Styx River Esplanade Reserve at Redwood Springs

# Ecological restoration guidelines

Supporting the Styx Vision 2000 – 2040

December 2021

ccc.govt.nz/parksbiodiversity



## Contents

Introduction	1
Background	1
Agreed management approach	3
Habitat restoration	4
Vision	4
Restoration zoning	5
Freshwater aquatic	6
Riparian margin	7
Floodplain	8
Terrace face	11
Upper terrace	12
Backswamp (Constructed) Wetlands	14
Wai puna/springheads	15
Small spring-fed waterway	16
Amenity areas	17
North side of river (private land)	
Threats to biodiversity	19
Pest plants	19
Pest animals	20
Mammalian pests	20
Dogs	20
Implementation Plan	21
Willow control	21
Riparian & floodplain restoration	21
Terrace face & upper terrace planting	22
Access	22
Appendix 1: Species lists - floodplain and riparian corridor	23
Appendix 2: Species lists – terrace face and upper terrace	26
Appendix 3: Consultation material	0

# Introduction

## Background

Development of the Redwood Springs residential subdivision resulted in the land adjacent to the Styx/Pūharakekenui River being set aside for esplanade reserve purposes. The Resource Management Act (1991) defines the purpose of "Esplanade Reserves" as areas that:

- Contribute to the protection of conservation values
- Enable public access to or along a river
- Enable public recreation where that use is compatible with conservation values

Legislation and policy that is relative to the management of this Reserve is contained in such documents as the Christchurch District Plan, the Long Term Plan, the Resource Management Act, the Reserves Act, the Wildlife Act, the Waterways and Wetlands Asset Management Strategy and Christchurch Biodiversity Strategy.

The Styx River Esplanade Reserve covers an area of approximately 8.90 hectares. The Styx/Pūharakekenui River forms the Reserve's boundary to the north, with Willow View Drive and the new residential development of Redwood Springs form its southern boundary. The Northern Arterial Motorway borders the east of the reserve and the main north-south railway line forms the western boundary. A number of springs along the river's edge are a feature of this stretch of the river, as are natural landforms including the five-metre high terraces along which the river flows. The Reserve forms part of a much larger green corridor associated with the Styx/Pūharakekenui River extending from its source to the sea. Therefore any development of this Reserve needs to be considered in conjunction with the long-term objectives and aspirations of the overall plan (Refer Figure 1 below, and Appendix 3 for full detail on the adopted pan).



Figure 1: Christchurch City Council approved landscape plan for the Styx Esplanade Reserve at Redwood Springs.



In developing the original plan consideration was given to meeting the following objectives:

- To protect and enhance the ecological values associated with the Reserve, the Styx/Pūharakekenui River and the greater Styx/Pūharakekenui corridor.
- To incorporate walkway linkages, not only as part of the Source to Sea walkway (Styx Vision No. 2), but to other community centres and focuses.
- To provide a wilderness experience that contrasts with the adjacent urban areas.
- To provide built structures that complement and enhance the Styx/Pūharakekenui River experience and tell the stories of the land.
- To recognise the name of the adjacent residential development by making a special feature of the spring located near the railway line.
- To provide community and children's play areas.
- To provide public access to the water's edge
- To minimise long term maintenance costs

Any planning and development of the Styx Esplanade Reserve must also support Council's adopted 'Styx Vision 2000 – 2040' planning document. Both the Styx Vision 2000 – 2040 and the landscape plan for the reserve were developed following extensive consultation and involvement by the community.

Ultimately, authentic restoration of indigenous plant an animal communities along the Styx/Pūharakekenui River is central to achieving Council's adopted 'Styx Vision 2000 – 2040' planning document, particularly Vision-1; 'A Viable Spring-fed River Ecosystem':

"To achieve a "Viable Spring-fed River Ecosystem" to complement the other representative protected ecosystems of Christchurch such as the Port Hills, Travis Wetlands and the Coastline."

Vision 1 – Styx Vision 2000 – 2040



## Agreed management approach

Landscape values associated with a new residential development and those of a conservation reserve have the potential to differ. Therefore, careful management of the interface between the two areas will be required to ensure that there is a transition zone between the areas needing to be highly maintained, and those areas that are managed more for their wilderness and wildlife values. Accordingly, as a result of the planning, design and community consultation process, two distinct zones were agreed upon: 1) a conservation zone and 2) a high-care amenity zone that aims to also maintain a farm-type landscape as far as is practicaly achievable (Figure 2).

These management guideline focus on the conservation zone of the reserve.



Figure 2: Management Zones as set out in the approved landscape plan for the Styx Esplanade Reserve at Redwood Springs

In the future, ideally the 'conservation zones' would fall under the management of council's regional parks ranger team, whilst the amenity/high-care areas - including the playground - would continue to be managed by council's urban parks operational team. The 'possible future retention basin' shown in Figure 2 was constructed as a partially forested first flush treatment basin in 2008. It includes a complex three-way flow splitter device that takes spring water arising in Murchison Park to 1) provides base-flow through a low-flow channel within the basin, 2) provide base-flow for a section of waterway that runs parallel with the Styx/Pūharakekenui River within the reserve, and 3) discharge excess water directly to the river. This system managed and maintained by council's land drainage operations team, however parks can-and-do manage pest plants within the basin.



# Habitat restoration

## Vision

The development proposal recognises the existing wildlife values (including flora and fauna and their interactions) associated with the reserve, and aims not only to enhance those values, but also people's enjoyment of them. Parts of the site still retain relatively unmodified soils, and these areas are considered the most suitable for ecological restoration.

Some habitat restoration has occurred at the western end of the reserve where large areas of willow were removed and the banks and adjacent areas planted out in locally sourced native plants. Following expressions of concern from the public, it is proposed that future habitat restoration will involve managing weed species, infill plantings, and a more gradual rate of removal of willow trees. In doing so, sensitive consideration will be given to the needs of the bush and wetland birds in deciding the location of paths and public access to the River.

While small willows will be targeted for control, the rate removal of the larger willow trees will be dependent on the rate of growth new plantings within the reserve. Ongoing willow management will also encourage the processes of decay and regeneration through retaining trees stumps, large woody debris and decay hollows that recognise the willows as an important component of a natural forest structure.

Add Vision Statement



## **Restoration zoning**

The waterway corridor along the Styx/Pūharakekenui River at the Styx Esplanade Reserve can be characterized as different zones, within which ecological restoration can be approached in different ways and for different values. These are shown in a typical lowland water way cross section (Figure 3) below, and include:

- Freshwater aquatic
- Riparian margin
- Floodplain
- Terrace face
- Upper terrace, and
- Back-swamp-wetland in this case as series of constructed wetlands



Figure 3: A typical waterway cross section showing different restoration zoning at Redwood Springs.

Other important features of the reserve, but not shown in Figure 3, is a significant natural wai puna/spring located at the western end of the reserve, and a 250 m length of waterway running parallel with the river that receives permanent base-flow from an artificial spring. Restoration and management of these features, and another wai puna towards the eastern end of the reserve, will also be discussed as discrete restoration zones in these guidelines.

Areas of amenity turf and garden beds within the reserve are not shown in the Figure 3 cross section, and are not discussed in detail in these restoration guidelines other than a need to monitor them for pest plants that may spread to restoration zones.



## **Freshwater aquatic**

Generally, the freshwater aquatic environment of the Styx/Puharakekenui River is managed and maintained by Council's 3-Waters Team where there is a focus on maintaining waterway conveyance. However because the River flows through a 5 m deep gorge which extends for approximately 5 km upstream from the reserve, flood damage to private properties upstream is unlikely. Therefore this provides opportunity to manage the waterway corridor more for its natural/ecological values than for flood management purposes.

#### Actions

**Monitor pollution:** Monitor waterway for discharges of sediment and/or other contaminants and report to Environment Canterbury (ECan) 24-hour pollution hotline (0800 765 588), or via the Snap Send Solve app: <u>Report</u> an environmental incident | Environment Canterbury (ecan.govt.nz).

Maintain conveyance: Ensure large woody debris or other objects do not overly restrict waterway flow. Providing adequate conveyance for such activities as kayaking needs to the balanced with that value that woody debris and log-jams provide as fish refuge and structural complexity.

Manage pools, runs and riffles: Although the river runs through a relatively deep channel through most of the length of the reserve, further investigation may identify discrete sections of the waterway that can be managed, maintained and where possible enhanced as natural pools, runs or riffles:

- *Pools:* These are deep, slow flowing areas with almost level, smooth water surface and often containing deposits of fine substrate (sand or gravel). They are areas of sediment deposition and also act as important storage areas for organic material that is gradually released into the stream. Small pools often form on the outside of curves, providing an area of deeper water, which may be utilized by larger fish.
- Runs: These features are the main instream habitat of most Christchurch waterways and are intermediate between pools and riffles. They are characterised by an undulating but relatively unbroken water surface. Their substrate generally varies from a mixture of small particles (gravel, sand) to cobble substrates. But generally consists of smaller particles than in a riffle section.
- *Riffles:* These are shallow, swift flowing areas with broken water surface and large substrate (gravel, boulders). Here, increased water turbulence with increased bed roughness increases the exchange of dissolved gasses and nutrients. Riffle sections with coarse substrates therefore provide more suitable habitat for invertebrates with high oxygen demand (i.e. many 'clean water' species). Furthermore, many of the drift feeding fish, such as trout, prefer to feed just below riffles to catch invertebrates drifting in the water column.

Groups and individuals involved with waterway restoration at this site should therefore work closely with Council's freshwater ecologists and environmental engineers to determine appropriate interventions. Once these are determined, a series of design details can be developed that are able to be implemented under (e.g.) Council's global waterway consent. However further advice on any consenting requirements will need to be sought at an early stage in the investigation and design process.

**Aquatic macrophytes:** Regularly survey for changing coverage of native and introduced aquatic macrophytes (water weeds). Develop a plan to establish a healthy and diverse community of native aquatic macrophytes through maintaining tree canopy cover, and potentially investigating and carrying out translocation of appropriate species that no longer occur within this reach of the river.



## **Riparian margin**

Between the railway line and the Northern Arterial Motorway, the Styx Esplanade Reserve hosts more than 1.25 km of riparian margin along the rivers true right bank. As an eco-tone (a transitional area between two different plant communities blend together), the riparian margin provides an essential habitat for a diverse range of both aquatic and terrestrial indigenous flora and fauna. Well managed waterway margins are also the last lines of defence for keeping sediment and other contaminants out of waterways. Sediment is a major driver of waterway degradation throughout New Zealand, as it smothers aquatic life & cobbles, and fills voids that are important for aquatic fauna. Therefore maintaining a well vegetated riparian margin will not only provide habitat and shade the waterway, but it will also keep the streambank intact through root reinforcement, and help filter out sediment contained in surface flows during heavy rainfall.

### Actions

**Identify significant indigenous vegetation:** As with many relatively unmodified stretches of the Styx/ Pūharakekenui River, often the riparian margin may still support remnants of original vegetation. Therefore before any restoration work commences – particularly site preparation for planting – the sites should be surveyed by an ecologist to identify any vegetation (or other features) to be protected.

**Vegetative cover:** Maintain continuous native vegetation cover along the riparian margin of the river throughout the length of the reserve through active planting, maintenance and protection. Where conditions allow, this vegetation should include eco-sourced tree species that are capable of forming a canopy over the water column to provide waterway shade and cooling. Where tree species are not appropriate or not able to be established due to the saturated nature of the floodplain, native vegetation such as pukio sedge *(Carex secta)* and harakeke *(Phormium tenax)* that can provide overhanging vegetation along the water's edge should be established.

**Complexity:** Throughout the length of the reserve, the river flows through a convoluted, serpentine course. This complexity results in varying flow regimes, and in turn results in under-cutting of steeper outside bends, and more gentle batters on the insides of bends where sediment is deposited. It is important to maintain this degree of complexity, but also balance the value of undercuts for fish refuge with the risk of ongoing erosion and sedimentation. In most cases within the reserve, this can likely be balanced through riparian planting with sedges such as *Carex secta* on the damp floodplains, and trees and shrubs with woody roots that will provide good root reinforcement on steeper banks.

Manage access: Minimise disturbance to erodible riverbanks by designating and developing a limited number of visitor access points to the river's edge. In high-use areas, these access points may need to be artificially bolstered with streambank reinforcing such as (e.g.) hardwood timbers/logs, boulders, or through the creation of less-erodible gravel beaches. These gravel beaches should be located on the inside of river bends to both avoid areas of increased erosion, and enhance natural waterway complexity and form as described above.

**Woody Debris:** Dead woody debris is an important component of both aquatic and terrestrial ecosystems where it is used for shelter, food, perching, a growing substrate for naturally regenerating seedlings, and - if well incorporated into the environment – for human aesthetics and natural character too. Consider incorporating dead woody debris only where it will not be washed away in storm flows resulting in waterway conveyance issues downstream.

## Floodplain

Throughout the length of the Styx Esplanade Reserve, the river is characterized by an extensive low wet floodplain. However throughout large areas of the reserve, this floodplain is hidden within a dense riparian willow woodland – particularly towards the reserve's western end. These floodplains have significant potential for restoration and also a high probability of restoration planting success due to their sheltered, nutrient rich and damp nature. However this also means that the floodplain areas are also highly impacted by vigorous growth of weeds and pest plants that will hold restoration back if not adequately addressed early in the restoration process.

**NOTE:** It is important to ensure that willow control or any significant work in the floodplain is carried out prior to significant plantings occurring on the terrace face or upper terrace that may make subsequent access difficult.

### Actions

**Control crack willow:** Progressively drill-and-poison crack willow *(Salix fragilis)* throughout length of river corridor. Where crack willow is controlled in this manner, it may be possible to leave dying/dead trees in-situ in areas where they will not present a health and safety risk to the public from falling debris. If left in-situ, the dead trees will gradually fall apart, and because the falling debris is dead, it will not take-root and form new trees. Furthermore, the dead falling woody debris will be lighter than live wood, and will therefore be less inclined to damage understorey plantings.

Where poisoned trees may present a risk to public, as soon as the tree is completely dead it should be carefully felled in such a manner that causes minimum disturbance to the understorey. It is important that the tree is completely dead before felling, as any live debris that come into contact with the ground has the potential to form roots and form new trees, thereby exacerbating the willow issue within and downstream along the corridor. Once felled, smaller diameter branches can be chipped for use as mulch on terrace face and upper terrace planting areas, while larger diameter woody material can be left in-situ for habitat complexity and as a carbon sink.

**Eradicate grey willow:** Unlike crack willow, grey willow (*Salix cinerea*) does not reproduce vegetatively, however, it does regenerate prolifically from seed produced by female trees. Grey willow has significant adverse effects on waterway and wetland ecosystems through direct competition with indigenous species. It also 1) alters the natural hydrology, and 2) increases nutrient levels of wetlands, and in doing so can displace indigenous plant species that have adapted to low-nutrient wetland habitats.

Historically, throughout the Styx/Pūharakekenui River catchment and elsewhere in Christchurch's natural areas, reserve managers have only targeted female grey willow trees for control. However, more recently environmental managers have begun to target both male and female trees in order to achieve complete eradication. This complete eradication approach should be adopted at the Styx Esplanade Reserve using similar methods to crack willow (refer above).

In most instances, grey willow is a smaller stature tree than crack willow, and is unlikely to present the same degree of public safety issue from falling debris. Furthermore, because if does not regenerate vegetatively from live fallen debris, it can be felled while still alive (i.e. without pre-treatment with herbicide), as long as the stump is painted with herbicide immediately - within minutes - after felling trees or cutting smaller saplings.



Manage fine-scale topography: Rather than being a flat expanse of wet floodplain, the floodplain along the Styx/Pūharakekenui River has a range of subtle topographic and other features that can be used as the basis for restoration in this area. Old willow trees have formed large elevated root-plates that sit above the saturated floodplain, and where trees have fallen, their root-plates have been up-turned to form pools of standing water. Decaying fallen tree trunks support moss, and native seedling regeneration, and decay cavities in standing trees provide refuge and nesting sites for native birds including kingfisher, paradise duck and grey teal, and the introduced little owl. These features should be identified and used to inform how trees and vegetation are managed on a case-by-case basis though consultation with Council's Parks Biodiversity team.

**Establish authentic planting:** The fine scale topography discussed above provides the basis for a mosaic of vegetation patterns that include pukio sedge, harakeke and kiokio fern (Blechnum minus) flanked pools and wetlands, that grade into mikimiki (*Coprosma propinqua*) and manuka (*Leptospermum scoparium*) dominated shrubland. Beyond this, kahikatea (*Dacrycarpus dacrydioides*) and pokaka (*Elaeocarpus hookerianum*) dominated swamp forest (Appendix 1) will extend back to the toe of the terrace slope where it grades into totara (*Podocarpus totata*) and matai (*Prumnopits taxifolia*) dominated drier forest (Appendix 2).

NOTE: Species lists contained in Appendix 1 and Appendix 2 are taken directly from Lucas and Associates (1999) 'Indigenous Ecosystems if Otautahi-Christchurch', and contain an exhaustive list of plants that may have occurred on respective soil types across the city. However, generally the species compositions would have likely been much simpler, and floodplains would likely have been dominated by pukio sedge and harakeke with other species occurring far less commonly. Figure 4 (below) provides an example of relatively natural floodplain vegetation on the Otakaro-Avon River from 1859, showing a dominance of harakeke with scattered pukio sedge and toetoe (*Austroderia richardii*). Woody forest and shrubland vegetation would likely have largely been cleared prior to European colonisation.



Figure 4: Otakaro-Avon River, Christchurch, 1859, showing dominance of harakeke with scattered pukio sedge and toetoe.

**Introduce understorey plantings:** Toward the western end of the reserve native plantings have matured to a stage where under-planting of some of the more frost, sun, and wind sensitive species listed in Appendices 1 & 2 can be carried out. These types of plants, along with native vines and scramblers that require other plants for support, should be incorporated as secondary plantings wherever possible in order to help establish an authentic and fully functioning plant community and ecosystem. These types of plants will require additional care and maintenance over and above what the semi-mature plantings will be receiving and needs to be factored into maintenance work and/or contracts.

Manage access: Due to its wet nature and ease of access by local residents – particularly children and youth – the wet floodplain suffers from high levels of soil disturbance. This in-turn leads to increased sediment discharge into the Styx/Puharakekenui River. Therefore, key desire lines should be identified and enhanced to concentrate human activity on well-designed, less erodible paths, and the more disturbance-prone areas should be densely planted with appropriate wetland/floodplain species. These planted areas should receive a high degree of initial maintenance and care to ensure they a) establish well, and b) are seen and valued by the public as important infrastructure. Ideally, such planting should be done in parallel with the development and installation of interpretation material that highlights the plantings importance, and the local community should also be actively involved in any planting so that they are more inclined to value it.



## **Terrace face**

The north-facing terrace faces will be naturally drier and harsher in terms of growing conditions for establishing restoration plantings than the riparian margins, wet floodplains and even the upper terrace (refer below). While forest and shrubland restoration on the terrace face provides an important buffer to the waterway, and a continuum of habitats between the river and upper-terrace forest, it needs to be carefully planned to allow strategic views to the river from the Styx Source to Sea Walkway. Restoration on the terrace face has also been adversely affected by youth – and in some instances with the help of parents/adults – constructing mountain bike/BMX tracks through plantings resulting in established native trees being vandalized or completely removed. Therefore the terrace face zone needs careful consideration of a range of factors.

### Actions

**Identify strategic viewing points:** Despite is proximity to housing and the river corridor's current dominance of willow woodland, the Styx/Pūharakekenui River through this reach has high natural character and high landscape value. The river's aesthetics is therefore likely to be highly valued by the local community and park users, and therefore there will be a desire to identify, maintain and/or create high-quality views to key parts of the waterway from (e.g.) the Styx Source to Sea Walkway. These viewing sites should be preserved by selecting appropriate plant species that do not block strategic views, and by using other plant species to frame and emphasise these important views to the river.

**Manage access:** As with access through the floodplain (refer above), informal pathways and biking tracks have been formed at a number of locations along the terrace face, often impacting on both new and well established restoration plantings. Where considered appropriate, these access paths should be formalised and managed to reduce bank erosion. New plantings – particularly east of the playground need to consider access to the river via the terrace face. Any new plantings should consider temporary fencing to prevent path construction and to foster better/faster plant establishment.

**Apply mulch:** The north-facing terrace face will be exposed to all-day summer sun. Therefore, in addition to appropriate plant selection and temporary fencing, the use of mulch to control competitive weed growth and preserve soil moisture will likely be fundamental to restoration success. Therefore wherever willow is drilled and poisoned within the reserve (or nearby), and where the willow is chipped, it should be retained on-site for use on both the terrace face and upper terrace plantings. Mulch should be applied at a relatively uniform depth across planted areas of 100 mm (settled depth).

**Introduce woody debris:** Dead woody debris is a typical characteristic of forest understorey environments. It is important for wildlife refuge, invertebrate habitat, nutrient cycling, as a seedling regeneration growth substrate, conserving soil moisture, managing storm water runoff & erosion and for adding habitat complexity. Therefore wherever (e.g.) willow trees are felled, large logs should be incorporated into the terrace face and upper terrace also). However this must be carried out in such a manner that they will not roll downslope, and may entail partially burying logs into the terrace face to prevent their movement.

**Introduce understorey plantings:** As with maturing floodplain plantings described above, under-planting of frost, sun, and wind sensitive species can also be carried out in older plantings established along the terrace face. These types of plants, along with native vines and scramblers that require other plants for support, should be incorporated as secondary plantings wherever possible in order to help establish an authentic and fully functioning plant community and ecosystem. These types of plants will require additional care and maintenance over and above what the semi-mature plantings will be receiving and needs to be factored into maintenance work and/or contracts.



## Upper terrace

Restoration on the upper terrace should consider similar factors to those described for the terrace face. While views to the river will be less affected by restoration on the upper terrace than by planting the terrace face, it will still be impacted by pest plants, drought conditions and vandalism, and can be enhanced by addition of woody debris and mulch. In addition to these considerations, restoration of the upper terrace should focus on establishing authentic forest - particularly authentic *'forest edge'* - and enhancing habitat connectivity and reducing edge effects.

## Actions

**Increase native forest area:** The approved landscape plan for the reserve shows extensive native forest planting on the upper terrace. To date, approximately just 5500 m2 has been planted, however there is scope to establish an additional almost 1.5 ha as shown in Figure 5 (below), including:

- An additional 7500 m2 within the central area of the reserve, and included in the approved plan.
- An additional 1750 m2 of planting at the eastern end of the reserve to provide extra buffering between the reserve and the Northern Arterial Motorway (not included in the approved plan).
- An additional 5500 m2 on New Zealand Transport Authority (NZTA) land east of the reserve boundary. Note that this area was originally planted by NZTA as part of the motorway but has since suffered significant failure. Any panting in this area will require approval and liaison with NZTA, who may also be able to provide additional funding and/or other support.



Figure 5: Aerial of Redwood Springs showing extent of proposed upper terrace planting areas

Appropriate species for these upper terrace sites can be taken from the lists in Appendix 2. However, advice must be sought from council's Parks Unit ecologists to determine an appropriate species composition for these areas that is both ecologically authentic and acceptable aesthetically in such an urbanised setting.



**Establish authentic forest edges:** Although areas of upper terrace plantings have been established within the reserve and are now semi-mature, they are mostly composed of species that do not necessarily represent natural forest communities, much-less authentic natural forest edges. Natural forest edges are typically composed of small-leafed coprosmas (especially mikimiki - *Coprosma propinqua*), matagouri (*Discaria toumatu*), harakeke, manuka and ti kouka/cabbage trees (*Cordyline australis*) and various sedges, rushes and grasses. Great opportunity therefore exists to enlarge existing forest patches by establishing forest edge species in bands around existing forest blocks, and also incorporating more representative native tree species within those blocks to improve authenticity (Refer to Appendix 2 for species lists for the upper terrace).

**Improve connectivity between plantings:** Within the reserve on the upper terrace, a number of planted forest patches are separated from nearby planted areas by expanses of mown grass. The mown grass areas not only represent ongoing maintenance needs and associated carbon emissions, but they also fragment the native forest compartments resulting in a high edge effects (increased heat, wind, weeds, disturbance etc), and in-turn reduces potential for establishing core forest habitat. Therefore areas of open grass that separate planted areas should be assessed against their suitability and appropriateness for planting.

Manage public interface: Because the upper terrace forms the transition zone between the high-care amenity areas and the conservation areas (Refer Figure 2), thought needs to be given to how this transition zone can be managed in order for wider ecological restoration efforts to be more accepted by the local community. Therefore it is proposed that a higher level of management and maintenance should be afforded to the forest edge where it adjoins the high-care amenity zone. This can be achieved through a higher standard of weed management along this interface, and by planting the edges densely so that establishment is fast. Fast and dense establishment will also have the benefit of also restricting views to restoration areas beyond that will have a lower level of management in order to help facilitate natural processes to occur.



## Backswamp (Constructed) Wetlands

Within the reserve area, a series of wetlands have been artificially constructed to provide treatment of storm water run-off from nearby subdivisions. Storm water runoff is piped to the constructed wetlands where it passes through sedges and rushes before discharging into the Styx/Puharakekenui River. Although not natural wetlands, they have the potential to provide many of the values that natural wetlands provide if managed well. While the large upstream first-flush basin is well vegetated and likely functioning well, the older wetland cells nearer the playground are poorly vegetated and are unlikely to be operating to their full potential in terms of improving storm water quality. Therefore great potential exists to both improve the storm water treatment value of these wetlands, and their ecological potential, through establishing dense wetland vegetation that is well integrated into the other ecological zones within the reserve.

## Actions

**Retrofit wetland cells with ecological plantings:** Work with Council's land drainage operations team to agree on a planting scheme for the wetland cells nearest the playground. Despite their ephemeral nature, consideration should be given to replicating - as far as practicable - a natural lowland Canterbury wetland ecosystem that merges seamlessly with adjacent plantings. As with the proposal to establish natural forest edges in the upper terrace zone, natural wetland edges consisting of manuka, mikimiki, and harakeke etc should also be established within the constraints of the artificial bunds that confine the wetland cells. Council's land drainage engineers will need to provide advice on any planting on or near the bunds.

**Woody weed control:** Due to their damp and ephemerally flooded nature, these basins often provide the perfect growing conditions for a range of woody weed species including grey willow, alder (*Alnus spp*), birch (*Betula spp*), Sycamore (*Acer pseudoplatanus*), and others. If left un-checked, these trees have the potential to provide seed sources for their further spread, and also detract from the natural character and ecological authenticity & integrity of the wetlands. Furthermore, because they are mostly deciduous trees, they will continue to add increased volumes of leaf litter into the wetlands as they mature, with adverse effects of water quality. Therefore, these trees, and other non-native trees planted within the wetlands should be removed as soon as possible.

**Replace planted exotic conifers.** Exotic conifers have recently been planted around the margins of the wetland cells nearest the playground. As with the woody weed species discussed above, these planted trees have a range of adverse effects and should be removed and replaced with locally sourced native tree species including (e.g.) totara, kahikatea and/or matai. Because the wetland cells fall within the conservation zone (Refer Figure 2), no further planting of exotic trees or other exotic vegetation must be carried out with the these zones.



## Wai puna/springheads

At least two shallow wai puna/springs that support a number of native snails and crustaceans occur within the Styx Esplanade Reserve. At the extreme western end of the reserve, a significant natural wai puna vent arises in a pool that is partially surrounded by a viewing platform and deck (Figure 6). A second smaller wai puna east of the playground has recently been buffered with plantings of pukio sedge.

While the area around the larger western wai puna is very popular with local families – including bathing in the pool formed by the wai puna – little attempt has been made to fully naturalise the feature. Manawhenua, via the Mahaanui Iwi management Plan recommend that a 30 m buffer be established around natural wai-puna, and while this standard is met to the south of the feature, the remaining sides remain largely un-buffered. A similar wai puna that has been recently restored on the Ka Putahi Creek serves as a potential example of how the Styx Esplanade Reserve wai puna could be restored, however early engagement with manawhenua will be needed in terms of cultural advice and direction.



*Figure 6:* Viewing platform and sculptural element around significant wai puna/spring at western end of the Styx Esplanade Reserve (Source: Christchurch City Council).

### Actions

**Engage with manawhenua:** Discuss appropriate restoration of these significant cultural sites with manawhenua representatives at an early stage. The following actions may therefore change following this consultation.

**Establish buffer:** Establish a wide buffer of eco-sourced indigenous wetland vegetation around all wai puna. As with the floodplain wetlands (refer above), the vegetation sequence should represent a natural transition from pukio sedge/harakeke/mikimiki/Manuka margin through to kahikatea/pokaka-dominated swamp forest. Over time, and as vegetation matures, other species such as (e.g.) kiokio fern and swamp nettle (*Urtica persconfusa*) can be introduced.



**Restore natural character:** Around the large wai puna at the western end of the reserve, a large viewing platform structure and sculptural element has been constructed a part of the approved landscape plan for the reserve. The viewing platform structure is intended to incorporate interpretation material about the significance of the wai puna and information about the reserve in the context of the wider river system. However, unfortunately these elements significantly impact on the natural character and natural ambience of the springhead and its setting, and thought therefore needs to be applied in terms of how this significant feature of the reserve could be managed into the future. Options may include:

- Establishing significant planting to reduce the overall visual dominance of the built structures
- Reducing the scale of the decking by removing upper tiers
- Not replacing the decking and/or sculptural elements at the end of their life

## Small spring-fed waterway

A 380 m ephemeral swale that originally ran from the western end of Coolspring Way and discharged into the stormwater wetlands near the playground, was re-charged with permanent base flow during the construction of the first-flush stormwater basin at the western end of the reserve in 2012. The construction of the first flush basin meant that the unnamed waterway was shortened to approximately 250 m in length, but now receives permanent base flow that is piped from a spring in Murchison Park via an artificial spring at its western end.

Following the construction of the stormwater basin and introduction of base flow, cobbles were introduced to the bed of the waterway, the entire true left bank (north side) of the stream was restored with native riparian planting. However, only approximately 40 m of the south side of the stream has so-far been planted, and mowing currently occurs to the water's edge.

#### Actions

**Restore connectivity to river:** Because the stream discharges to the Pūharakekenui/Styx River via stormwater treatment wetlands, there may not be a good physical connection to the river for fish and aquatic invertebrate movement and dispersal. Therefore there is a need to work with councils land drainage team and waterways ecologists to investigate if connectivity is either possible or desirable. If connectivity may be desirable, develop a plan to remediate any barriers to fish and aquatic invertebrate movement.

**Construct fine-scale stream morphology:** Currently, the steam bank profiles and low-flow channel throughout the length of the stream are relatively uniform and are therefore not representative of an authentic lowland natural waterway. Therefore opportunity exists to work with council's waterway ecologists and environmental engineers to develop some design interventions to add a higher degree of complexity to the steam. These may include:

- Construction of small pools runs and riffles to create a pool-run-riffle sequence,
- Introducing a higher degree of sinuosity through minor bank re-shaping,
- Introducing more diverse stream profiles through creating floodplains and/or steepening streambanks,
- Introducing woody debris (e.g. totara stumps and logs) and boulders for habitat complexity.

**Plant true right bank:** Opportunity exists to continue riparian planting along the remaining unplanted >200 m of the south side of the waterway. Establishing planting along these sections would provide more effective waterway shade, riparian habitat, and reduce requirements for mowing. Note that this riparian planting will merge seamlessly with the upper terrace plantings proposed west of the playground (Refer to upper terrace planting section, above).



**Engage Community:** Because of the relatively fine scale interventions that are required to carry out most of the actions listed above, restoring this small stream may be ideally suited to a well-supervised, community-led waterway restoration project. Therefore, in the first instance there is a need to determine what interventions could be done by the community, and include these actions into a program of community activities. Adding these activities to such a program may create increased interest from the community, and also help retain volunteers who may otherwise become bored if community input is solely focused on planting and weed control activities.

## Amenity areas

The high-care amenity management zones shown in Figure 2 occupy a relatively small proportion of the reserve compared to the existing and proposed conservation zones. They mainly comprise mown amenity turf, the playground and its associated plantings, specimen trees, community gardens, plantings recently established at the eastern end of the reserve as a buffer for the motorway, and amenity plantings along the Willowview Drive frontage.

#### Actions

Manage pest plants: Continue to survey for, and respond immediately to any biodiversity pest plants that establish in amenity plantings throughout the reserve area.

**Provide advice on amenity plantings:** Council ecologists should provide advice on any plantings proposed for the reserve amenity zone - including the playground - to ensure that plant species being introduced will not have the potential to become biodiversity pest plants should they establish in the river corridor and associated conservation zones. Council ecologists should also be able to provide advice to members of the community who are using the reserve for community gardening, and be able to review species lists and approve and/or decline the cultivation of certain species that could potentially spread to the corridor



## North side of river (private land)

Immediately opposite the Styx Esplanade Reserve, the north side of the river is characterised by a dense stand of crack willow on a variable width wet floodplain that spans the length of the reserve. Beyond the floodplain, the terrace face is dominated by blackberry and willow that transitions abruptly into cultivated land on Radcliffe Road. This land is entirely in private ownership and permission and close liaison with the landowner/manager will therefore be required.



# Threats to biodiversity

## Pest plants

The Council has a legal obligation to protect and maintain indigenous biodiversity under the Resource Management Act (1991). A number of documents have been developed to assist Council in meeting those obligations. Regarding pest plant management, the Canterbury Regional Pest Management Plan (RPMP) is the regulatory document for pest management across the region. The Council has a legal obligation to meet the rules set out in this plan, and additionally works with Environment Canterbury to help achieve objectives in the plan when rules are not set.

Council has a legal obligation under the RPMP to control pest plants that are known to occur at the Styx Esplanade Reserve as listed in Table 1. These, and any other plants listed in the RPMP shall be controlled, and reported back to the Parks Biodiversity Team for reporting on to ECan.

Common Name	Botanical Name	Strategy
Old man's beard	Clematis vitalba	Eradication
Scotch broom	Cytisus scoparius	Eradication
Gorse	Ulex europeaus	Eradication
Wilding conifers	Pinus spp, Cupressus spp	Eradication

Given the urban nature and relatively small size of the Styx Esplanade Reserve, all four species listed in Table 1 should be easy to eradicate from this reserve.

In addition to the species outlined in the RPMP, there are a number of other pest plant species that can threaten Council owned and managed land and should be a priority for control. Species occurring at the Styx Esplanade Reserve, and listed in decreasing order of priority in Table 2 (below).

Table 2: Other post plants pot listed in	the Cantor	hury Pogion	al Post Manaa	omont Plan (PDMP)	but are known to occ	sur at Podwood Springs
Tuble 2. Other pest plunts not listed in	the cunter	bury Region	uti est munug		but the known to oct	ur ut neuwoou springs

Common Name	Botanical Name	Strategy
Yellow flag iris	Iris pseudacorus	Eradication
lvy	Hedera helix	Eradication
Grey willow	Salix cinerea	Eradication
Sycamore	Acer pseudoplatanus	Eradication
Alder	Alnus spp	Eradication
Karo	Pittosporum crassifolium, and P. ralphii	Eradication
Blackberry	Rubus fruiticosa	Manage
Male fern	Dryopteris flix-ma	Eradication
Crack willow	Salix fragilis	Manage
Elderberry	Sambucus nigra	Eradication

As with those plants listed in the RPMP, most of the species listed in Table 2 should also be easy to eradicate from the reserve in the short-term, with the likely exception of blackberry and crack willow. These two species are more likely to be controlled to levels where they do not significantly adversely affect biodiversity values, and prevented from spreading to new parts of the reserve

Advice on the best control methods for different species of pest plants can be found on the Weedbusters website: <u>https://www.weedbusters.org.nz/weed-information/weed-list/</u>.



## Pest animals

#### Mammalian pests

Because rabbits and hares are not present within the reserve, and habitat has not yet established to the point that it supports valuable wildlife populations that might be threatened by mammalian predators, currently no pest animal control occurs at Redwood Springs. However as ecosystem restoration proceeds and as good wildlife habitat does establish, there may be opportunity to consider a Council-supported/community-led predator control programme to complement similar programmes occurring elsewhere in the Styx/Pūharakekenui River catchment (Styx Mill Conservation Reserve, Te Waoku Kahikatea, Sheppards Stream, and Brooklands).

Pest animals likely to occur within the site may include:

- Brushtail possum
- Ship rat
- Black rat
- Mouse
- Ferret
- Stoat
- Weasel
- Hedgehog
- Cats (domestic & feral)

**Control:** Of the species listed above, the rats, mice, mustelids (ferrets, stoats and weasels) and hedgehogs can be effectively controlled through trapping using DoC-200 kill-traps as used at the other Styx/Pūharakekenui River sites. However given the very close proximity to the residential neighbourhood of Redwood Springs, traps that target possums and feral cats will also likely accidentally trap domestic cats and therefore need to be avoided. Instead, self-setting A—24 traps should be deployed for targeting possums, and live-traps placed and checked daily for feral cats if they are detected and become a problem at the reserve.

#### Dogs

Dogs are a known cause of significant wildlife disturbance in natural areas. However, as for domestic cats, it is anticipated that dogs will be a regular occurrence within the conservation zones of the reserve, particularly along the source-to-sea walkway and at river access points.

**Control:** Preventing wildlife disturbance by dogs in the context of the Styx Esplanade Reserve is best achieved through the following means:

- Maintaining good buffering between the Styx Source-to-Sea Walkway and the river
- Interpretation signage highlighting the effects dogs may have on wildlife
- Enforcing a dogs-on-leads bylaw within the conservation zones (Figure 2) of the reserve.
- Restricting dog access to the river to designated sites
- Public education



# **Implementation** Plan

## Willow control

Description	Funding	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	Total
Remove fallen willow from river channel downstream from playground	CCC LD	\$1000					\$1000
Drill and poison all willow trees <400 mm diameter between formed pathway and riverbank upstream from playground (approximately 1.5 ha). Fell and chip all poisoned and dead willow	CCC LD	\$12,500					\$12,500
Eradicate all crack and grey willow from planted areas on terrace face, upper terrace, stormwater ponds and spring- fed waterway	SLLT	\$1500					\$1500
Drill & poison all willow trees <400 mm diameter on private land along TLB of river (approximately 2.5 ha). Fell and chip trees that may damage stock fencing or cause conveyance issues	SLLT	\$7500	\$7500				\$15,000
Fell large willows overhanging	CCC Parks	\$2500	\$2500	\$2500	\$2500	\$2500	\$12,500
Follow-up control of residual willows from floodplain areas	SLLT	\$2500	\$2000	\$1500	\$1000	\$1000	\$8000

## Riparian & floodplain restoration

Description	Funding	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	Total
Establish <u>new</u> riparian planting	SLLT	\$12,500					\$12,500
at 1 m centers (5 m wide)							
throughout length of TRB							
upstream from playground							
Establish <u>new</u> floodplain	SLLT		\$10,000	\$10,000	\$5000	\$5000	\$30,000
wetland planting on floodplain							
in willow understorey (8500							
m2). Includes site preparation							
and plant guards							
Establish understorey	CCC		\$1500	\$1500	\$1500	\$1500	\$6000
secondary species requiring	Parks						
shelter/shade							



## Terrace face & upper terrace planting

Description	Funding	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	Funding
Establish understorey secondary species requiring	CCC Parks		\$1500	\$1500	\$1500	\$1500	\$6000
shelter/shade							
Extend/enlarge existing forest planting patches in-line with approved landscape plan (7500 m2) with plants at 1.5 m centers.			\$10,000	\$10,000	\$10.000		\$30,000
Supply mulch for planting extensions (7500 m2)	CCC Parks		\$5000	\$5000	\$5000		\$15,000
Supply plants and establish 4000 m2 forest at 1.5 m centers within NZTA corridor	SLLT & NZTA			\$15,000			\$15,000

K

## Access

Description	Funding	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	Funding
Create 'beach' access area immediately adjacent playground area	Pap Innes Comm' Board		\$5000				
Construct 2.6 m wide section of Styx Source to Sea walkway to link existing walkway to NZTA Northern Arterial Motorway shared pathway (470 m)	CCC Annual Plan		\$65,000				
Construct boardwalk-style bridge across river beneath railway line to link Styx River Esplanade Reserve with section of CCC Regional Park	CCC Annual Plan			\$25,000			
Construct 150 m length of informal path within floodplain area to allow access to river upstream of playground and to reduce erosion	CCC Parks				\$10000		



# Appendix 1: Species lists - floodplain and riparian corridor



#### KAHIKATEA – kereru – manatu, lush, older plains ecosystem

Food for native birds: F = Fruit S = Bird Seed N = Nectar B = Bud/foliage I = Insects For lizards: L = fruit

Plant Tolerances

= tolerates or needs

= intolerant

<sup>1</sup>/<sub>2</sub> = tolerant of some

\* = to establish, protect from frost t = toxic for toddlers

Staging 1 = 1<sup>st</sup> structural 2 = 2<sup>rd</sup> year 3 = only after canopy closure

PLANT LISTS Selected from vegetation natural to these wet Taitapu soils.

			Tolerances	
TALL (NOBLE) TREES (> 1	2 m)	Food	sun shade wet dry wind	Stages
Alectryon excelsus	titoki	F,I	¥≤ ∎ ¥≤ ¥≤ □	3*
Cordyline australis	ti kouka, cabbage tree	F,N,I	∎ 1⁄2 ■ ■ ■	1
Dacrycarpus dacrydioides	kahikatea, white pine	F	∎ ⅔ ∎ 🗆 ∎	2
Elaeocarpus dentatus	hinau	F,I	¥≤ ¥≤ ¥≤ ¥≤ □	3*
Elaeocarpus hookerianus	pokaka	F,I	¥₂ ∎ ∎ ¥₂ □	2
Pittosporum eugenioides	tarata, lemonwood	F,I	■ ■ <sup>3</sup> ⁄2 ■ <sup>3</sup> ⁄2	1
Plagianthus regius	manatu, lowland ribbonwood (deciduous)	I,B	∎ <del>1</del> ≤ 1≤ 1≤ ∎	1
Podocarpus totara	totara	F	∎ \$≤ \$≤ ■	2
Prumnopitys ferruginea	miro	F		3
Prumnopitys taxifolia	matai, black pine	F	∎ <sup>1</sup> / <sub>2</sub> ∎ <sup>1</sup> / <sub>2</sub> ∎	2
Pseudopanax crassifolius	horoeka, lancewood	F,B,N,I	∎ <del>1</del> ⁄2 <del>1</del> ⁄2 <b>■</b> ■	2
Sophora microphylla	kowhai	N,B	∎ ¥≤ ¥≤ ∎ ∎ t	2
SMALL TREES & TALL SH	RUBS (> 5 m)			
Aristotelia serrata	makomako, wineberry (semi-decid)	F,I,B	¥₂ ¥₂ ¥₂ ¥₂ □	2
Carpodetus serratus	putaputaweta, marbleleaf	F,I	ಾ≊ ∎ ಾ≊ ಾ≊ ⊓	2
Coprosma areolata	net-leaved coprosma	F,B	⅔ ∎ ∎ ⅔ 🗆	2*
Coprosma linariifolia	linear-leaved coprosma, yellow-wood	F	¥⊴ ∎ ¥⊴ ¥⊴ ¥⊴	2
Coprosma lucida	shining karamu	F	¥₂ ∎ ¥₂ ¥₂ ∎	2
Coprosma robusta	karamu	F	■ ■ <b>¥</b> 2 ¥2	1
Coprosma rotundifolia	round-leaved coprosma	F,B	¥₂ ∎ ∎ ¥₂ ¥₂	2*
Fuchsia excorticata	kotukutuku, tree fuchsia (decid)	F,N,B	1/2 ■ ■ □ □	3*
Griselinia littoralis	kapuka, broadleaf	F,I	∎ <sup>1</sup> ⁄2 ■ ■	2
Hedycarya arborea	porokaiwhiri, pigeonwood	F,I	1⁄2 ■ 1⁄2 🗆 🗆	3*
Hoheria angustifolia	houhere, narrow-leaved lacebark (semi-dec)	1	∎ <del>1</del> ⁄2 <del>1</del> ⁄2 <b>■</b> ■	1
Leptospermum scoparium	manuka, tea tree	1		1
Lophomyrtus obcordata	rohutu, NZ myrtle	F,I	1⁄2 ∎ 1⁄2 1⁄2 ∎	2
Melicytus micranthus	manakura, shrubby mahoe	F,I	1⁄2 ∎ 1⁄2 1⁄2 □	3
Melicytus ramiflorus	mahoe, whiteywood	F,L,I	¥≤ ∎ ¥≤ ¥≤ ¥≤	3*
Myrsine australis	mapau, red mapau	F,L,I	12 12 12 12	3*
Neomyrtus pedunculata	rohutu, NZ myrtle	F,I	⁵₂ ∎ ∎ □ □	3*
Pennantia corymbosa	kaikomako, ducksfeet	F,N,I	¥≤ ∎ ∎ ¥≤ ¥≤	2
Pittosporum tenuifolium	kohuhu, black matipo/mapau, tawhari	F,I	∎ ∎ <sup>1</sup> ⁄2 ■ ■	1
Pseudopanax arboreus	fivefinger, whauwhaupaku	F,N,I	■ ■ □ ½ ½	2
Pseudowintera colorata	horopito, peppertree	F,N,I	■ ■ ■ □ <sup>1</sup> ⁄2	2
Schefflera digitata	patete, seven-finger	F,I,B	¥₂ □ ¥₂ □ □	3*



3 3

			Tolerances	6
CLIMBERS & VINES		Food	sun shade dry wind	Stages
Clematis forsteri	yellow clematis	I. I.	¹½ ¹½ □ ¹½ ¹½	3
Clematis paniculata	puawananga, bush/white clematis	I.	½∎ ½ □ □	3*
Parsonsia capsularis	kaiwhiria, NZ jasmine	I.	■ ■ <sup>1</sup> / <sub>2</sub> <sup>1</sup> / <sub>2</sub> ■	3
Parsonsia heterophylla	kaiwhiria, NZ jasmine	I. I.	∎ ∎ <sup>1</sup> ⁄2 ■ ■	3
Passiflora tetrandra	kohia, NZ passionvine	I.	□ ■ ½ □ ½	3*
Ripogonum scandens	kareao, supplejack	F,I	¹∕₂ ∎ ¹⁄₂ □ ¹⁄₂	3*
Rubus australis	taramoa, bush lawyer	F,I	1/2 ■ ■ □ □	3
Rubus cissoides	not in Riccarton!	F,I	¥₂ ¥₂ ¥₂ □ ¥₂	2
Rubus schmidelioides	taramoa, narrow-leaved lawyer	F,I	∎ ½ ½ ∎ ∎	2
SHRUBS & SCRAMBLE	RS			
Calystegia tuguriorum	powhiwhi, NZ bindweed	1	■ <sup>1</sup> ⁄ <sub>2</sub> □ <sup>1</sup> ⁄ <sub>2</sub> ■	2
Coprosma rhamnoides	red-fruited mikimiki	F,L	□ ■ 1⁄2 1⁄2 1⁄2	3*
Coprosma propinqua	mikimiki, mingimingi	F,L	∎ <sup>1</sup> ⁄2 ■ ■ ■	1
Coprosma rubra	red-stemmed coprosma	F,L	∎ 3⁄2 3⁄2 3⁄2 ∎	1
Hebe salicifolia	koromiko	1	■ □ □ <sup>1</sup> ⁄2 ■	1
Fuchsia perscandens	climbing fuchsia	F,L,N,I,	<u>≯</u> ₂ <u>≯</u> ₂ □ <u>≯</u> ₂ <u>≯</u> ₂	3*
Melicope simplex	poataniwha	F,I	⅔ ∎ ⅔ ⅔ ∎	3
Metrosideros diffusa	white/climbing rata	1	□ ■ ½ □ □	3*
Myrsine divaricata	weeping mapou	F,L,I	¥₂ ⅔ ∎ ⅔ ∎	2
Olearia bullata	crinkly shrub daisy	S,I	∎ <sup>1</sup> ⁄2 ∎ <sup>1</sup> ⁄2 ∎	
Pseudopanax anomalus	shrub pseudopanax	F,N	⅔ ∎ ⅔ □ ⅔	3
Rubus squarrosus	leafless lawyer	F,L,I	∎ <sup>1</sup> ⁄2 □ ■ ■	2
Urtica ferox	ongaonga, tree nettle	1	½∎ □ ½ □	3*
PERCHING PLANTS & I	PARTIAL PARASITES			
Asplenium flaccidum	raukatauri, hanging spleenwort	в	1⁄2 ■ □ □ □	3
lleostylus micranthus	NZ mistletoe	F,N,B		3
Korthalsella lindsayi	dwarf mistletoe	1		3

lleostylus micranthus	NZ mistletoe	F,N,B	
Korthalsella lindsayi	dwarf mistletoe	I.	
Pyrrosia elaeagnifolia	leather-leaf fern		
Tupeia antarctica	NZ mistletoe	F,I	

#### GROUNDCOVER HERBS & 'GRASSES'

Acaena anserinifolia	piripiri, bidibidi	S,I	■ <sup>1</sup> ⁄2 □ <sup>1</sup> ⁄2 ■	3
Anemanthele lessoniana	hunangamoho, bamboo/wind grass	s	🔳 🔳 🗆 ½ 🔳	2
Astelia fragrans	kakaha, bush flax	F,I	■ ■ <sup>1</sup> /2 <sup>1</sup> /2 ■	2
Astelia grandis	kakaha, swamp flax	F,I	<b>•</b> • • <sup>1</sup> / <sub>2</sub>	1
Carex cockayneana	forest sedge	s	■ ■ 3⁄2 3⁄2 ■	3
Carex forsteri	forest sedge	S	■ ■ <del>1</del> ⁄2 <del>1</del> ⁄2 ■	3
Carex lambertiana	forest sedge	S,	■ ■ <del>1/</del> 2 <del>1/</del> 2 ■	3
Carex secta	pukio	s		1
Carex solandri	forest sedge	s	■ ■ <sup>1</sup> / <sub>2</sub> <sup>1</sup> / <sub>2</sub> ■	3
Carex virgata	swamp sedge	s	∎ <sup>1</sup> /2 ■ <sup>1</sup> /2 ■	1
Cortaderia richardii	toetoe	s		1
Cyperus ustulatus	upoko-tangata, umbrella sedge	s	🔳 🗆 🖶 ½ 🔳	1
Deschampsia caespitosa	tufted hair grass	s	🔳 🗆 🖶 😼 🔳	1
Dianella nigra	turutu, blue berry	F,I		2
Echinodium hispidum	moss		□ ■ <sup>1</sup> ⁄2 <sup>1</sup> ⁄2 □	3
Gahnia xanthocarpa	giant gahnia	s	⁺≤ ∎ ⁺≤ ⁺≤ □	3
Hypnum cupressiforme	moss		¹₂ ∎ ¹₂ ∎ ∎	3
Juncus distegus	wiwi, tussock rush	S	🔳 🗆 🖶 😼 📕	1

			Tolerances		
		Food	sun shade wet wind wind	Stages	
Juncus edgareae	wiwi, tussock rush	s	■□■⅔■	1	
Juncus sarophorus	wiwi, tussock rush	S		1	
Libertia ixioides	mikoikoi, NZ iris	F,I		3	
Microlaena avenacea	bush rice grass	S	0 🔳 🖬 🧏 🧏	3	
Nertera depressa	nertera	F,I	1∕2 ■ 1⁄2 1⁄2 ■	3	
Parietaria debilis	NZ pellitory	1	¥≤ ∎ 🗆 ¥≤ ¥≤	3	
Phormium tenax	harakeke, NZ flax	N,L		1	
Pratia angulata	panakeneke, creeping pratia	F,I	■ <sup>1</sup> 5 <sup>1</sup> 5 <sup>1</sup> 5 ■	1-3	
Ranunculus reflexus	NZ buttercup	S,I	0 🗖 0 ½ 0	3	
Stellaria parviflora	NZ stitchwort	S,I		3	
Thuidium sparsum	moss			3	
Uncinia leptostachya	matau, hooked sedge	S	⁵≤ ■ ■ □ ⁵≤	3	
Uncinia uncinata	watau/kamu, hooked sedge	S	¥≤ ∎ ¥≤ ¥≤ ¥≤	3	
Urtica incisa	dwarf nettle	1	⅔ ∎ □ ⅔ □	3	

#### **GROUND & TREE FERNS**

Asplenium flabellifolium	necklace fern	В	⁵₂ ∎ □ ∎ □	3*
Asplenium gracillimum	makau, graceful spleenwort	в	¹₂ ∎ ¹₂ ¹₂ □	3*
Asplenium terrestre	ground spleenwort	в	<sup>1</sup> ⁄2 ■ □ ■ □	3*
Blechnum chambersii	kiokio, a hard fern		□ <b>■ <sup>1</sup>⁄2</b> □ □	3*
Blechnum discolor	piupiu, crown fern		□ <b>■</b> <sup>1</sup> / <sub>2</sub> □ □	3*
Blechnum fluviatile	kiwakiwa, creek fern		□ ■ ½ □ □	3*
Blechnum novae-zelandia/minus	swamp kiokio			2
Blechnum penna-marina	kiokio, little hard fern		■ ■ <sup>1</sup> / <sub>2</sub> ■ <sup>1</sup> / <sub>2</sub>	3
Cyathea dealbata	ponga, silver (tree) fern		¹₂ ∎ □ ¹₂ □	3*
Cyathea smithii	katote, soft tree fern		¥₂ ∎ ¥₂ 🗆 🗆	3*
Dicksonia fibrosa	kuripaka, wheki ponga - tree fern		1⁄2 ■ ■ □ □	3*
Dicksonia lanata	tuokura, woolly tree fern		¹₂ ∎ ¹₂ □ □	3*
Dicksonia squarrosa	wheki, rough tree fern		<sup>1</sup> ∕2 ■ <sup>1</sup> ∕2 <sup>1</sup> ⁄2 □	2
Histiopteris incisa	mata, water fern		¥₂ ∎ ¥₂ 🗆 🗆	3
Hypolepis ambigua	rough pig fern		1⁄2 ■ ■ 1⁄2 1⁄2	3
Hypolepis rufobarbata	sticky pig fern		1∕2 ∎ 1⁄2 1⁄2 1⁄2	3
Lastreopsis glabella			□ <b>■</b> <sup>1</sup> ⁄2 □ □	3*
Leptopteris hymenophylloides	heruheru, crape fern		□ ■ ½ □ □	3*
Pellaea rotundifolia	tarawera, button fern		<sup>1</sup> ∕2 ■ □ ■ □	3
Microsorum pustulatus	maratata, hounds tongue fern		1/2 ■ □ ■ □	2
Polystichum vestitum	puniu, prickly shield fern		■ ■ ■ □ <sup>1</sup> ⁄2	2
Polystichum zelandica/richardii	pikopiko/tutoke, shield fern		<sup>1</sup> ⁄2 ■ □ ■ □	2
Pneumatopteris pennigera	pakau-roharoha, gully fern		□ <b>■</b> <sup>1</sup> / <sub>2</sub> □ □	3*

Note Use plants propagated from wild populations and ask for natural local species rather than cultivars. 1. Don't use the common North Island lacebarks (Hoheria populnea or Hoheria sextylosa) as they hybridise with the natural local narrow-leaved

lacebark (Hoheria angustifolia). 2. The common grown Golden Totara is a sterile hybrid and therefore does not produce berries, food for birds.



Underlayers: Clay & sand alternating on silt over greywacke river stones (2-100mm rounded) with some peat.

© Christchurch Otautahi Indigenous Ecosystems, Lucas Associates, updated 2011

# Appendix 2: Species lists – terrace face and upper terrace



#### HOUHERE - piwakawaka - kohuhu, mid age plains system

PLANT LISTS Selected from vegetation natural to these moist & deep Waimakariri soils

Food for native birds: F = Fruit S = Bird Seed N = Nectar B = Bud/foliage I = Insects For lizards: L = fruit

Plant Tolerances

= tolerates or needs

🗆 = intolerant

1/2 = tolerant of some

\* = to establish, protect from frost t = toxic for toddlers

Staging 1 = 1<sup>st</sup> structural 2 = 2<sup>nd</sup> year 3 = only after canopy closure

#### Tolerances ę D

16 🔳 16 16 16

1/2 1/2 □

12 12 12

36 36 36

1/3 1/3

3∕≤ ■ ■

32 ∎ □ 32 32

■ <del>1</del>⁄2 1⁄2 ■ ■

¹≤ □ ■ ■

¹₂∎∎∎

■ <del>1</del>⁄2 <del>1</del>⁄2 <del>1</del>⁄2 ■

¥≲∎∎

1∕2 1∕2 ∎

1∕2 ∎ ∎

⅓ ⊓ ∎ ∎

1

2

3

3\*

3\*

3\*

1

2

1

2

3

3

3

2

2

1

1

1

1

F,I

F,L

TALL (NOBLE) TREES (> 10 m)			sun sha wet win	Stages
Cordyline australis	ti kouka, cabbage tree	F,N,I	<b>B</b> <sup>1</sup> / <sub>2</sub> <b>B B B</b>	1
Hoheria angustifolia	houhere, narrow-leaved lacebark (semi-decid)	1	■ <sup>3</sup> ⁄2 <sup>3</sup> ⁄2 ■ ■	1
Kunzea ericoides	kanuka	1		1
Pittosporum eugenioides	tarata, lemonwood	F	■ ■ ¥s ■ ¥s	1
Plagianthus regius	manatu, lowland ribbonwood (deciduous)	F,I	■ 35 35 35 <b>8</b>	1
Podocarpus totara	totara	F	■ ¥5 ¥5 ■ ■	2
Prumnopitys taxifolia	matai, black pine	F	■ <sup>1</sup> ⁄2 ■ <sup>1</sup> ⁄2 ■	2
Pseudopanax crassifolius	lancewood, horoeka	F,N,B,I	■ 32 32 ■ ■	2
Sophora microphylla	South Island kowhai	F,I	∎ 3⁄5 3⁄5 ∎ ∎ t	2
SMALL TREES & TALL	SHRUBS (> 3 m)			
Carpodetus serratus	putaputaweta, marbleleaf	F,I	⅔ ∎ ∎ ⅔ 🗆	2
Coprosma linariifolia	linear-leaved coprosma, yellow-wood	F	¥₂ ∎ ¥₂ ¥₂ ¥₂	2
Coprosma robusta	karamu	F	■ ■ ■ <sup>1</sup> / <sub>2</sub> <sup>1</sup> / <sub>2</sub>	1
Dodonaea viscosa	akeake	1	∎ <sup>1</sup> ⁄2 □ ■ ■	1-2*
Griselinia littoralis	kapuka, broadleaf	F,I	∎ ∎ <sup>1</sup> /2 <b>■</b> ■	2

Leptospermum scoparium Lophomyrtus obcordata Melicytus micranthus Melicytus ramiflorus Myoporum laetum Myrsine australis Olearia paniculata Pennantia corymbosa Pittosporum tenuifolium Pseudopanax arboreus

#### manakura, shrubby mahoe F,I mahoe, whiteywood F,L,I ngaio F,I mapau, red mapau F,L,I akiraho, golden akeake I, S kaikomako, ducksfeet F,N,I kohuhu, black matipo/mapau, tawhari F,I fivefinger, whauwhaupaku F,N,I CLIMBERS & VINES yellow clematis I. Parsonsia capsularis kaiwhiria, NZ jasmine I. Parsonsia heterophylla kaiwhiria, NZ jasmine I. Rubus schmidelioides taramoa, narrow-leaved lawyer F,I SHRUBS & SCRAMBLERS Calystegia tuguriorum powhiwhi, NZ bindweed Ľ. Coprosma crassifolia thick-leaved mikimiki F,L Coprosma propingua mikimiki, mingimingi F,L

red-stemmed coprosma

manuka, tea tree

rohutu, NZ myrtle

21/1819479 | Page 26

Coprosma rubra

Clematis forsteri

			Tolerances	
		Food	sun shade wet dry wind	Stages
Coprosma virescens	pale green coprosma	F,L	∎ <sup>1</sup> ⁄2 <sup>1</sup> ⁄2 ■ ■	1
Hebe salicifolia	koromiko	I.	■ □ □ ½ ■	1
Helichrysum lanceolatum	niniao	I.	∎ <sup>1</sup> ⁄2 🗆 ■ ■	2
Leptecophylla juniperina	prickly mingimingi	F,I	<sup>1</sup> ∕2 ■ □ ■ ■	2
Leucopogon fasciculatus	dwarf mingimingi	F,I	¥₂ ¥₂ □ ¥₂ ¥₂	2
Melicope simplex	poataniwha	F,I	1∕2 ∎ 1⁄2 1⁄2 ∎	3
Muehlenbeckia astonii	shrub pohuehue	F,L,I		1
Muehlenbeckia complexa	scrambling pohuehue	F,L,I		1
Myrsine divaricata	weeping mapou	F,L,I	¥₂ ¥₂ ∎ ¥₂ ∎	2
Rubus squarrosus	leafless lawyer	F,L,I	∎ <sup>1</sup> ⁄2 □ ■ ■	2
Teucridium parvifolium	NZ shrub verbena	I.	■ <sup>1</sup> ⁄2 □ <sup>1</sup> ⁄2 ■	2
PERCHING PLANTS & PA	RTIAL PARASITES			
lleostylus micranthus	NZ mistletoe	F,N,B		3
Korthalsella lindsayi	dwarf mistletoe	1		3
Pyrrosia elaeagnifolia	leather-leaf fern			3
GROUNDCOVER HERBS	& 'GRASSES'			
Acaena novae-zelandiae	bidibidi, piripiri	S.I		2
Dianella nigra	turutu, blue berry	F,I		2
Dichondra repens	dichondra			
Hypnum cupressiforme	moss		¥₂ ∎ ⅔₂ ∎ ∎	3
Juncus distegus	wiwi, tussock rush	s	■ □ ■ <sup>1</sup> ⁄2 ■	1
Leucopogon fraseri	patototara, a dwarf heath	F , L,I	■ <sup>1</sup> /2 □ ■ ■	2
Libertia ixioides	mikoikoi, NZ iris	F,I		3
Microlaena polynoda	a rice grass	s	1∕2 ∎ 1⁄2 1⁄2 ∎	3
Microlaena stipoides	meadow rice grass	S	∎ ∎ <sup>1</sup> ⁄2 ∎ ∎	3
Parietaria debilis	NZ pellitory	1	¥₂ ∎ □ ¥₂ ¥₂	3
Stellaria parviflora	NZ stitchwort	S,I		3
Thuidium sparsum	moss			3
Urtica incisa	dwarf nettle	I.	1⁄2 ■ □ 1⁄2 □	3
GROUND FERNS				
Asplenium flabellifolium	necklace fern	В	½∎□∎□	3*
Asplenium terrestre	ground spleenwort	В	½∎□∎□	3*
Blechnum penna-marina	kiokio, little hard fern		∎ ∎ ¥2 ∎ ¥2	3
Hypolepis ambigua	rough pig fern		¥₂ ∎ ∎ ¥₂ ¥₂	3
Pellaea rotundifolia	tarawera, button fern		<sup>1</sup> ⁄2 ■ □ ■ □	3
Microsorum pustulatus	maratata, hounds tongue fern		½∎□∎□	2
Polystichum zelandica/richardii	pikopiko/tutoke, shield fern		¥₂ ∎ □ ∎ □	2
Pteridium esculentum	rahurahu, bracken fern		∎ \$≲ \$≲ ∎ ■	1



Underlayers: Alternating silt & sand (minor clay) on greywacke river stones (2-100mm rounded) on sand on more stones

© Christchurch Otautahi Indigenous Ecosystems, Lucas Associates, updated 2011

## **Appendix 3: Consultation material**



Community Planning for the Future November 2004

The purpose of this brochure is to outline plans for the Styx River Esplanade Reserve adjacent to Redwood Springs residential development and to provide you with an opportunity to comment.

#### BACKGROUND

The Styx River Esplanade Reserve is an area of 8.8784 hectares. The Styx River forms the Reserve's boundary to the north, with Willow View Drive and the new residential development of Redwood Springs determining its southern boundary. A designated motorway borders the east and the main north-south railway line forms the western boundary of the Reserve.

A number of springs along the river's edge are a feature of this stretch of the Styx River, as are the associated land forms and the 5 metre high terraces through which the river flows.

The higher land adjoining the Styx River was until recently used for dairying and horticultural purposes.

The Reserve forms part of a much larger green corridor associated with the Styx River extending from its source to the sea. Therefore any development of this Reserve also needs to be considered in conjunction with the long term objectives and aspirations of the overall plan.



Styx River location of Reserve highlighted in yellow motorway designation

-- railway line







View of Reserve from railway line Springs near railway line-Walnut trees and concrete foundations with Styx River in distance



#### LEGISLATIVE CONTEXT

CHRISTCHURCH CITY COUNCIL - YOUR PEOPLE - YOUR CITY

#### **Objectives of Development Plan**

- In developing the plan consideration was given to meeting the following objectives:
  - protect and enhance the ecological values associated with the Reserve, the Styx River and the greater Styx corridor
  - incorporate walkway linkages, not only as part of the Source to Sea walkway (Styx Vision No. 2), but to other community centres and focuses
- provide a wilderness experience that contrasts with the adjacent urban
- provide built structures that complement and enhance the Styx River experience and tell the stories of the land
- recognise the name of the adjacent residential development through making a special feature of the springs located near the railway line
- provide community and children's play areas
- provide public access to the water's edge
- minimise long term maintenance costs

- The Resource Management Act (1991) defines the purpose of "Esplanade Reserves" as areas that:
- · Contribute to the protection of conservation values
- · Enable public access to or along a river
- \* Enable public recreation where that use is compatible with conservation values
- Legislation that is relative to the management of this Reserve is contained in the Christchurch City Plan, the Long Term Council Community plan, the Resource Management Act and the Waterways and Wetlands Asset Management Strategy adopted by the Christchurch City Council in October 2000.
- It is important also to realise that any planning and development of this Esplanade Reserve must comply with the "40 year Vision for the Styx" developed as a result of extensive consultation and involvement by the community.





#### 1. Habitat Restoration

edges, rushes, harakeke, aupo, toetoe, mikimiki, fer

The development proposal recognises the existing wildlife values associated with the Reserve and aims, not only to enhance those values, but also people's enjoyment of them. Some habitat restoration has occurred at the western end of the Reserve where willow trees were removed and the banks and adjacent areas planted out in locally sourced native plants. Following expressions of concern it is now proposed that future habitat restoration will of concern it is now proposed that future habitat restoration will involve managing weed species; infill plantings, and a more gradual rate of removal of willow trees. The rate of removal will be dependent on the rate of growth of both infill and new plantings within the Reserve. Ongoing management will encourage the processes of decay and regeneration, through retaining trees stumps, debris, hollows and the limited, careful use of chemical sprays.

Sensitive consideration will be given to the needs of the bush and wetland birds in deciding the location of paths and public access to the River.

Plant species in the Conservation Zone will be based on the following model that has been developed for the Styx Catchment.





sadge - New - results	- bearing	tions	Treast in Frank	wheel .	Restation -	charred backs know
awanga -					Kennat	A figurian segretation
Walks an the second at a	and the second distant	of in the Destroy	and the second state and state	States marked by first	internet, his formed in firms	to Restant Amount of the last in most of the



#### Swale & Retention Basins

Stagnant water within the swale and the retention ponds within the erve has caused concern. Although the swale was regraded by the developer during the last stage of the residential development, the low gradient means that there is minimal fail to drain the storm water away.

Historically the large wetlands to the south drained towards the Avon River via the waterway we know today as Shirley Stream. Residential development during the 1970's that occurred to the south of Farquhars Road resulted in the headwaters of the Shirley Stream being redirected towards the Styx Rivers via a 27 inch (69 cm) pipe.

Investigations have shown that there is an opportunity to utilise this large amount of water by diverting it through the swale, rather than discharging it directly into the Styx River as currently occurs.

Options are outlined below and community views are being sought.

OPTION	ACTION	OUTCOME
One	Status quo	Stagnant water remains
Two	Increase maintenance of the swale	Damp mud bottom within swale
Three	Introduce water into the swale by pumping water from the existing large pipe underneath the Reserve	Continuous flow of water within swale
Four Introduce water into the Swale and treat storm w water from the catchment in through the construction e of another retention basin d near the existing large pipe		Continuous flow of water within swale PLUS improved quality of water entering the Styx River during storm events

#### 3. Source to Sea Walkway

It is proposed to construct a major walkway running approximately 1,200 metres east west through the Reserve following the course of the Styx River. Seating, views of the river, and explanation/interpretation points will be provided at various places along the path.

Part of the \*40 year Vision for the Styx\* developed in conjunction with the community, and adopted in 2001 by the City Council, provides for a continuous walkway from the source of the Styx River to the sea. Therefore, at some time in the future, this section of walkway within the Reserve will form part of a much larger walkway extending both east and west along the River.

Points at which pedestrians and cyclists could cross the River are also being considered both in the vicinity of the railway line and the proposed motorway.



# ne southern bank of the River consists of peaty codplain with vegetation in the area being grass flow trees, or replanted native plants. This are

ies to be an important habitat for bush an land birds. The development proposal indicate se locations along this stretch of waterway when ople can have direct access to the water's edg the use of pathways and letties.

Jetty incorporating seating area

#### 5. Feature Spring

The name of the adjacent residential development. Redwood Springs, derived its two part name firstly from a number of large redwood trees previously in the locality, and secondly because of the many springs along this stretch of the Styx River. At the western end of the Reserve there is a pond with a number of springs continuously bubbling up in it. While all of the rivers of Christchurch are spring-fed, there are few opportunities where the springs are as accessible for viewing as these. The proposed development of this area looks at making a safe feature of these springs.



'The Dairy Shed' consists of a large flat area at the eastern end of the Reserve where previously a homestead and farm buildings were located. This area also provides excellent views of the Styx River. The proposed development seeks to highlight the history of dairying in this location while at the same time providing places for children to play, public seating and picnic areas and views of the water. A large hedge at the eastern end of the Reserve will provide a visual and noise barrier to the proposed motorway that will eventually occur along the edge of the Reserve.

Viewing Platforms

The natural terrace provides a different perspective of the Styx River enabling people to look down on the river and the adjacent flood plain, a favourite area for nesting wetland birds. Foundations of some of the farm sheds located on the edge of the terrace have been retained and it is proposed that these will form the foundation of new viewing platforms.

Retaining and Conveying the stories of the Land An area on top of the terrace at the eastern end of the Reserve previously contained a farm house and buildings associated with a dairy farm. At one time dairying was the dominant use of land in the Styx Catchment. For many years father and son, Allan and Sam Farquhar, (after who Farguhars Road is named), each farmed on opposite sides of the river. The size of their dairying herds in the 1930's and 40's, normally about 60 milking cows, varies greatly with today's herds of up to 1,000 cows.

With the demise of dairy farming in recent years within the catchment it is proposed to 'tell the stories of the land' by creating features reminiscent of the activities of the past. These include fruit trees, artworks, seating and information/ interpretation.

#### Cow Track

Children in the early years of the 1900's spent many hours challenging themselves to ride their bikes along the narrow paths made as the cows trekked their way twice daily to and from the milking shed. Some of these paths were only 2 feet (60cm) wide and dangerously close to the river.

As part of the proposed walkway through this section of Reserve efforts will be made to replicate the twice daily trek by the dairying herd to the milking shed, although the track will be much wider than the original and the cows will be in the form of artworks rather than living examples











#### 7. Children's Play

The proposal provides for specific areas adjacent to the The proposal provides for specific areas adjacent to the 'Dairy Shed' to be developed as children's play areas. In addition to large grassed sections for ball games, an obstacle course and climbing ropes it is planned to include a safe area for water play by utilising an old water pump.

#### 8. Picnic areas

It is proposed to develop picnic areas and seating throughout the Reserve providing places to: sit and reflect,

- observe children at play, gather with friends and family, or
- play informal community games eg cricket or
- ball games on long summer evenings





"The nation behaves well if it treats the natural resources as assets which it must turn over to the next generation increased, and not impaired, in value." Theodore Roosevelt (1858-1919) 20th President of the lunied States



#### FEATURES OF THE SITE

This stretch of the Styx River features two distinct aquatic habitats: the main river which possesses deep strong flows and the adjacent springheads with gentle shallow waters flowing from them. The presence of substantial springs within the Reserve is a rare and interesting feature. With this diversity of aquatic habitats it can be expected that aquatic biodiversity will be high.

The main river stream contains both the longfin and shortfin eels, along with large common bullies, and the deeper water, with a variation of holes, makes this a suitable location for brown trout. The shallow spring flow is home to a number of native snails and crustaceares.

Native plants currently present include ferns, sedges, rushes, pohuehue vine and cabbage trees. Two locally rare species, a fern (Blechnum chambersii) and a carex (Carex maorica), are also found in this area. Weeds include old man's beard, grey willow, gorse and blackberry.

The River and surrounding riparian zone forms a natural corridor for bird life. A survey completed in October 1997 indicated 34 different bird species could be living and breeding in this area. Over half of these species are native to New Zealand and include the South Island fantail, NZ scaup, the pukeko and the white faced heron. Sixteen types of wetland birds were also identified and these include the welcome swallow, NZ shoveler and the paradise shelduck.

Retention basins and a swale have been constructed within the Reserve to treat and manage storm water arising from the adjacent Redwood Springs residential development. Although the swale has been regraded, water continues to stagnate and has caused concerns within the local community.

Landscape values associated with a new residential development and those of a conservation reserve have the potential to differ. Therefore, careful management of the interface between the two areas will be required to ensure that there is a transition zone between the areas needing to be highly maintained and those areas that are managed more for their wilderness and wildlife values.

Although it is anticipated that the construction of the designated motorway to the east is still some time away, it is important that any proposed development recognises the impact that a motorway will have on the Reserve and that any adverse effects that may arise are minimised, for example, noise.

There are a number of potential linkages to and from the Reserve. These may include:

- A cycleway along the railway line taking people to and away from the City centre
- A walkway along the Styx River including links to the Styx Mill Conservation Reserve
- A walkway/cycleway adjacent to Curtis Stream and the railway line to link to the Supa Centre
- Walkway/cycleway along the proposed northern motorway.

The Reserve previously contained a farmhouse and dairy buildings. Some of these structures have been retained as they have the potential to be adapted for other activities within the Reserve and to provide clues as to the history of the site.



#### Water Quality Monitoring

A community based water qualitymonitoring program is active throughout the Styx catchment and there is an opportunity for local residents to take part in the regular monitoring of water quality within the Styx River adjacent to the Reserve.

If you would like to be involved in this program please contact:

Victor Brown

Volunteer Coordinator Styx Living Laboratory Trust 021 116 9133 victorbrown@paradise.net.nz

tephanie Humphries

Secretary Styx Living Laboratory Trust 342 9513 stephaniek@clear.net.nz



#### Information about the Styx Vision 2000 - 2040 is now available at www.thestyx.org.nz

#### Invitation to become a Partner in the Process

The level of involvement by the community in the development of the Vision for the Styx 2000 – 2040 has been significant. As the Styx River Esplanade Reserve forms part of the overall planning for the Catchment, in the spirit of true 'partnership' (Vision 5), you are again invited to share in the development and implementation of this Plan.

#### Closing date for submissions is Friday 17 December

Enclosed with this brochure is a Response Form. If you would like to contribute, your written comments and suggestion are welcomed. More response forms can be obtained by telephoning the Greenspace Unit (Tel 941 8872) and these will be forwarded to you.

#### Further copies of this brochure can be obtained from either:

Greenspace Unit Christchurch City Council 163 – 173 Tuarn Street Christchurch Papanul Service Centre Corner Restall St and Langdons Rd Christchurch

Any enquiries should be referred to:

Kirsty Patton Parks & Watarways Area Advocate Greenspace Unit Christchurch City Council Tel (03) 941 6702 kirsty.patten@coc.govt.nz

Issues raised through the consultation process will be referred to the Shirley Papanul Community Board for comment, guidance and/or acceptance.

#### **Further Information**

For additional information and advice on the Styx Esplanade Reserve art Redwood Springs, or other Puharakekenui/Styx River reserves, please contact:

Dr Antony Shadbolt, Team Leader, Parks Biodiversity Christchurch City Council Email: antony.shadbolt@ccc.govt.nz

For more information about the Puharakekenui/Styx River and a range of research, volunteering opportunities and other activities, please visit the Styx Living Laboratory Trust website:

#### <u>www.thestyx.org.nz</u>

Email: <a href="mailto:styxllbom@gmail.com">styxllbom@gmail.com</a>

