

THE WAITAKERE GUIDELINES FOR RIPARIAN RESTORATION: LESSONS FROM PROJECT TWIN STREAMS

Waitakere City Council

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ABSTRACT

Waitakere possesses a network of streams and rivers running from the Waitakere Ranges through the city to the Waitemata Harbour. Waitakere City Council has seized the opportunity to improve the health of these watercourses through a large scale restoration project.

Project Twin Streams focuses on achieving long term sustainable management of the Henderson Creek and Huruhuru Creek catchments. The project weaves together the restoration of stream banks with a sustainable community development approach. Restoration is being undertaken on 56km of urban streams involving the local community, Council employees and contractors. This paper will introduce the Project Twin Stream philosophy and discuss how restoration and community engagement is undertaken on the ground.

Riparian restoration requires the dedication of significant time and resources. Expertise developed on Project Twin Streams has contributed to the development of the Waitakere Guide to Bush and Riparian Restoration. This paper introduces two of the tools from this guide. Setting a vision and objectives at the commencement of a project allows you to focus resources and provides a benchmark to assess progress. Effective weed management is a long-term process crucial in urban settings. The long timeframes involved need to be communicated and costed into restoration programmes.

KEYWORDS

Restoration, Riparian, Urban Streams, Ecology, Weed Control, Community Engagement

1 INTRODUCTION

Engineers have traditionally viewed urban streams as conduits for stormwater. Issues such as flooding and erosion have been addressed by straightening and channelling streams, removing riparian vegetation and woody debris, lining banks with concrete, gabions and rip-rap, or commonly, by removing streams altogether and enclosing them in pipes (Suren, 2000). These methods facilitate the efficient movement of water as well as intensive development in and around flood prone areas. Unfortunately this also reduces or removes habitat for native plants, birds, fish and insects. In the Auckland Region

alone, an average of 11km of streams are lost each year to pipes or infilling (Rowe et al., 2008).

In recent years, the ecological and aesthetic values of streams have become increasingly recognised. In addition to stormwater reticulation, streams can provide habitat for native fish and insects, riparian vegetation can attract birds, lizards and other fauna, provide shade to reduce algae and macrophyte growths, and can capture sediment and nutrients from overland flow (ARC, 2001). If adequately cared for and maintained, streams can also provide amenity and recreation opportunities for the community and increase environmental awareness.

These changing attitudes towards streams are reflected in the growing number of stream restoration projects being undertaken. Regulatory authorities no longer accept the piping or destruction of streams as a given, instead requiring justification, mitigation, and where applicable, compensation for the loss of streams and stream function (Rowe et al., 2008). Private companies, local and regional government, as well as community groups are increasingly involved in stream restoration. In Waitakere alone there are at least five community organisations specifically focussed on improving stream health (www.ecoevents.org.nz, 26/02/09), with many other groups conducting stream restoration as a component of their work.

The large number of groups involved in stream restoration brought about the need for a document to assist Council staff, contractors, property developers, private land owners, and community groups to develop effective restoration solutions. In 2009, Waitakere City Council will be publishing a restoration guide to help to improve how works are conducted on the ground (Hall, in press). The aim of the guide is to promote a more consistent approach to facilitate effective and successful restoration projects across Waitakere.

The Waitakere Guide to Bush and Riparian Restoration is a much more comprehensive document than anything currently available. The document covers ecological theory, planning a restoration project, weed eradication, pest control, encouraging natural regeneration as well as planting. It combines published information from pamphlets and technical publications with practical experience gained by professionals and volunteers working on the ground. While there is no one right answer applicable to every situation, the document seeks to provide the information and tools for practitioners to be able to make the best decisions given their site.

This paper selects two of the tools presented in the guide; setting aims and objectives for restoration and conducting effective weed control. This information is considered to be current best practice for riparian restoration. As a practical case study, we focus on Project Twin Streams, a riparian restoration project currently being undertaken in Waitakere. The paper introduces the Project Twin Streams philosophy and discusses how the local community are seen as an integral part of improving stream health.

2 PROJECT TWIN STREAMS

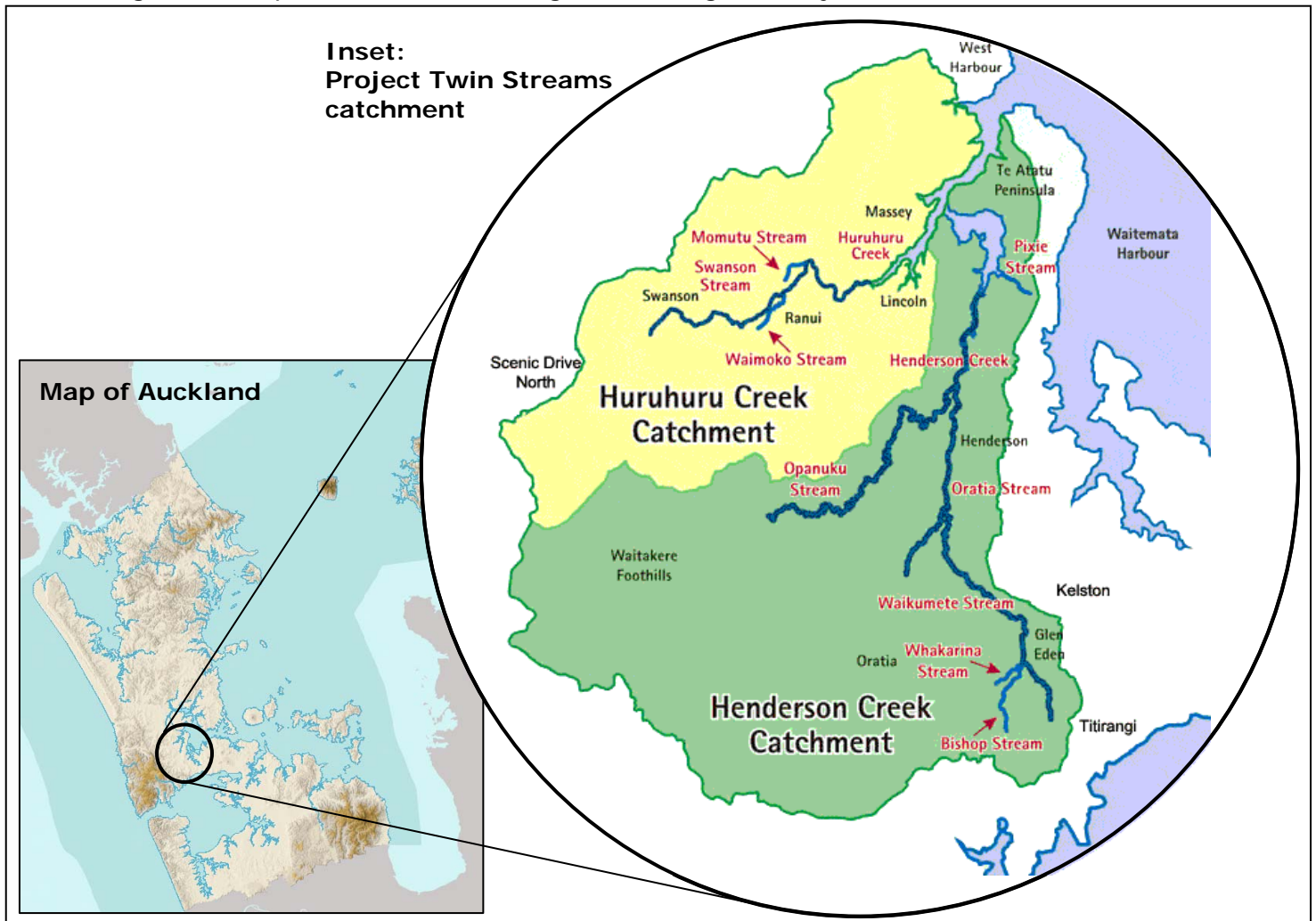
Waitakere is fortunate to retain a network of streams and rivers running from the Waitakere Ranges through the centre of the city to the Waitemata Harbour. Most other urban centres in Auckland have already lost their rivers through being piped underground. Waitakere has a unique opportunity to conserve and improve the health of these watercourses in a location where people can be integrally involved.

Hall, K.L. and Helsel, C.M. (2009) *The Waitakere Guidelines for Riparian Restoration: Lessons from Project Twin Streams*, proceedings from Stormwater 2009: 6th South Pacific Stormwater Conference, Auckland, New Zealand, 29 April to 01 May 2009.

Project Twin Streams was initiated in response to scientific studies highlighting the impacts of stormwater on the Oratia and Opanuku Streams (Thorn and Hay, 1997; Tonkin & Taylor Ltd, 1988; Breen, 2000; Kingett Mitchell and Associates Ltd, 2001). Between 2001 and 2003, Waitakere City Council submitted funding applications to Infrastructure Auckland, now Auckland Regional Holdings Limited administered by the Auckland Regional Council. The applications were to restore streams in the Henderson Creek and Huruhuru Creek catchments: Henderson Creek and the Pixie, Oratia, Opanuku, Paremuka, Swanson and Waikumete Streams. Collectively, these watercourses drain a catchment of 10,000 hectares and encompass 56 kilometres of stream bank (Figure 1).

By 2003, Project Twin Streams had secured \$39.9 million of funding over a ten year period to 2012. An additional \$5.2 million was approved for the construction of 10 kilometres of walk and cycleways to run alongside some of the streams. Funding was provided for activities associated with streamside revegetation; weed control, plant supply, planting, and aftercare, as well as community engagement. A sizeable proportion of the budget was allocated to the full or part purchase of 144 stream side properties and covenanting of a further 59, house removals, as well as the construction of some stormwater treatment devices.

Figure 1: Map of the Auckland Region showing the Project Twin Streams catchment



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2.1 SET A CLEAR VISION AND OBJECTIVES

The vision for Project Twin Streams is:

“Working together for healthy streams and strong communities”

This statement encapsulates what the project is trying to achieve. Project Twin Streams is about partnerships and empowering communities through capacity building as much as it is about planting and restoring the streams.

The vision or aim of a project is a statement of the intended outcome. A vision can be a prescriptive statement of what you intend to do (e.g. plant 100m of stream bank or protect a native bird), through to a more qualitative direction or aspiration that you wish to work towards. The Project Twin Streams vision falls into the latter category. Establishing a vision or aim at the commencement of a restoration project allows you to focus your time and resources and provides a benchmark against which you can assess your progress.

All restoration projects should have a vision, however the size and scale of the project should be considered when creating the vision as it will determine what can realistically be achieved. Frequently, the vision is complemented by a series of objectives which act as targets or milestones which enable you to accomplish your vision. A larger project may have several objectives, and these may change over time as the project progresses, whereas the vision typically remains unchanged.

To be effective, objectives should be ‘SMART’ i.e. Specific, Measurable, Achievable, Relevant and Time bound. This means setting targets for the project that are clear and simple, realistic given available time and resources and have deadlines attached to them. Ideally, there should also be an easy way of tracking progress so that you can tell whether or not you are achieving what you set out to do.

Example of a vague objective: “Plant trees on the site”

Example of a ‘SMART’ objective: “Plant 500 eco-sourced native trees within 3 years”

Measurable Specific Time bound

Project Twin Streams has a series of 24 objectives which fall under environmental, social, cultural and economic criteria (Table 1). This illustrates how restoration projects can successfully achieve multiple objectives, and go far beyond merely environmental improvement. The objectives for Project Twin Streams are admirable although unfortunately they were not set using SMART criteria. This makes it somewhat more difficult to monitor and assess success.

Table 1: The vision and objectives of Project Twin Streams

Project Twin Streams	
Working together for healthy streams and strong communities: creating a sustainable future	
Environmental Objectives	Social Objectives
<ul style="list-style-type: none"> • Integrated land use planning and management of the three waters to minimise flooding and reduce pollution and siltation in streams and the harbour • Integrated catchment management planning and application of the treatment train approach • Recreate and restore ecological corridors, extending the Green Network • Create lower impact footprints in the future through low impact urban design and form • Encourage new sustainable technologies in households, business and the public sector • Contribute to mitigation of climate change including upholding the Kyoto protocol • Monitor and evaluate the effectiveness of PTS in improving the environmental and ecological health of the catchment 	<ul style="list-style-type: none"> • Encourage communities to understand and take responsibility for the social, environmental, cultural and economic development of their localities • Facilitate the development of locality and community PTS governance structures • Foster sustainable community leadership • Develop and promote an integrated holistic approach which connects with people's minds, bodies and spirits. • Create life long learning about how to live, work and play sustainably • Provide pedestrian and cycle linkages that promote healthy lifestyles • Promote opportunities that advance affordable and sustainable housing • Evaluate effectiveness of the community development approach in improving the health and wellbeing of the catchment
Economic Objectives	Cultural Objectives
<ul style="list-style-type: none"> • Create opportunities for collaborative ventures with government, business, iwi, urban Maori and academic institutions • Be a catalyst for iwi, Maori and community economic and enterprise development • Develop opportunities for research and new water, waste and energy efficient technologies. • Monitor and evaluate the effectiveness of PTS in increasing job and economic development opportunities 	<ul style="list-style-type: none"> • Foster expression of iwi and diverse cultural world views through creative methods such as storytelling, art, music and literature • Ensure inclusiveness of and learning from different cultural and world views • Recognise, respect and profile the heritage of local areas • Promote creative ways for learning and as a key agent of change • Monitor and evaluate the effectiveness of using arts and culture to increase the understanding and uptake of local communities and iwi

For restoration initiated as a result of resource consent conditions, typically the vision and objectives are set by the regulatory authority. The directive to restore a section of stream is effectively the vision, with requirements such as plant numbers and timeframes the objectives. Issues such as monitoring are also solved by the regulatory authority requiring reporting by the applicant or conducting site inspections themselves.

Establishing the vision and objectives are only one part of initiating a restoration project. Ideally, a restoration plan should be developed which describes the site and establishes what (if any) intervention is required to restore the ecosystem. Components of a restoration plan should include a review of any existing information available on the site; a map of the site and surrounding area noting special features such as weed infestations, native seed sources, geotechnical constraints, archaeological sites etc.; a discussion of available resources, labour and sources of funds; as well as the restoration actions

required and ways of assessing progress. The level of detail in the plan should be determined by the size of the project and resources available.

2.2 EFFECTIVE WEED CONTROL

Environmental weeds are those species with actual or potential detrimental effects on the natural environment (Sullivan et al., 2005). These species smother native plants, prevent natural regeneration, and out-compete native vegetation from suitable habitat. Seventy-four percent of New Zealand's terrestrial environmental weed species originated as ornamental garden plants (Sullivan et al., 2005). This makes urban riparian areas particularly prone to weed invasion. The vicinity of urban gardens and waste areas combined with open areas of high light and disturbance provide both the seed source and suitable habitat for weeds. The physical shape of streams also exacerbates the problem as long narrow strips have high edge effects suitable for continued weed invasion.

Weed eradication is one of the most critical components of urban stream restoration. Many restoration projects focus inadequate time and resources on site preparation and (particularly) after care, focussing instead on the more charismatic planting activities. Along many urban streams, weeds are the dominant vegetation and can successfully out-compete any native species. Effective weed eradication can significantly improve the survival and growth of native plants and facilitate ecosystem recovery. Conversely, incorrect or inadequate weed control will facilitate weed spread, meaning that native plantings are more difficult to maintain resulting in a significant waste of time and money.

The Waitakere restoration guide introduces a five step process to eradicate weeds from a site. This method takes into account simple weed ecology, recognising that most environmental weed species establish quickly in high light environments whereas only a limited number are able to survive in the shade. Effective weed management involves removing not only the existing weeds themselves but also the disturbed, open habitat in which most weeds establish. It also requires a long term commitment to ensure that the site remains weed free. This five step method is now implemented successfully on Project Twin Streams.

2.2.1 PREVENT WEED ESTABLISHMENT AND SPREAD

One of the best ways to keep a site free of weeds is to prevent them from entering the site in the first place. If weeds are already present, minimising further spread will allow for quicker and cheaper eradication.

Minimising weed establishment and spread can be as simple as cleaning boots and equipment between sites and before entering weed free areas. If possible, eradicate weeds on neighbouring properties before they have the chance to spread. Knowing the reproduction strategies of different weeds and how they spread is essential to achieving eradication.

Weeds can be dispersed in a number of different ways. Pollen, seeds and plant material can be spread by wind, water, animals, vegetative means (e.g. suckers) and unfortunately even by humans. Riparian zones are used by many people as a dumping ground for household rubbish and garden waste. Grass clippings and garden rubbish frequently contain the seeds and plant material of exotic weeds. Some weed species are spread almost entirely by the dumping of garden waste, such as tradescantia

(*Tradescantia fluminensis*), yellow ginger (*Hedychium flavescens*) and German ivy (*Senecio mikanioides*), which do not produce viable seed (Timmins and Williams, 1991). Once discarded at a site, these plants will spread by vegetative reproduction.

Education is an invaluable tool for preventing weed spread in riparian zones. Involving the community in restoration and teaching them about environmental weeds can help to reduce the incidence of dumping and promote the best methods of control. Unfortunately it can be impossible or impractical to prosecute for garden dumping offences. In Waitakere, local residents can receive free advice on weed control, the provision of herbicide for ginger eradication, and weed bins or tarpaulins to dispose of weeds that have been removed. In Project Twin Streams, Riparian Coordinators and Community Coordinators work with community groups, corrections and paid contractors to improve weed control on the ground.

2.2.2 MINIMISE OPEN WEED HABITAT

Most environmental weed species establish quickly in high light environments. Only a limited number of weeds are able to survive in the shade. For this reason, open sites with little or no shade are extremely vulnerable to weed invasion. In Waitakere, privet (*Ligustrum lucidum*, *L. sinense*), wattle (*Paraserianthes* and *Acacia* species), gorse (*Ulex europeus*), blackberry (*Rubus fruticosus*), Japanese honeysuckle (*Lonicera japonica*), and pampas (*Cortaderia selloana*, *C. jubata*) seedlings are often the first species to establish on cleared land. These weeds grow rapidly and are able to out-compete natives in such habitats.

Shading out weeds is the most sustainable method to achieve weed control at a site. Since most weeds require open, high light environments to flourish, maintaining or creating shade at ground level reduces the available habitat for weeds. This causes weeds to die out naturally *and* prevents new weeds from establishing. Minimising weed habitat can be done in a number of ways:

- On open sites, plant fast growing native pioneer species such as manuka (*Leptospermum scoparium*), kanuka (*Kunzea ericoides*), flax (*Phormium tenax*) and cabbage trees (*Cordyline australis*). The rapid growth of these plants will provide canopy shade.
- Plant dense bushy pioneer species on the edge of existing vegetation to minimise light penetration. Avoid pruning shrubs and removing low hanging branches.
- Minimise the creation of large open areas of bare ground when conducting weed control. Only eradicate environmental weeds - retain grasses and other species that will not threaten native plants. Keep the ground covered by leaving dead weeds on site as mulch.
- If there is an existing exotic canopy, under-plant with natives rather than cutting the existing trees down. The exotic trees can be eradicated over time as the native plants mature.

Providing shade at ground level not only reduces the available habitat for weeds but also creates the ideal habitat for other native plants and animals to colonise the site.

Establishing Pioneer Plants

Native plants suitable for open sites are pioneer species capable of surviving in harsh conditions. These species will grow rapidly in order to shade out weeds as quickly as

possible. Once a canopy (even 1m high) is established weeds should become less of a problem. The light-loving weed species will die out over time beneath the canopy of developing vegetation. Continue to conduct weed control around the new plants until shade at ground level is achieved.

Using Canopy Weed Trees

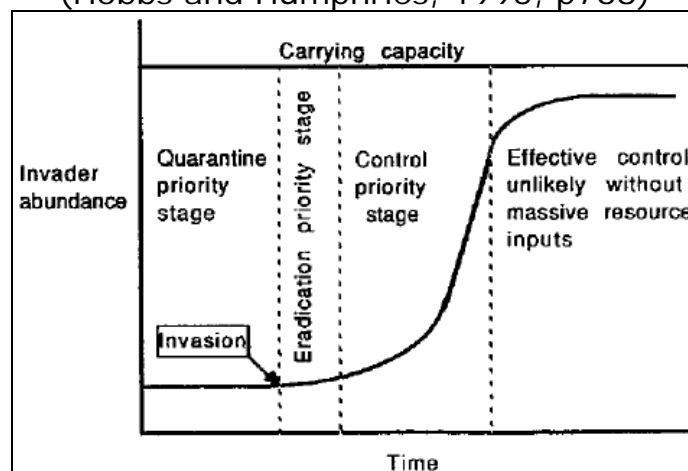
Along numerous areas in the Project Twin Streams catchment, weed trees line the stream banks with little or no understory native vegetation. Even though these trees are weeds they do not need to be removed immediately. The shade that these trees offer provides ideal conditions for the growth of native plants and is much better than creating a cleared, open site, ideal for weed reinvasion. By maintaining the shade of the canopy for as long as possible, it is less likely that the large seed bank of weeds beneath the trees will germinate and take over. Beneath the weed trees, weed control is conducted to remove shade tolerant groundcovers, weed seedlings and saplings that may be limiting natural regeneration of native species. If there is native vegetation nearby, it is likely that birds will be distributing the seeds and native plants will colonise themselves. Alternatively, if there are few local seed sources or more rapid regeneration of natives is desired, planting will be necessary.

Due to the shelter and shade provided by a canopy, a wider range of later succession native shrubs and trees suitable for planting in light gaps beneath canopy can be established. Once these native plants have grown up beneath the canopy, the existing weed trees can be poisoned and left standing to provide shade and habitat even whilst they are dying. If health and safety is a concern (e.g. from falling dead branches), the trees can be gradually pruned or crown lifted over a period of several years.

2.2.3 TARGET SMALL WEED INFESTATIONS FIRST

The control of scattered individuals or small clumps of weeds (sometimes called 'outliers') should be a priority over large, well established, high density infestations. It is much more cost and time efficient to eradicate weeds before they spread throughout a site (Figure 2), even though larger infestations are usually the more obvious targets for control.

Figure 2: It is more efficient to eradicate outlier weeds before they spread (Hobbs and Humphries, 1995, p768)



Small infestations of weeds also pose the greater threat. The spread of a weed from numerous, widely spaced individuals is much faster than from one large infestation (Mack, 1995). This is because outlier plants have fewer limitations such as light and space than if they were grouped together in a patch. Small infestations can therefore grow quicker and reproduce more rapidly. In a restoration project, small weed infestations should be targeted first, before they have a chance to establish more widely. Once these have been eradicated, then larger infestations can become a focus.

In Project Twin Streams, an outlier weed control programme was commenced in summer 2008. The purpose of the programme is to eliminate outlier pest plant populations that pose a significant threat to the ecosystem if left untreated. The programme is undertaken by contractors twice per year in spring (October-November) and early autumn (March). Contractors conduct a rapid sweep of the stream banks searching for small pockets of weeds. Outliers that take less than five minutes to poison, hang pull or dig out are targeted. Larger weed infestations are left to be eradicated during site specific control programmes.

2.2.4 RETAIN WEEDS WHERE THEY ARE PROVIDING BENEFITS

In certain circumstances it can be beneficial to retain weeds on site where they are providing benefits to the environment or to the community. Some of the positive effects of weeds can include:

- **Weed suppression.** Exotic trees provide shade at ground level which can prevent other weeds from germinating beneath them. (Discussed in Section 2.2.2).
- **Habitat and food for native fauna.** In the absence of natives, mature exotic trees provide roosts and food for birds and bats, as well as sources of organic matter for native fish and insects. Pampas, agapanthus (*Agapanthus praecox*), tradescantia and even long grass are good habitat for skinks and invertebrates while prickly and willow leaved hakea (*Hakea* spp.) provide for arboreal geckos. Puriri moth larvae will live in tree privet (*Ligustrum lucidum*) and some other exotic trees.
- **Stream shade.** Canopy cover provided by exotic trees and shrubs can reduce water temperatures and inhibit excessive algae and macrophyte growths.
- **Soil stability.** The presence of exotic trees and groundcovers can reduce soil erosion on stream banks. Some species such as willows (*Salix* spp.), poplars (*Populus* spp.), bamboo (*Phyllostachys* spp.) and giant reed (*Arundo donax*) can be specifically planted for this purpose.
- **Sediment and nutrient entrainment.** Exotic grasses and sedges can trap sediment and remove nutrients and pollution from overland flow.
- **Amenity.** Exotic trees and shrubs can appeal to the community, particularly where they have attractive flowers, leaves or form. Tall bushy plants like bamboo can screen neighbouring properties.

It is important to consider the positive contributions of weeds to ensure that their removal does not cause unnecessary damage to the ecosystem or upset the local community. It may be necessary to stage weed control to maximise the benefits that the weeds are providing and ensure that any future plantings provide the same (or better) function in the long term.

2.2.5 PLAN FOR LONG TERM MAINTENANCE

The restoration guide defines weed eradication as "to out compete or otherwise kill all existing environmental weeds on a site and to conduct maintenance to ensure that no

new seedlings establish" (Hall, in press, p47). Unfortunately, the maintenance and after-care of restoration plantings can be grossly inadequate. Site managers and regulatory authorities need to be aware of the long timeframes involved and allow for the time and costs necessary.

To be effective, weed control on a site may need to be commenced a year or more before planned planting. The timing of weed control will be determined by the species of environmental weeds present, and the technique(s) that are being used. Both manual and chemical control methods will almost always necessitate repeat treatment. Some herbicides (such as triclopyr in Grazon® and metsulfuron in Escort®) remain active in the soil requiring weed control to be completed several months before planting. These long lead times can prove particularly frustrating for volunteers and community groups who usually want to plant as soon as possible.

Weed control is even more important after vegetation has been planted on a site. Weed control needs to be conducted regularly within the first two to four years while native plants become established. Ideally, the site needs to be checked once per month in the first summer following planting, with effort reducing as the plants mature and weeds are shaded out. Many restoration projects, both public and private, do not conduct adequate maintenance, allowing weeds to overgrow and kill the native plants. This can be the result of ignorance on the behalf of volunteers or contractors, apathy (particularly after the enthusiasm of planting has waned), and/or inadequate resourcing. When plants are young and in danger of being overgrown, a small area 0.8-1.0m² should be kept weed free at the base of each plant. Other non-environmental weeds and grasses should be retained between plants to provide shelter, maintain soil cover and improve moisture levels. Periodic checks of the site should be continued even beyond four years after planting to target any shade-tolerant weeds that may colonise the site. Unfortunately such long timeframes can be impractical for small projects.

When Project Twin Streams commenced, weed control was conducted in an ad hoc basis, largely responding to sites where communities were intending to plant. On such a large project it is more beneficial to plan weed control well in advance to ensure that sites are prepared correctly, and to manage after-care more effectively. Weed management can be facilitated by thorough knowledge of the site complemented by weed maps identifying areas of priority. Now that Project Twin Streams has progressed, Riparian Coordinators manage weed control in this manner. Fortunately the long timeframe and secure funding of the project improves the likelihood of successful after-care.

2.3 COMMUNITY ENGAGEMENT

Involving the community in restoration projects can produce a range of environmental, social, cultural and economic benefits. These include increased environmental awareness, personal development and learning opportunities, networking for community groups, businesses and government, support and understanding for different cultural groups, through to opportunities for work experience and employment opportunities (Buchan, 2007). Involving and empowering communities creates a sense of shared ownership and can increase the success of restoration projects (Craig et al., 1995).

Project Twin Streams recognises that repairing and restoring natural waterways long term cannot be achieved without involving local communities. Project Twin Streams promotes community involvement in care, a cyclical relationship between people and nature; by nurturing the environment the environment will nurture the community. Even

simple things such as choosing to wash the car on the lawn so that run-off does not enter stormwater and streams, recycling and composting waste, cycling rather than driving to the local shops, are all examples of community involvement in care.

Because Project Twin Streams is located in an urban area, the project has the opportunity to engage a wide volunteer base. Community involvement is facilitated by locally-based community organisations that are contracted to promote Project Twin Streams in their neighbourhoods. A total of five community organisations operate in different parts of the catchment. These organisations involve residents in planting, weeding and clean up days and also through encouraging day-to-day decisions that conserve natural resources and prevent or reduce pollution. Some community groups work on the stream regularly every week or month while other volunteers attend one of the weekend community planting days in their neighbourhood. In 2008 alone, a total of 67 community groups, 11 schools, and 4,460 volunteers were involved in the project (WCC, 2008).

The community planting days are a highlight in the Project Twin Streams calendar. These days are designed to not only comprise a large planting with local community members but to also be a celebration with music, education, food and arts activities. These events unite the many components of Project Twin Streams and emphasise the importance of engaging residents in a number of ways. The success of environmentally inspired arts activities is not only limited to community planting days. The Project Twin Streams arts programme works with local schools and community groups to support creative learning and expression through paintings, sculpture and performing art. In 2008 Project Twin Streams held inaugural art awards, run alongside the established Waitakere Trust Art Awards. This event promoted Project Twin Streams to a new audience and rewarded artists that best portrayed the themes and ideals surrounding the project. 2008 also saw a children's drama group tour local schools – a great opportunity for children to teach their peers about the importance of looking after the natural environment.

Although community members eagerly engage in planting along the stream banks, a challenge facing Project Twin Streams is to foster the same enthusiasm around weeding and plant maintenance. Unfortunately weed control can be a long process with little of the kudos associated with planting native trees. This requires an extended commitment from volunteers for comparatively little reward. A crucial time for weed control is during the high weed growth period of spring and summer. Unfortunately, this is also the time when many volunteers are away on holiday. Without regular community group attention during this time, the plants are vulnerable to weed invasion, necessitating the use of professional contractors to maintain the plantings. This in itself can create tensions as the involvement of contractors may be seen as eroding the ownership and management responsibilities of a site by the community.

In the long term, Waitakere City Council hopes to establish community ownership and governance of Project Twin Streams. This means local community groups(s) running and managing the project on a day to day basis. To date, the project is still seen by many as a Council run initiative, rather than a grass roots community project. Council initiated the project and is responsible for managing the funds, resources and many of the people involved on the project. While this is convenient for organising and implementing the project, it creates a challenge when shifting leadership and ownership responsibility to the community. More commonly, restoration projects begin with local residents' concern over the ecological health of their surrounding area and from this passion they seek assistance and funding. This 'bottom-up' approach is ideal for long term sustainability. By

2012 Project Twin Streams hopes to have instilled a sense of ownership and care into the community allowing for the scheme to continue in this manner.

3 CONCLUSIONS

Waitakere City Council took a bold step when it initiated Project Twin Streams. There is no other riparian restoration project in the country that rivals it in terms of size, scale or complexity. This was acknowledged internationally in 2007 when Project Twin Streams became a finalist in the Theiss River Prize, an award to recognize leadership in catchment management and aquatic habitat improvement.

While the focus of Project Twin Streams is on stream restoration, the vision is much wider, involving how land is used and how households can become more sustainable. Project Twin Streams realizes that protecting and restoring the natural environment requires the commitment and buy-in of the local community, and encourages participation through a range of initiatives. In the long term, it is hoped that the community will adopt Project Twin Streams as their own and assume management and governance of the project.

The knowledge and experience gained on Project Twin Streams has contributed to the development of the Waitakere Guide to Bush and Riparian Restoration, due to be published later this year. It is hoped that this document will help and inspire other groups both within Waitakere and further a field to protect and enhance the environment.

ACKNOWLEDGEMENTS

The funding contribution by Auckland Regional Holdings and the Auckland Regional Council for the implementation of Project Twin Streams is gratefully acknowledged. Acknowledgement is also due to Waitakere City Council for providing leadership and direction for this project.

Special thanks to Tony Miguel, Deputy Director City Services, Waitakere City Council and Richard Thomas, Director, Thomas Civil Consultants Ltd for supporting attendance to this conference. Thank you also to Shuaib Chota and Renee Davies of Waitakere City Council for reviewing the paper and providing useful feedback. We acknowledge Project Twin Streams and the Waitakere City Council Parks Planning Department for funding the development of the Waitakere Guide to Bush and Riparian Restoration. Special mention also to the Project Twin Streams employees and volunteers whose expertise and enthusiasm for the natural environment has contributed to the development of this guide and the guardianship of the city.

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