. Because the weeds are usually better able to do this than many natives, especially in open and exposed situations, they need to be removed, either manually or with sprays before planting occurs. Continual management needs to occur after the planting to ensure that the replanting site is not re-infested. Then it is important that canopy closure occurs as soon as possible after planting, as most weed species do not survive in shady conditions. Mulching can have an effective means of suppressing weed growth in the initial phases of the revegetation, reducing the need for weed control;
 - (ii) animal pest control. Browsers, such as possums, feral goats and feral deer are a large threat to native plantings. Therefore it is important that they are controlled and eliminated to levels where the plantings are not severely affected. In the case of possums this entails eradicating them using bait stations, trapping or shooting. In the case of feral deer and goats this entails fencing the area around the plantings to keep them out or eradicating them. After the planting is established it is important that animal pest control continues in order to ensure the long-term survival of the plants and also so that undergrowth can generate beneath the planted species; and
 - (iii) stock control. Stock can cause a huge amount of damage to native planting through the browsing of the plants or trampling them. Therefore it is important that the planting area is fenced with a stock proof fence to keep the stock out. The fence needs to be maintained in the long term to prevent stock entering into the area so that under growth regeneration can occur, allowing for a diversity of species to establish.

(2) Site planting:

- (a) canopy closure and planting spacing. Once the site preparation has occurred then the plants can be planted. Ensuring canopy closure as quickly as possible is vital. Canopy closure has the following advantages:
 - (i) many weeds and kikuyu are more easily suppressed and controlled, as they tend to be shade intolerant;
 - (ii) summer water stress is greatly reduced;
 - (iii) frost intensity is greatly reduced or eliminated;
 - (iv) the problems caused by wind are reduced (i.e. wind and cold); and
 - (v) a closed canopy is more likely to attract seed eating birds which nest and roost in trees and therefore increases the number of seeds deposited in the floor beneath the trees.
- (b) all of the above results in greater species diversity, especially for sensitive plants which require shade and conditions free of extreme conditions such as wind and frost. Plant species are more likely to survive once they germinate as well;
- (c) in order for there to be rapid canopy closure the native plants should be planted at a density of 1.4 metre centres (5,100 stems per hectare), except when planting into kikuyu; and
- (d) in the case of planting into kikuyu plants should be planted at 1 metre centres (10,000 stems per hectare) to shade out the kikuyu and ensure the long-term survival of the native trees. Canopy closure should occur within 3 years in this situation. Where it can be demonstrated that blanket spraying of the kikuyu with a bio-degradable herbicide prior to planting or suppression by physical means will be an effective means of control and that such control is suitable for use on the subject site, then the density of 1 metre centres (10,000 stems per hectare) might be relaxed to a maximum of 1.4 metre centres (5,100 stems per hectare).

(3) Size of plants:

- (a) the size of plants affects their ability to survive when planted out. Very small plants are less likely to survive, as their root system is not well established. Very large plants are also less likely to survive because of the physical conditions of most revegetation sites, including wind and salt exposure, extremes of conditions, drought and damp conditions. Larger plants take longer to establish extensive root system to anchor the plants and to provide nutrients for growth, often resulting in their being toppled over by wind or damaged;

- (b) based on the above, the most appropriate sizes for planting out are considered to be root trainers, PB3/4 or PB2s and PB5s.

(4) Fertiliser:

- (a) the decision to apply fertiliser, what type and in what quantity, will vary depending on the site. The following are basic considerations:
 - (i) the application of a suitable fertiliser can proactively assist the native plants to establish, grow quickly and close the canopy, especially in coastal environments or where they are planted into kikuyu. Too much fertiliser however can be toxic to native plants and can lead to poor growth;
 - (ii) in many cases the ground will already be quite fertile and support good growth. It is worth considering however, that although many areas where native revegetation is occurring have been fertilised in the past for pasture growth, this is not appropriate for native tree establishment as these fertilisers tended to be nitrogen based. Trees require trace elements, minerals and phosphorous based fertilisers;
 - (iii) certain environments will be adversely affected by the application of fertiliser. Consideration should be given to the proximity of plantings to waterways and riparian areas. In some circumstances there will be good reason to avoid the application of fertiliser or a particularly cautious approach adopted;
 - (iv) a conservative method for the application of fertiliser is the use of slow release tablets in each planting hole. The advantage of this method is the utilisation of the soil as a natural filter; and
 - (v) a cautious approach needs to be applied where fertiliser is to be a side dressing. In particular, the timing of application needs to be considered. Application should coincide with the plants growth spurts during spring and autumn to maximise nutrient uptake and prevent nutrient enrichment of receiving water bodies.

(5) Time of planting:

- (a) the timing of the planting is important. Late autumn and winter (i.e. late April to September) are the best months as most native plants are adapted to moist conditions and watering is required at the time of planting. Rainfall is the best means of ensuring adequate watering as it encourages the development of deep roots. Hand or surface watering can encourage the development of surface roots, resulting in the plants being more adversely affected in low rainfall periods;
- (b) the disadvantage of planting in winter is the exposure to frost, particularly on level, exposed sites in inland areas. Therefore it is important to use hardier

pioneer species to provide shelter before planting more sensitive species;
and

(c) mulching greatly increases the chances of survival as it assists in retaining soil moisture by reducing evapotranspiration.

(6) Maintenance planting:

(a) mulching involves spreading permeable material around newly planted trees to:

(i) protect the roots;

(ii) reduce moisture loss from the soil;

(iii) insulate the soil, thus stabilising soil temperatures; and

(iv) suppress weed growth.

(b) mulches can be either organic (e.g. straw, sawdust, bark chip, wood shavings, compost, grass, leaves) or synthetic (e.g. wet paper / cardboard, and tar paper);

(c) mulching greatly increases the chances of survival for plants on dry, open, exposed sites;

(d) the disadvantages of mulch are that they can:

(i) introduce plant diseases or insect pests to the site;

(ii) introduce weed species;

(iii) prevent water from reaching the roots and therefore it is important to wet the soil before applying mulches; and

(iv) increase costs.

(e) certain mulches also can be toxic to plants, such as sawdust and bark chip which need to be well rotted down;

(f) mulches comprising compost and grass clippings should be treated with caution. Unless temperatures high enough to 'cook' the seeds have been reached the mulch has the potential to introduce unwanted weed species to the area; and

(g) cheap mulches should be treated with caution. They have a tendency to rob the soil of nitrogen, stunting adjacent plant growth unless compensated for with fertiliser application.

(7) Weed control and animal control:

- (a) this involves the ongoing plant and animal pest control to ensure the survival of the planting.

16.5. Monitoring Programme:

- (1) Monitoring needs to be undertaken for five years, as it takes between 3-5 years before native replanting are well established and their certainty of survival is assured. The following needs to be monitored:
 - (a) survival rates: this is because the council requires a 90 per cent survival rate which is thought appropriate to ensure that the replanting will become ecologically viable;
 - (b) size of plants: this is an indication of the health of the plantings. The greater the growth, the healthier the planting and therefore the more likely a planting is to survive; and
 - (c) canopy closure: if a planting is healthy, canopy closure should occur at year three, although it can take to year five if the conditions of the site are particularly harsh. Therefore, this is an important indication of the health of the planting.
- (2) Replacement of plants which do not survive is important to ensure that gaps are not created which could allow weeds to enter the planting and to ensure that there is an adequate canopy cover in the long term.