LANDCARE RESEARCH
MANAAKI WHENUA

Wetland restoration methodology

Envirolink Grant:
1707-MLDC119

Wetland restoration methodology support/advice

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Prepared for:

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Summary

Project and client

An Envirolink grant was awarded to the Marlborough District Council (MDC) to assist local communities in partnership with MDC to achieve their goal of restoring former floodplain forests on the Wairau Plains near Blenheim. The application, parameters and conditions of the grant are provided in Appendix 1.

Objective

Support ecological restoration outcomes in Marlborough District through community and local government participation in field workshops, and provide a public lecture and written summary of recommendations/advice, particularly for restoration of riparian/floodplain/terrace sequences.

Methods

I spent the day of 30 August 2016 in the company of Peter Hamill, Steve Urlich and Robin Dunn (MDC), along with the Grovetown Restoration Group, in the vicinity of Blenheim. We visited the Grovetown Restoration Project, the Spring Creek Kahikatea Restoration Project site, and the Koromiko Forest Reserve, south of Picton, to see examples of local indigenous planting and revegetation. Observations were recorded on NatureWatch NZ, and we held onsite discussions on the performance of existing work and proposed future developments.

Results

Restoration achievements to date have been impressive, reflecting the knowledge and experience of the local community, their hard work, support from MDC, the mild climate, and suitable soil moisture conditions.

A public lecture ('The coming age of restoration – what does nationhood mean?') on the importance of biodiversity in the cultural landscape was given in the evening, with about 30 local residents attending.

Conclusions

This report represents the fulfilment of follow-up advice on the progress and recommendations for the community-led restoration projects in the Marlborough district.

1 Introduction

There is a strong will among the lower Wairau community and Marlborough District Council (MDC) to reverse the trend of deforestation and loss of natural habitat in lowland Marlborough. This attrition has been occurring over the past 800 years, with pulses of decline due to fire, drainage, cultivation, farming, and the introduction of species, some of which have become invasive or predatory. Less than 1% of the original wetlands remain on the Wairau Plain and less than 10 kahikatea older than 150 years are present.

Local community groups have been carrying out extensive habitat planting over the past 10 years, particularly in the Grovetown oxbow lake area 2 km northeast of Blenheim. MDC has also initiated major enhancement planting at Spring Creek Kahikatea Reserve about 3 km away (greatly extending the new forested area around a few, large remnant trees out to 11 ha) and at Koromiko Forest Reserve, south of Picton (around remnant beech and podocarp trees).

2 Objective

The purpose of this project was to provide support to ecological restoration outcomes in the Marlborough District (especially the lower Wairau and Tuamarina valley). This would be achieved through community and local government participation in field workshops, a public lecture and a written summary of recommendations/advice. This report references the first two of these actions and fulfils the third.

3 Method

I spent the day of 30 August 2016 in the company of Peter Hamill, Steve Urlich and Robin Dunn (MDC), along with the Grovetown Restoration Group, in the vicinity of Blenheim. We visited the Grovetown Restoration Project (Te Whanau Hou), the 'Kahikatea restoration project site and the Koromiko Reserve, south of Picton, to see examples of local planting and revegetation. Observations were recorded on NatureWatch NZ (see footnote for links) [1],

[1] http://naturewatch.org.nz/observations/meurkc?utf8=%E2%9C%93&q=&search_on=&quality_grade=any&reviewed=&geoprivacy=&identifications=any&captive=&place_id=&swlat=-41.49123356761896&swlng=173.9532684919434&nelat=-41.426909581005255&nelng=173.99961706372073&taxon_name=&taxon_id=&day=&month=&year=&order_by=observations.id&order=desc&rank=&hrank=&lrank=&taxon_ids%5B%5D=&d1=&d2=&created_on=&site=&tdate=&list_id=&filters_open=true&view=map&changed_fields=&changed_since=&change_project_id=

http://naturewatch.org.nz/observations/meurkc?utf8=%E2%9C%93&q=&search_on=&quality_grade=any&reviewed=&geoprivacy=&identifications=any&captive=&place_id=&swlat=-41.34831571925178&swlng=173.96198030682376&nelat=-41.332205295315866&nelng=173.9735674497681&taxon_name=&taxon_id=&day=&month=&year=&order_by=observations.id&order=desc&rank=&hrank=&lrank=&taxon_ids%5B%5D=&d1=&d2=&created_on=&site=&tdate=&list_id=&filters_open=true&view=map&changed_fields=&changed_since=&change_project_id=

and we held onsite discussions on the performance of existing work and proposed future developments.

4 Results and recommendations

4.1 Grovetown and similar sites

The Grovetown Restoration Project is situated on an 'island' defined by an oxbow lake formed on the Wairau River. There is an elevation/moisture gradation represented radially across the site. The river and its oxbow impoundment lies at the aquatic end of the spectrum, with a steep riparian zone on the embankments and a broader floodplain on gentler margins (see Figure 1). These sustain periodic flooding from two to six times a year.

Some of the soils are peaty (organic). These are often occupied by willow and a mix of other exotic and some indigenous regenerating plants in the understorey. Some of the exotic plants are invasive and others benign. At a slightly higher level there is the 100-year flood line. The centre of the 'island' is not known to flood at all, and although well drained contains rich alluvial soils with a moderately shallow water table.

These broad zones or positions in the gradient can be equated with the standard streamside planting diagram (Figure 1):

- riparian = aquatic; lower bank and fresh plain; upper bank and levee
- floodplain = backswamp, and adjacent footslope (of both levee and scarp) – not differentiated in Figure 1 from the lower terrace face or scarp
- upper free-draining area = lower and upper terrace scarps (or risers) and terrace top.

There is some difference in moisture sensitivity according to whether the banks and scarps are facing north (sunny) or south (shady).

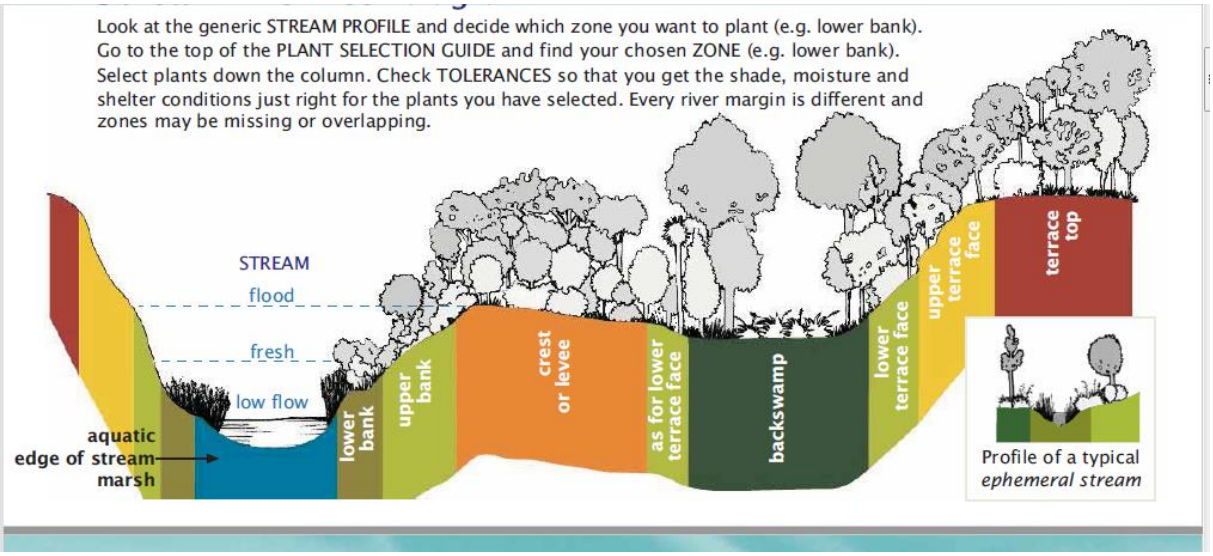

Figure 1 Stream (or lake-edge) profile showing colour-coded equivalent flooding and planting zones. Steep banks (left side of diagram) will be without backswamp or levee zones.

The attached spreadsheet (Appendix 2) provides an inventory of indigenous plant species that are local to this area, according to the planting zones identified in Figure 1 and outlined above – from wettest (peat soils) to driest (free-draining).

Since the visit and field discussion, Marlborough has suffered a severe earthquake, which affected land levels and water tables in low-lying areas. This has undoubtedly influenced the way the current topography and riparian environment – and therefore the planting zones – should be interpreted. Indeed, there are reports of some plants dying, possibly as a result of the root zone of established trees being disturbed or now being restricted by a relative rise in the water table. Changes in surface runoff and underground water influence the duration and spatial extent of soil drainage : both anaerobic conditions (in wetter areas) or droughty conditions (drier areas). The health of trees and other plants in this zone should be observed over the next year or so to establish how the planting zones should be adjusted to the new conditions.

4.2 Plant establishment technique

There is already a well-established, experience-based knowledge of practical restoration in the Marlborough area achieving effective outcomes, so there is little further to add in this regard. Two useful references are the Landcare Research wetland handbook, in particular the section on weeds: http://www.landcareresearch.co.nz/publications/books/wetlands-handbook; and a recent 'Voice of the Wetland' has a section on willow control: http://www.landcareresearch.co.nz/publications/books/te-reo-o-te-repo.

There are many council-sponsored websites and guides about appropriate restoration and planting techniques. Many of these are available as links through the Nature Space website: http://www.naturespace.org.nz/. Basically, the required steps are:

1. visioning, developing an overview concept and generating buy-in

2. developing a site-specific seasonal plan for planting and pest control each year
3. eco-sourcing plants in plenty of time
4. establishing the timing of planting in general and for individual species (according to drought, frost and flooding cycles)
5. using a good planting technique and supervising volunteers
6. monitoring
7. maintenance (weed and pest control – again with careful supervision to avoid losses from 'ring-barking' or spray drift).

Essentially the message is to 'work with rather than against nature'.

Note that the table in Appendix 2 indicates the three stages of planting. Stage 1 species (bolded and highlighted in green) are the fast-growing structural species that are required to quickly suppress competing pasture grasses in particular. Stage 2 species are those that need some initial overhead or lateral protection that suppresses competition from weeds and exposure to frost. These can also be planted immediately under the deciduous canopy of willow. Stage 3 species are those that require full structural integrity of the site in order to become established. These include vines, ground covers and species that are very sensitive to frost and/or require a host species (that is, epiphytes or hemi-parasites like mistletoe). They may also be planted earlier under willow.

4.3 Weed management

There is often a desire to clear weeds and replant. The most dominant exotic plant along rivers is generally willow. However, following the principle of 'work with nature' mass removal of willow will often cause more rapid spread of other weeds such as blackberry – which respond to high light levels and are then more difficult to manage. It is often best to carry out a gradual approach to such eradication: work to develop new areas within the capacity of your volunteer crew to manage or maintain them. Dead willows left standing also represent coarse wood habitat that can facilitate natural regeneration of bird-dispersed native (and non-native) plants. Willow stumps 2 to 3 m tall can also form useful habitat, left upright and drilled with suitable cavities.

On the other hand, new invasive weeds arriving in a district should be vigorously eradicated, in line with other old adages 'One year's seeding, seven years' weeding' and 'A stitch in time saves nine'. These sayings are accurately describing the consequences of exponential growth if problems are not dealt with quickly. For example, the European tussock sedge (*Carex pendula*) has arrived in the catchments of Christchurch, and volunteers are trying hard to nip it in the bud before it becomes entrenched and can have a marked impact on riparian environments. The same species has just turned up in Stewart Island. There is little time left to contain and potentially eradicate this weed. Examples of such species at Grovetown are male fern, blackberry, holly and ivy. None of these are strongly established, and a campaign to remove these pockets of invasives should be pursued energetically, as a priority.

Although it was not observed on the day, one of the serious willow threats is grey willow (*Salix cinerea*) because it produces vast quantities of wind-blown seed. Willow treatment should involve seeking out and eliminating grey willow – or initially at least the female trees if these can be identified in the early spring and removed before setting seed. Then, any already established, relatively benign exotic canopy such as crack willow (*Salix fragilis*), and perhaps *male* grey willow), can be under-planted. Over time, and once the indigenous sub-canopy is maturing, the willow canopy can be selectively removed, ideally by ring-barking and poisoning. Dead trunks will eventually fall and become important litter or log sites for invertebrates, birds and perching plants. There will be a health and safety concern here, so as treated trees die it may be necessary, near paths and other high (human) traffic areas, to assist the collapse of the trees in a safe manner.

Particular weeds observed and/or likely to become invasive and menacing to restoration efforts in the South Island generally include blackberry, Japanese honeysuckle, cotoneasters, ivy, old man's beard, tradescantia, arum lily, prunus, holly, sycamore, elderberry and male fern (make sure this is clearly differentiated from native pigfern before removal). Many restoration groups report *Muehlenbeckia* (pōhuehue) as being one of the few 'successful' native plants, to the extent of being invasive in young stands of trees and even collapsing young trees. Only two of the five New Zealand species are a potential hazard (*M. australis*, and to a much lesser extent *M. complexa*). They should not be eradicated as they are indigenous and provide food sources for native copper butterflies, and birds. However, if they are interfering with the succession or performance of other trees, then 'surgical' or selective removal can be contemplated. This involves cutting vines at the base and painting the stump with glyphosate. This will certainly slow its progress. Swamp nettle is a host of the spectacular native admiral butterfly, but should not be planted close to paths.

4.4 Animal pests

Animal control is outside the scope of this advice, but effective fencing to exclude stock, and control of browsing and grazing mammal pests will improve outcomes. Highly palatable plant species include large leafed Coprosmas and broadleaf. The usual eradication of possums, rodents, wild cats and mustelids can be carried out by trapping or poisoning and will be a prerequisite for any future translocation of wildlife.

5 Conclusions

An Envirolink Advice Grant – 1707-MLDC119, awarded to the Marlborough District Council (MDC) to assist local communities in partnership with MDC to achieve their goal of restoring former floodplain forests on the Wairau Plains near Blenheim, has been fulfilled through field visits with MDC staff and local community volunteers (30 August 2016) at three restoration sites, and by discussing issues, problems and options. A public lecture on conservation and restoration was delivered in the evening. This report completes the advice.

Achievements by local volunteers to date have been impressive, reflecting the knowledge and experience of the local community, their hard work, support from MDC, the mild climate, and soil moisture conditions.

This report (together with the attached spreadsheet, Appendix 2) summarises the findings and advice, and provides suggestions for further enrichment planting of locally sourced indigenous plant species in relation to a moisture/drainage gradient. Further clarification will be provided on request.

Appendix 1: Successful application by Marlborough District Council to the EnviroLink (environmental) Advice Fund

Date: 20/07/2016

Regional Council: Marlborough District Council

Regional Council Advice number: 1707-MLDC119

Who is the Advice Grant being requested by: Peter Hamill

Name of the person completing the application form: Peter Hamill

Phone number: 03 5207400

Email address: peter.hamill@marlborough.govt.nz

Requested funding amount: $5,000

Proposed Research Organisation: LANDCARE RESEARCH – MANAAKI WHENUA

Proposed person (if known): Dr Colin Meurk

Type of ecosystem involved: Terrestrial

Issue Identified

The distribution and number of wetlands and areas of indigenous terrestrial vegetation on the Wairau Plain is very limited. Less than 1% of the original wetlands remain and less than 10 kahikatea older than 150 years are present. A wetland restoration project has been undertaken over the last 10–12 years and has recently expanded into restoring a lowland forest area adjacent to the wetland. The Marlborough District Council is seeking expert advice on the best methodology for restoring a lowland kahikatea forest in an efficient manner that will take advantage of natural succession processes.

Benefit to Community

The outcome of the advice grant will mean that the local community will have the information available to carry out an ecologically sound restoration of the lowland kahikatea forest in an efficient way and which will most accurately reflect what was once present before European colonisation. The restoration plantings of lowland kahikatea forest will restore some indigenous vegetation to a depauperate and once extensive ecosystem in Marlborough.

Method/Approach

The grant would be used to get Dr Colin Meurk to travel to Marlborough and visit the restoration site and then provide a guidance document on suitable species to plant in specific areas in order to establish an ecologically functioning lowland kahikatea forest.

Appendix 2: Table of native species suitable for a range of riparian zones (column headings) and their appropriate planting stage (1–3) – see text; first stage species are highlighted green.

		Aquatic	Emergent	Lower bank	Upper bank	Levee	Back-swamp	Foot-slope	Lower scarp	Upper scarp	Terrace top
Myriophyllum[a]	**milfoil**	**1**									
Potamogeton[a]	**pond weed**	**1**									
Eleocharis acuta[b]	spike sedge		2								
Eleocharis sphacelata[b]			**1**								
Schoenoplectus tabernaemontani[b]	**lake clubrush**		**1**								
Carex secta[c]	**pūkio**			**1**			**1**				
Blechnum novae-zelandiae/minus	swamp kiokio			2			2				
Polygonum salcifolia	knotweed			3							
Schoenus apogon				2							
Isolepis distigmatosa				2							
Lobelia angulata	pānakenake			3							
Juncus spp	rushes (spp. below)			1							
Leptinella dioica	button daisy			2							
Urtica linearifolia	swamp nettle			3			2				
Carex lessoniana				2			2				
Carex maorica	pūrei			2			2				
Cyperus ustulatus	**umbrella sedge**				**1**						
Polystichum vestitum	prickly shield fern				2	3	2	3			
Blechnum fluviatile	kiwakiwa				3						
Leptospermum scoparium	**mānuka**				**1**		**1**	**1**			
Cordyline australis	**tī kōuka**				**1**	**1**	**1**	**1**	**1**	**1**	**1**
Coprosma propinqua	**mikimiki**				**1**	**1**	**1**	**1**			

		Aquatic	Emergent	Lower bank	Upper bank	Levee	Back-swamp	Foot-slope	Lower scarp	Upper scarp	Terrace top
Plagianthus divaricatus	**marsh ribbonwood**				**1**						
Coprosma rigida	**mikimiki**				**1**	**1**	**1**				
Juncus pallidus	**tall rush/wīwī**				**1**		**1**				
Juncus edgareae	**tall rush/wīwī**				**1**		**1**				
Juncus sarophorus	**tall rush/wīwī**				**1**		**1**				
Austroderia richardii	**toetoe**				**1**		**1**				
Phormium tenax	**harakeke/NZ flax**				**1**		**1**				
Carex virgata	**pūkio**				**1**		**1**				
Carex geminata	pūrei				2	2	2				
Hebe salicifolia	**koromiko**				**1**	**1**					
Hoheria angustifolia	**narrow-leaved lacebark**					**1**		**1**	**1**	**1**	**1**
Lophomyrtus obcordata	rōhutu					2		2	2		2
Melicytus ramiflorus	māhoe					2		2	2		2
Microsorum pustulatum	hounds tongue fern					3		3	3	3	3
Myrsine australis	red māpou					2		2	2		2
Pennantia corymbosa	kaikōmako					2	2	2	2	2	2
Aristotelia serrata	**makomako/wineberry**					**1**		**1**	**1**		
Pittosporum teniufolium/colensoi	**kōhūhū**					**1**	**2**	**1**	**1**	**1**	**1**
Carex lambertiana	sedge					3		3	3		
Carex solandri	sedge					3		3	3		
Coprosma robusta	**karamū**					**1**	**2**	**1**	**1**	**1**	**1**
Coprosma lucida	**shining karamū**					**1**		**1**	**1**	**1**	**1**
Griselinia littoralis	**broadleaf**					**1**		**1**	**1**	**1**	**1**
Kunzea robusta	**kānuka**					**1**				**1**	**1**
Parsonsia spp	NZ jasmine					3		3	3	3	3

		Aquatic	Emergent	Lower bank	Upper bank	Levee	Back-swamp	Foot-slope	Lower scarp	Upper scarp	Terrace top
Passiflora tetrandra	NZ passionvine					3		3	3		
Dianella nigra						3		3	3	3	3
Libertia ixioides/grandifolia	mīkoikoi					3		3	3	3	
ground ferns						3		3	3	3	3
Coprosma linariifolia	yellow wood					2		2	2		2
Coprosma rhamnoides						2			2	2	2
Pseudopanax crassifolius	horoeka/lancewood					2			2	2	2
Pseudopanax arboreus	five-finger/whauwhaupaku					2			2	2	
Sophora microphylla	**kōwhai**					**1**				**1**	**1**
Carpodetus serratus	putaputawētā/marble leaf				2	2		2	2		2
Myrsine divaricata	weeping matipo						2	2			
Dacrycarpus dacrydioides	kahikatea						2	2			
Elaeocarpus hookerianus	pōkākā						2	2			
Laurelia novae-zelandiae	pukatea						2				
Syzygium maire	swamp maire						2				
Astelia grandis	swamp lily						2				
Melicytus micranthus	small-leaved māhoe						2	2			
Streblus heterophyllus	tūrepo						2	2			
Hedycarya arborea	pigeonwood/porokaiwhiri						3	23	2		
Beilschmiedia tawa	tawa							3	3		
Rhopalostylis sapida	nīkau							3	3		
Ripogonum scandens	supplejack							3	3		
Dicksonia squarrosa	whekī							3	3		
Dicksonia fibrosa	whekī-ponga						3	3			
Cyathea dealbata	silver tree fern/ponga							3	3		

		Aquatic	Emergent	Lower bank	Upper bank	Levee	Back-swamp	Foot-slope	Lower scarp	Upper scarp	Terrace top
Coprosma rubra								2		2	2
Myrsine salicina	toro							3	3		
Pseudopanax edgerleyi	raukawa							3	3		
Plagianthus regius	**mānatu/lowland ribbonwood**							**1**	**1**	**1**	**1**
Coprosma areolata	veined coprosma							2	2		
Coprosma rotundifolia	round-leaved coprosma							2	2		
Alectryon excelsus	tītoki							2	2		
Prumnopitys taxifolia	mataī							2	2		2
Podocarpus totara	**tōtara**							**1**	**1**	**1**	**1**
Elaeocarpus dentatus	hīnau							2	2		
Astelia fragrans	bush lily							2	2	2	2
Pittosporum eugenioides	**tarata/lemonwood**							**1**	**1**	**1**	**1**
Olearia paniculata	**golden akeake**									**1**	
Helichrysum lanceolatum	niniao									3	
Olearia rani	heketara								2	2	2
Brachyglottis repanda	Rangiora									2	
Rubus spp.	bush lawyer								3	3	3
Clematis paniculata	clematis							3	3		

[a] Plant only at low water in mud or in biodegradable containers/racks

[b] Plant only at low water into mud

[c] Plant at low water