



The Styx

Pūrākaunui

K McCoombs

Greenspace Unit
Christchurch City Council

December 2003

Report: 2003/2
CCCECO03-12

**Weed Plan for Styx Mill Conservation Reserve
- September 2003**



CHRISTCHURCH
CITY COUNCIL - PARKS & WATERWAYS



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Location of Styx Mill Conservation Reserve



Aerial photograph of Styx Mill Conservation Reserve

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Introduction

This report aims to summarise the main weeds present in Styx Mill Conservation Reserve, and to outline a plan for their control that makes the best use of limited resources.

The weeds present are listed and information provided about them, including control methods. The reserve is divided into general management areas, and the weeds in each area are identified. A range of factors are then taken into account to determine the optimum priority for control for each species in each area, to make the most effective use of resources. This resulting schedule can be used to feed into staff work programmes.

Site Description

Styx Mill Conservation Reserve (Styx Mill) is a remnant of freshwater wetland in the northern part of Christchurch City. It is one of the Christchurch City Councils' regional parks and is managed by the councils' Ranger Service.

The vegetation is a mosaic of vegetation types, which are mainly rush/sedge wetland, willow woodland, riparian areas, or exotic pasture. The reserves high ecological value is recognised in the Christchurch City Plan, where the downstream end of the reserve is recognised as Ecological Heritage Site 8.10.

The 57 ha reserve is increasingly being surrounded by urban development, e.g. Northwood subdivision to the north of the reserve.

Weed Details

The following section of this plan lists each of the main weed species present, and provides the following details for each:

Pest status - whether the plant has any official pest status. 'RPMS' refers to the Regional Pest Management Strategy 1998 or the Regional Pest Management Strategy - Biodiversity Pests (2002).

DoC weed score - the 'weediness' score from Owen (1997). The scores are based on the effect of the particular species on ecological systems (the damage it can cause), and on its biological success rating (how likely it is to survive as a weed).

The worse the weed, the higher the score. Department of Conservation (2002) has grouped the raw scores into 4 classes as follows:

A = 29 - 36

B = 26 - 28

C = 21 - 25

D = < 21

Impact - the effect of the weed species on natural systems (mainly based on information in Craw, 2000).

Aim of control - the level of control appropriate at this site, in the short-medium term.

Method - recommended control techniques (a lot of the detail is based on information in Craw, 2000).

Identification - there is a photograph of most species. Additional photographs and information is available in the "Christchurch Waterway Maintenance Plant Guide" (McCombs *et al.*, 1999) and in the Canterbury Weed Guide on the internet at www.ccc.govt.nz/parks/TheEnvironment/weedguide.asp.

Alder	<i>Alnus glutinosa</i>
Comments	Has been planted in some parts, especially at the western end.
Pest status	No formal pest status in Canterbury.
DoC weed score	26 (B)
Impact	Forms dense stands. Creates a deciduous canopy in wetlands. Stops seedlings establishing. Increases fertility by fixing nitrogen.
Aim of control	Eradicate small infestations, prevent larger populations from spreading.
Method	In autumn either: <ul style="list-style-type: none"> • Make 1 cut / 100 mm diameter and squirt with 2 g Escort / cut • or, cut and paint with Escort at 5 g/L Follow up control of suckers is required, difficult to kill.

Blackberry	<i>Rubus fruticosus</i> agg.
Comments	This species has no formal pest status .
Pest status	‘Surveillance Plant Pest’ under the RPMS – it is illegal to propagate, sell or distribute blackberry.
DoC weed score	31 (A)
Impact	Sprawling growth eliminates other species and reduces recruitment. The dense layering of leaves shades out other species. Makes access difficult.
Aim of control	Eradicate small infestations, prevent larger populations from spreading.
Method	Apply Escort at label rates, summer-autumn (before leaves become brittle). When in amongst desirable species, grubbing/mechanical removal may be necessary. This will need to be done carefully so that the ground is not disturbed too much, as disturbed ground favours the establishment of other weeds. Biological control may be helpful in reducing the population long-term.



Figure 2. Alder seedling (*Alnus glutinosa*).



Figure 1. Blackberry leaves and fruit (*Rubus fruticosus*).

Barberry	<i>Berberis glaucocarpa</i>
Comments	A couple of plants are present along old hedge lines.
Pest status	This species has no formal pest status .
DoC weed score	26 (B)
Impact	Replaces native species, difficult to kill.
Aim of control	Eradication from the reserve.
Method	<ul style="list-style-type: none"> • Cut and paint with Escort at label rates, any time of year • <i>or</i>, cut and squirt with Escort 1 g / 100 mm stem diameter, any time of year



Figure 4. Mature barberry leaves with spines visible where leaves join the stem (*Berberis glaucocarpa*).



Figure 3. Flowers of barberry (*Berberis glaucocarpa*).



Figure 5. Glossy young leaves of barberry with spines visible where leaves join the stem (*Berberis glaucocarpa*). Note that some young leaves can have smooth

Broom	<i>Cytisus scoparius</i>
Comments	
Pest status	‘Containment Control Plant Pest’ under the RPMS, rules detailed below.
DoC weed score	25 (C)
Impact	Invades both dry and wet areas, alters habitat, increases soil fertility.
Aim of control	Containment to existing areas, eventual reduction in numbers.
Method	<ul style="list-style-type: none"> • Cut and paint with Grazon / Escort / Stump Stick at label rates, any time of year. • <i>or</i>, spray with Grazon at label rates, spring-summer.

6.4.4 Strategy Rules for Containment Control Plant Pests

In relation to the following rules, land occupiers must also comply with these rules on any adjoining roads as described in Section 4.1.2 of this Strategy.

Rule 6.3

Land occupiers shall eradicate broom infestations that cover up to 50 square metres in area and are greater than 5 metres from other broom infestations exceeding 50 square metres in area on the land that they occupy.

This rule shall not require the eradication of broom in a hedge.

A breach of this rule creates an offence under Section 154(r) of the Biosecurity Act 1993.

Rule 6.4

Land occupiers shall eradicate broom infestations on the land that they occupy within 10 metres of any adjoining property occupied by another land occupier where that adjoining property is clear of, or being cleared of, broom infestations within 10 metres of the boundary between the properties.

This rule shall not require the eradication of broom in a hedge, provided that the tops and sides of the broom in the hedge are trimmed each year after flowering but before seed set to minimise seeding.

A breach of this rule creates an offence under Section 154(r) of the Biosecurity Act 1993.

Rule 6.9

Land occupiers and other persons shall not sell, propagate or distribute any Containment Control Plant Pests.

A breach of this rule creates an offence under Section 154(r) of the Biosecurity Act 1993.



Figure 6. Broom (*Cytisus scoparius*).

Convolvulus / bindweed	<i>Calystegia silvatica</i>
Comments	May be more widespread – some of the weed survey was done in winter when this species has died back.
Pest status	This species has no formal pest status.
DoC weed score	This species is not in the DoC database. The most similar species, <i>Convolvulus arvensis</i> , has a score of 25 (C)
Impact	Climbs over other species and can smother them.
Aim of control	No new infestations, reduce number of existing sites.
Method	<ul style="list-style-type: none"> • Apply Banvine in Spring-Autumn. • <i>or</i>, cut and paint with Escort 1 g/L • <i>or</i>, cut and paint with glyphosate 10% • <i>or</i>, cut and paint with Banvine 20% <p>Repeated applications are likely to be required. Could cut and paint stems with herbicide – dispose of the cut material carefully as it will re-grow given the chance.</p>



Figure 7. Bindweed leaves and flower (*Calystegia silvatica*).

Crack willow	<i>Salix fragilis</i>
Comments	Throughout reserve, especially along waterways near the Hussey Rd car park.
Pest status	This species has no formal pest status.
DoC weed score	28 (B)
Impact	Can form pure stands with a deciduous canopy. Prevents other species establishing and changes the structure of the habitat. Roots can block waterways and cause drainage problems
Aim of control	Containment of existing areas, with gradual reduction.
Method	<ul style="list-style-type: none"> • 1 cut /100 mm diameter, squirt with 10 ml glyphosate, summer-autumn • For smaller plants use Tipit gel pruners with Vigilant <p>Where practical, poison and leave standing - otherwise the material is difficult to dispose of. Do not leave any material on site - cut material will re-grow if left on the ground.</p>



Figure 8. Crack willow (*Salix fragilis*) sprouting from a cut log that has been left lying around - **don't** do this!



Figure 9. Crack willow (*Salix fragilis*) leaves and a male catkin with anthers visible.

Elder	<i>Sambucus nigra</i>
Comments	Seeds are spread by birds.
Pest status	This species has no formal pest status .
DoC weed score	22 (C)
Impact	Forms fairly dense stands that prevent other species from establishing.
Aim of control	Eventual removal, but not an especially high priority.
Method	<ul style="list-style-type: none"> • Cut and paint with Escort at 1 g/L, any time of year.



Figure 10. Leaves of elder (*Sambucus nigra*).

Gorse	<i>Ulex europaeus</i>
Comments	
Pest status	‘Containment Control Plant Pest’ under the RPMS, rules detailed below.
DoC weed score	28 (B)
Impact	Forms pure stands that prevent anything else from establishing, for a while at least. This may be followed by a more sparse stage where gorse acts as a nurse crop and other plants are able to establish. Increases fertility by fixing nitrogen.
Aim of control	Prevent invasion of areas with relatively rare plants or communities, e.g. the area with sphagnum moss. Prevent spread to new areas. Contain existing areas and remove outliers.
Method	<ul style="list-style-type: none"> • Cut and paint with Grazon at 10% any time of year • <i>or</i>, cut and paint with Escort 2 g/L any time of year • <i>or</i>, spray with Grazon or Renovate at label rates, spring-summer • <i>or</i>, spray with Escort + penetrant, autumn-winter <p>Where dense patches of gorse are targeted, planting with desirable species should follow control.</p>

6.4.4 Strategy Rules for Containment Control Plant Pests

In relation to the following rules, land occupiers must also comply with these rules on any adjoining roads as described in Section 4.1.2 of this Strategy.

Rule 6.1

Land occupiers shall eradicate gorse infestations that cover up to 50 square metres in area and are greater than 5 metres from other gorse infestations exceeding 50 square metres in area on the land that they occupy.

This rule shall not require the eradication of gorse in a hedge.

A breach of this rule creates an offence under Section 154(r) of the Biosecurity Act 1993.

Rule 6.2

Land occupiers shall eradicate gorse infestations on the land that they occupy within 10 metres of any adjoining property occupied by another land occupier where that adjoining property is clear of, or being cleared of, gorse infestations within 10 metres of the boundary between the properties.

This rule shall not require the eradication of gorse in a hedge, provided that the tops and sides of the gorse in the hedge are trimmed each year after flowering but before seed set to minimise seeding.

A breach of this rule creates an offence under Section 154(r) of the Biosecurity Act 1993.

Rule 6.9

Land occupiers and other persons shall not sell, propagate or distribute any Containment Control Plant Pests.

A breach of this rule creates an offence under Section 154(r) of the Biosecurity Act 1993.



Figure 11. A spiny gorse branch (*Ulex europaeus*).

Grasses	Tall fescue (<i>Schedonorus phoenix</i> ¹), cocksfoot (<i>Dactylis glomerata</i>) etc.
Comments	Exotic grasses are widespread within the reserve.
Pest status	None of the grasses present in the reserve have formal pest status.
DoC weed scores	Tall fescue (<i>Schedonorus phoenix</i>) = 29 (A) Floating sweet grass (<i>Glyceria fluitans</i>) = 28 (B) Ryegrass (<i>Lolium perenne</i>) = 26 (B) Browntop (<i>Agrostis capillaris</i>) = 25 (C) Cocksfoot (<i>Dactylis glomerata</i>) = 22 (C)
Impact	Many exotic grasses have the ability to overtop small herbaceous species. Grasses also prevent the establishment of other species, thereby preventing recruitment of other species.
Aim of control	Control in areas of high value habitat to allow small herbaceous species to survive.
Method	Use grazing management in the areas identified by Meurk (1994), attached as Appendix 1. For the areas that are within mowed parts of the reserve, grazing is not an option. <ul style="list-style-type: none"> • Selectively spray with Gallant or glyphosate at label rates • <i>or</i>, apply glyphosate at label rates with a weed wiper Planting taller species to provide shade will assist control in the long term.



Figure 12. Tall fescue (*Schedonorus phoenix*).



Figure 13. Cocksfoot (*Dactylis glomerata*).

¹ Previously known in NZ as *Festuca arundinacea*.

Grey willow	<i>Salix cinerea</i>
Comments	One of the primary weeds at this site. A sheet to enable identification of female grey willow plants is attached as Appendix 2.
Pest status	'Unwanted Organism' under the Biosecurity Act (1993).
DoC weed score	32 (A)
Impact	Invades wetland and alters the habitat by forming a canopy. Grows and spreads very rapidly.
Aim of control	Containment, then gradual removal of plants to reduce the area invaded. Only remove female plants in the woodland areas until ready to combine with replanting – otherwise the increased light levels are likely to encourage other weed species such as blackberry.
Method	Mark female plants at time of flowering (Sep-Oct). Eradicate female plants first to reduce seed production and therefore spread of this species. Do not cut and leave lying around - pieces will re-grow. Use one of the following methods on larger trees, and leave standing: <ul style="list-style-type: none"> • Cut and squirt with 1 cut/100 mm diameter, 10 ml glyphosate, summer-autumn. • <i>or</i>, bore and fill with 1 hole/100 mm diameter, 10 ml glyphosate, summer-autumn • <i>or</i>, frill using glyphosate 10%, summer-autumn For small plants/seedlings cut with Vigilant tipit gel pruner and remove material to landfill. Control of seedlings should be achieved by light grazing in some areas, see report by Meurk (1994, Appendix 1).



Figure 14. Grey willow (*Salix cinerea*), male catkins.



Figure 15. Grey willow (*Salix cinerea*) leaves early in the season, with female catkin.

Hawthorn	<i>Crataegus monogyna</i>
Comments	There are only a few plants present. This species is bird dispersed so it is worth controlling the plants that are present since they are providing a seed source for elsewhere.
Pest status	This species has no formal pest status.
DoC weed score	31 (A)
Impact	Forms thickets, crowding out other species. Stops other species establishing.
Aim of control	Eradication from this reserve.
Method	<ul style="list-style-type: none"> • Cut and paint with Escort at label rates • <i>or</i>, cut and squirt with 1 cut/100 mm stem diameter, using 2 g Escort / cut, any time of year

Hyssop loosestrife	<i>Lythrum hyssopifolia</i>
Comments	Only one patch seen. A herbarium specimen has been taken for future reference (CHBG 10462).
Pest status	This species has no formal pest status .
DoC weed score	None available.
Impact	This species is closely related to purple loosestrife, so it seems prudent to control it before it becomes established.
Aim of control	Eradication from this reserve.
Method	Dig plants out and monitor in case of re-establishment.



Figure 16. Leaves and flowers of hawthorn (*Crataegus monogyna*)

Ivy	<i>Hedera helix</i>
Comments	
Pest status	This species has no formal pest status.
DoC weed score	25 (C)
Impact	Grows along the ground and up into canopy, taking habitat and stopping new plants establishing. The weight of an ivy plant can destroy other plants.
Aim of control	Containment.
Method	<ul style="list-style-type: none"> • Cut and paint with Escort 5 g/L, any time of year • <i>or</i>, spray with Escort 5 g/L + penetrant, summer <p>Where the ivy is growing on trees, leave the material in the canopy to die.</p> <p>If material is on the ground then take care to thoroughly dry or burn all of the stems.</p>



Figure 17. Plain and variegated ivy leaves (*Hedera helix*).

Japanese honeysuckle	<i>Lonicera japonica</i>
Comments	
Pest status	‘Surveillance Plant Pest’ under the RPMS.
DoC weed score	31 (A)
Impact	Smothers other plants and can cause canopy collapse.
Aim of control	Eradicate any populations.
Method	<ul style="list-style-type: none"> • Cut and paint stems with Escort 5 g/L, any time of year • <i>or</i>, spray with Escort at old mans beard rate, summer-autumn Small plants can be dug up. Dispose of any material carefully, otherwise it may re-grow. Follow up treatments will be required (~6 monthly).

Male fern	<i>Dryopteris filix-mas</i>
Comments	Identification is tricky – get confirmation of plant identification before carrying out control. There are still a fairly limited number of plants on the site so it is a good chance to try eradication as a trial project.
Pest status	This species has no formal pest status.
DoC weed score	None available.
Impact	Replaces native ferns and spreads prolifically.
Aim of control	Trial control methods.
Method	Dig plants out and compost thoroughly – bag any plants before shifting them around as spores will easily spread.



Figure 19. Japanese honeysuckle leaves, buds and flowers (*Lonicera japonica*).



Figure 18. Male fern fronds (*Dryopteris filix-mas*).

Old mans beard	<i>Clematis vitalba</i>
Comments	Near Northwood subdivision and in SW corner.
Pest status	‘Containment Control Plant Pest’ under the RPMS, rules outlined below. Unwanted organism under the Biosecurity Act.
DoC weed score	33 (A)
Impact	Smothers plants right up to the canopy, stops recruitment of new plants.
Aim of control	Eradicate from site.
Method	<p>Cut at ground level and at 1 m high and paint both cuts with either:</p> <ul style="list-style-type: none"> • Escort 1 g/L • <i>or</i>, Tordon BK 10% • <i>or</i>, Banvine 20% <p>Leave stems in canopy to die. Take care in disposing of any cut material, as it will readily re-grow. Don’t try to mulch the material – apply herbicide or deep bury.</p> <p>Follow-up, especially of seedlings, likely to be required.</p>

6.4.4 Strategy Rules for Containment Control Plant Pests

In relation to the following rules, land occupiers must also comply with these rules on any adjoining roads as described in Section 4.1.2 of this Strategy.

Rule 6.5

Land occupiers shall eradicate old man’s beard infestations that cover up to 100 square metres in area and are greater than 20 metres from other infestations of old man’s beard exceeding 100 square metres in area on the land that they occupy.

A breach of this rule creates an offence under Section 154(r) of the Biosecurity Act 1993.

Rule 6.6

Land occupiers shall eradicate old man’s beard infestations on the land that they occupy within 20 metres of any adjoining property occupied by another land occupier where that adjoining property is clear of, or being cleared of, old man’s beard infestations within 20 metres of the boundary between the properties.

A breach of this rule creates an offence under Section 154(r) of the Biosecurity Act 1993.

Rule 6.9

Land occupiers and other persons shall not sell, propagate or distribute any Containment Control Plant Pests.

A breach of this rule creates an offence under Section 154(r) of the Biosecurity Act 1993.



Figure 20. Old mans beard seedling (*Clematis vitalba*).



Figure 21. Old mans beard seed heads (*Clematis vitalba*).

Periwinkle	<i>Vinca major</i>
Comments	Mostly in the south-west part of the reserve. Presence near waterway makes its spread downstream likely.
Pest status	This species has no formal pest status.
DoC weed score	22 (C)
Impact	Forms a dense ground cover, which stops other species from establishing. Makes habitat more open and then likely to be invaded by other weedy species.
Aim of control	Containment, especially away from waterways.
Method	<ul style="list-style-type: none"> • Small patches can be dug out – dispose of material carefully. • Otherwise spray with glyphosate 2-3% + penetrant. Follow up required, every 3 months.

Pines	<i>Pinus</i> spp.
Comments	Probably not a major problem on this site, but needs to be monitored.
Pest status	This species has no formal pest status .
DoC weed score	27 (B)
Impact	Can form dense stands and prevent other plants from establishing.
Aim of control	If seedlings are a problem, remove the large adult pines, otherwise they could be left for birds to use
Method	<ul style="list-style-type: none"> • Pull or dig out small plants. • For large plants, cut and paint with Escort 1 g/L or Tordon BK 5%



Figure 22. Periwinkle leaves and flower (*Vinca major*).

Silver birch	<i>Betula pendula</i>
Comments	Has been planted, especially in the western part of the reserve. This species is causing problems at some other nearby wetlands (e.g. Groynes) and so it might be worth replacing these plants eventually.
Pest status	No formal pest status
DoC weed score	None available
Impact	Forms canopy, thereby changing conditions for low-growing species.
Aim of control	Remove outliers, don't plant any more.
Method	In autumn: <ul style="list-style-type: none"> • 1 cut / 100 mm diameter, inject with 2 g Escort • or, 1 cut / 100 mm diameter, inject with Tordon BK 10% Small plants can be sprayed with Escort at barberry rates, when in full leaf.

Soft rush	<i>Juncus effusus</i>
Comments	
Pest status	This species has no formal pest status .
DoC weed score	23 (C)
Impact	Invades wetland areas and replaces native species. Particularly resistant to grazing.
Aim of control	May only be worth controlling in some parts of the reserve as re-establishment from plentiful seed sources elsewhere is highly likely.
Method	Identification is tricky – get confirmation of plant identification before carrying out control. <ul style="list-style-type: none"> • Apply glyphosate at label rates with a weed wiper, any time of year • or, spray with glyphosate at label rates, any time of year Apply herbicide 6-monthly until control achieved.



Figure 23. Silver birch trees (*Betula pendula*) along Hussey Walkway.



Figure 25. Soft rush seed heads (*Juncus effusus*).

Spindle tree	<i>Euonymus europaeus</i>
Comments	Visually blends in with other plants, so can be difficult to see unless fruiting.
Pest status	This species has no formal pest status .
DoC weed score	19 (D)
Impact	Forms dense stands that stop other species from establishing
Aim of control	Containment and gradual reduction.
Method	<p>Pull or dig out small plants.</p> <p>For larger plants, in summer-autumn:</p> <ul style="list-style-type: none"> • Cut and paint with Escort 1 g/L • <i>or</i>, cut and paint with Tordon BK 10% • <i>or</i>, cut and paint with glyphosate 20%

Stinking iris	<i>Iris foetidissima</i>
Comments	Seeds are poisonous.
Pest status	This species has no formal pest status .
DoC weed score	25 (C)
Impact	Covers the ground preventing other species from establishing.
Aim of control	Eradication from this site.
Method	<ul style="list-style-type: none"> • Spray with glyphosate at gorse rates, spring-autumn • <i>or</i>, apply glyphosate 33% + penetrant with a weed wiper, any time of year • <i>or</i>, inject stem base with 5 ml undiluted glyphosate, any time of year <p>Take care if removing material not to distribute the seeds.</p>



Figure 26. Spindle tree leaves (*Euonymus europaeus*). Inset picture shows fruit.



Figure 27. Stinking iris leaves, and the brightly coloured fruit within capsules that have split open (*Iris foetidissima*).

Sycamore	<i>Acer pseudoplatanus</i>
Comments	
Pest status	No formal pest status
DoC weed score	27 (B)
Impact	Capable of invading intact native communities (including forest) as well as disturbed land. Forms a canopy.
Aim of control	Control – reseedling into the reserve from elsewhere is likely, so control will need to be ongoing.
Method	<p>Pull or dig out small plants.</p> <p>For larger plants:</p> <ul style="list-style-type: none"> • Cut and paint with Escort 5 g/L, summer-autumn • or, 1 cut / 100 mm diameter, inject with 2 g Escort /hole, summer-autumn <p>6-monthly follow-up likely to be required</p>









Figure 28. Sycamore leaves (*Acer pseudoplatanus*).


Surveillance for new species

Styx Mill is likely to have additional weed species arrive in the future, especially given the increasing urbanisation surrounding the site. Some plants are the subject of weed-led control programmes in the city, and reports of these would be especially useful.

Weeds likely to be found at the reserve in the future include the following:

Species	Comments	
<p>Arum lily (<i>Zantedeschia aethiopica</i>)</p>	<p>This species typically arrives when people dump their garden waste in an area. The margins of the site are the most likely places it will be found.</p>	
<p>Egeria (<i>Egeria densa</i>)</p>	<p>A serious aquatic weed that has recently established in Christchurch in the Avon River. The ability of egeria to spread, combined with the high recreation use of a site like the ponds at Styx Mill mean that a high level of surveillance for this species is recommended.</p> <p>Please report to council Botanist if found.</p>	
<p>Lagarosiphon (<i>Lagarosiphon major</i>)</p>	<p>A serious aquatic weed which is now present at several sites in Christchurch. The ability of lagarosiphon to spread, combined with the high recreation use of a site like the ponds at Styx Mill mean that a high level of surveillance for this species is recommended.</p> <p>Please report to council Botanist if found.</p>	
<p>Mexican daisy (<i>Erigeron karvinskianus</i>)</p>	<p>This species typically arrives when people dump their garden waste in an area. The margins of the site and along the waterways are the most likely places it will be found.</p>	

<p>Montbretia (<i>Crocasmia x crocosmiiflora</i>)</p>	<p>This species typically arrives when people dump their garden waste in an area. The margins of the site and along the waterways are the most likely places it will be found.</p>	
<p>Purple loosestrife (<i>Lythrum salicaria</i>)</p>	<p>Currently we are attempting eradication of this species in Canterbury. Please report to council Botanist if found.</p>	
<p>Tradescantia (<i>Tradescantia fluminensis</i>)</p>	<p>This species typically arrives when people dump their garden waste in an area. The margins of the site and along the waterways are the most likely places it will be found.</p>	

<p>Yellow flag (<i>Iris pseudacorus</i>)</p>	<p>Already present in Regents Park. Please report to council Botanist if found.</p>	
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Early detection of any weed species reduces the amount of work required to control, or possibly eradicate, a species from the site. A yearly weed check is therefore recommended. In particular, surveillance around the boundaries is likely to enable early detection of ‘garden escapes’ from nearby properties



Figure 29. Management areas at Styx Mill Conservation Reserve, as referred to in the text. The management areas are outlined in black. Fences are shown as white crossed lines, waterways are blue dashed lines.

Weed Distributions

For the purpose of this plan, the reserve has been divided into management areas. These are shown on Figure 29.

The areas have been broadly grouped into one of the following:

- rush/sedge wetland
- waterways
- willow woodland
- planted areas
- misc. areas
- managed pasture

Rush/sedge wetland

Area A

This area is very wet and part of it has been planted with native trees and shrubs. There are also quite a few remnant native rushes, sedges, ferns and herbaceous plants present.

Grey willow is the main weed present. Grasses are also prolific.

Area B

This area has not been grazed for several years now and it has a very good cover of rushes, some sedges and herbaceous species.

Scattered broom, gorse, soft rush and thistles are present. There are also exotic grasses and some hawthorn (E 2,478,814; N 5,748,961).

A small amount of hyssop loosestrife is present (E 2,478,708; N 5,748,983).

Area J

Quite damp, fed by a spring to the west. A number of small native plants, including several locally rare species, have been seen in this area.

Broom and grey willow are invading the area, and grasses have become prolific since grazing stopped.



Figure 33. Dense broom and gorse in Area K



Figure 30. Area A



Figure 31. Looking across Area C to Area B (beyond the fence).



Figure 32. Area J

Area K

This paddock has not been grazed and is not as swampy as some. It is now dominated by quite tall broom. Gorse and blackberry are also present.

Area N

This a very good area botanically, with short wetland vegetation that includes several locally rare

species. It appears to be grazed periodically by cattle.

Weeds include grey willow, soft rush, gorse, cocksfoot, Yorkshire fog. There is also a patch of blackberry.

Area P

This is another very good area botanically, with short wetland vegetation that includes several locally rare species. However it has not been grazed for several years now and exotic grasses and shrub weeds (grey willow, gorse, broom, blackberry) are invading.

Soft rush is also present.

Area R

Similar to Area P.



Figure 34. Gorse invading rush/sedge wetland in Area R.

Waterways

Area M

This strip has some broom, gorse and grasses. Most of the willow is crack willow.

Area O

The strip along the waterway at the north and middle of the reserve, which includes Contemplation Point.

Grazing was removed several years ago and a variety of weeds have taken hold. These include blackberry, broom, gorse, grasses, bindweed, male fern, poplar, spindle tree and thistles.

Both grey willow and crack willow are present. Some crack willows have fallen over, and some have been cut and left in pieces on the ground. Unfortunately these are all sprouting and forming brand new thickets of crack willow (see Figure 37).

There is gunnera (Chilean rhubarb) on one of the waterways (E 2,478,248; N 5,749,366). If it is in the reserve it should be removed and if it is on private land the owner should be approached to discuss the possibility of removing it (since it is providing a seed source to areas downstream, and gunnera is now listed nationally as an unwanted organism).

SW waterway

Hussey walkway follows this waterway. Several of the (planted) canopy species are potential weeds, including poplar, alder, elder and silver birch. Their gradual replacement is recommended.

There are quite a few areas that have been planted with native trees and shrubs. Broom, gorse and blackberry are invading these areas. Exotic grasses are also rampant, inhibiting recruitment of other species.



Figure 38. Silver birch trees along the SW waterway.



Figure 35. Area M



Figure 36. Crack willow and scattered broom along waterway in Area M.



Figure 37. A forest of new crack willow growing from cut logs in Area O.

Willow Woodland

Central willow woodland

The area of willow woodland is expanding. It is dominated by a thicket of grey willow and is quite wet underneath, making access difficult.

Below are a mixture of species including native ferns (*Blechnum minus*), sedges (*Carex* spp.), trees and shrubs (*Cordyline australis*, *Coprosma propinqua*).

The recommended approach for this area is to contain the grey willow, by removing outliers and eradicating female plants within the core area. Eventually it could be restored through a combination of natural regeneration and some planting.

NE willow woodland

This area is also dominated by grey willow, but there is little else growing below, except along the margins.



Figure 39. Native sedges and ferns below grey willow in the central willow woodland.



Figure 40. NE margin of the central willow woodland, which is dominated by blackberry, gorse and broom.

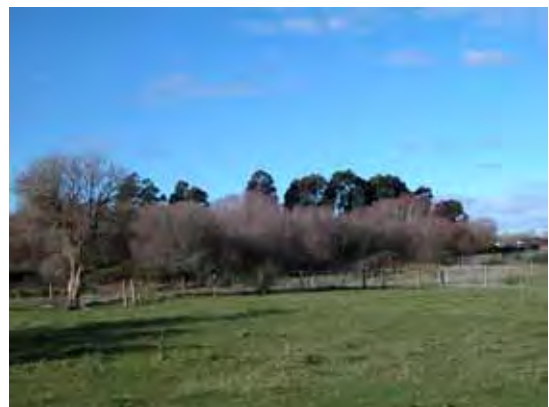


Figure 41. Looking across to the NE woodland.

Planted Areas

Eastern entrance

A mixture of native trees and shrubs have been planted here including kanuka, hebes, lancewood, kahikatea, cabbage trees. There are also remnant native species present, mainly rushes and sedges.

The higher slopes are being invaded by broom, and also gorse and blackberry.

Hussey Rd entrance

This area is a mixture of carparking and roads, mown grass, amenity plantings and remnant wetland vegetation.

There are some shrub weeds establishing amongst the plantings and these need to be controlled. The remnant wetland areas, which are not being grazed or mown, are also being invaded by shrub weeds and grasses.

Planting E of lakes

This area has a mixture of native trees including flax, broadleaf, cabbage tree, hebe, lemonwood etc. Shrub weeds are starting to invade, but are not too well established, so early control is recommended.

Misc. areas

Mound

Low priority in itself because almost no botanical values. However it is located within a very good area botanically, so weeds need to be contained so they don't spread from the mound.

NW margin

This part has various introduced trees forming a canopy. Weeds are mainly a problem where it is not being mown.

Alder, broom, grasses and poplar are all present.



Figure 45. SW corner



Figure 42. Eastern entrance, planting of kanuka etc. with broom appearing.



Figure 43. A partly planted area within the NW margin.



Figure 44. Male fern, stinking iris, blackberry in the SW corner.

SW corner

This corner of the reserve has the greatest variety of different weeds including trees and shrubs (alder, elder, gorse, hawthorn, silver birch, spindle tree, sycamore), vines (blackberry, ivy, Japanese honeysuckle, old mans beard, periwinkle), ferns (male fern), grasses, and herbs (stinking iris). Blackberry is probably the most prolific weed currently, and it also makes access difficult in places for controlling the other weed species.

Managed pasture

These are areas that are mown, or, grazed by cattle.

Area C

This paddock is fairly clear of shrub weeds except for scattered gorse.

Area D

Essentially clear of shrub weeds.

Area E

The waterway is fenced off with a (temporary) electric fence. The main paddock is relatively weed free, however the un-grazed strip along the waterway has small gorse and broom plants.

Area F

The south-west part is quite boggy and is fenced off with a (temporary) electric fence. The remainder is grazed. There is a waterway running through and along this are several willow and some barberry.



Figure 46. Barberry in Area F.

Area G

Essentially clear of shrub weeds.

Area H

Broom scattered throughout, elder along the fence.

Area I

Scattered broom present.

Area L

The south-eastern part of this paddock is the most weedy with broom, gorse, blackberry and grey willow.

Area Q

This area is slightly raised, dry, and dominated by exotic pasture. Scattered broom and gorse are present.



Figure 47. Scattered gorse in Area S.

Area S

There is quite a bit of broom as well as some scattered gorse. Blackberry is invading from outside, but at present its spread is being limited by grazing.

Area T

Essentially clear of shrub weeds. The pond at the western end should be fenced off from stock to improve the water quality.

Area U

Scattered gorse and broom.

Area V

Grazed pasture with scattered broom, gorse and thistles.



Figure 48. Wetland/pond in Area T.

Area W

Grazed pasture with scattered broom and gorse.

Area X

Some low-lying areas have not been mown because they have remnant wetland vegetation. These parts now have rampant grass growth. There is also some invasion by other weed species such as thistles, broom, blackberry and gorse. Some potentially weedy species have also been planted, including silver birch, poplar and alder.

Area Y

Most of this area is mown, but some low-lying areas with remnant wetland vegetation have been left. These have become quite weedy with grasses, broom and gorse.

Corridor 1

Grasses are present along with a mixture of herbaceous weeds such as dock.

Corridor 2

Broom is establish



Figure 49. Part of Area Y that is not mown.



Figure 50. Corridor 1.



Figure 51. Corridor 2

Matrix of weed locations

Values in the body of the table are abundance, with “2” indicating the species is present. “1” indicates there are only a few plants, “3” indicates the species is prolific or dominant.

	No. of Sites	Rush/sedge wetland							Waterways			Willow woodland		Planted Areas			Misc. Areas			Managed Pasture																			
		Area A	Area B	Area J	Area K	Area N	Area P	Area R	Area M	Area O	SW waterway	Central willow woodland	NE willow woodland	Eastern entrance	Hussey Rd entrance	Planting E of lakes	Mound	NW margin	SW corner	Area C	Area D	Area E	Area F	Area G	Area H	Area I	Area L	Area Q	Area S	Area T	Area U	Area V	Area W	Area X	Area Y	Corridor 1	Corridor 2		
alder	4									2							2	2																			2		
barberry	1																					1 ^a																	
bindweed	1								2																														
blackberry	13					2	2	2		2	2	1	3		2	2		3									3		1							2			
broom	27		2	2	3		2	2	2	2	2	2	2	2	2	2	2				2				2	1	3	2	2		2	2	2	2	2	2		2	
crack willow	6								3	2	2		2	2	2																								
elder	3			2																					2														
gorse	22		2		2	2	2	2	2	2	2	1		2	2			1		1		2					3	2	2		2	2	2	2	2	2			
grasses	20	2	2	2	2	2	2	3	2	3	2	2	2	3	2	2	3	3	3									2							2	3	2		
grey willow	16	3	2	2	2	2	2	3	2	3	2	1	2	2	2	1											2												
gunnera	1									1 ^g																													
hawthorn	3		1 ^b								1 ^c																												
hyssop loosestrife	1		1 ^f																																				
ivy	1																																						
Japanese honeysuckle	1																																						
male fern	3								1			2																											
old man's beard	1																																						
periwinkle	2									2																													
poplar	3								2								2																				2		
silver birch	2									2																													
soft rush	4		2			2	2	2		2																													
spindle tree	3								1	1 ^d																													
stinking iris	1																																						
sycamore	1																																						
thistles	10		2	2					2	2		2			2	2	2								2			2			2			2	2				
No. of Weeds		2	8	5	4	5	6	6	5	12	13	5	7	5	5	5	3	5	15	1		2	1		3	1	4	4	3		2	3	2	7	3	1	1		

^a Barberry at E 2 478 696; N 5 749 111. ^b Hawthorn at E 2 478 814; N 5 748 961. ^c Hawthorn at E 2 477 647; N 5 748 997. ^d Spindle tree at E 2 477 901; N 5 749 142. ^e Old mans beard at E 2 477 540; N 5 748 994. ^f Hyssop loosestrife at E 2 478 708; N 5 748 983. ^g Gunnera at E 2 478 248; N 5 749 366.

Prioritising control work

A range of criteria were considered to determine what order to carry out control for each species, on each part of the site. The following factors were all taken into account:

Weed-led programmes

It is worth targeting some species for control, especially where there is the possibility of eradicating them from the site. At this site the following species were considered worth targeting, in order of decreasing priority are:

	Priority
old mans beard	1
hyssop loosestrife	2
hawthorn	3
barberry	3

Impact

Some weeds are more damaging than others. Owen (1997) has compiled a ranked list of species and these scores were taken into account.

Legal requirements

There are requirements under the Regional Pest Management Strategy (1998) for some control of broom, gorse, old mans beard and thistles. The rules specific to each are included in the earlier section on each species.

Effectiveness of control methods

Some species are much harder to control than others. Where effective techniques are known it makes sense to work on these than tackle harder species (other factors being equal). For example, we don't have a widely applicable method for controlling grass weeds at this stage, even though they are arguably having the greatest impact on the wetland areas.

Dispersal

Some sites are more likely to facilitate dispersal of weed species. Other factors being equal, sites along a waterway, and those upstream, should be controlled before one downstream. Similarly weedy sites in the middle of high value areas (or areas otherwise essentially clear of weeds) should be controlled to prevent spread to those sites.

Existing botanical value

Not all of the sites within the reserve are of equivalent botanical value. Weed control work can be ordered to give priority to the areas with the highest value (see Figure 52).

The existing botanical value of each habitat was ranked as follows:

	Botanical Value
Rush/sedge wetland	1
Waterways	2
Willow woodland	3
Planted areas	4
Misc. areas	5
Managed pasture	6

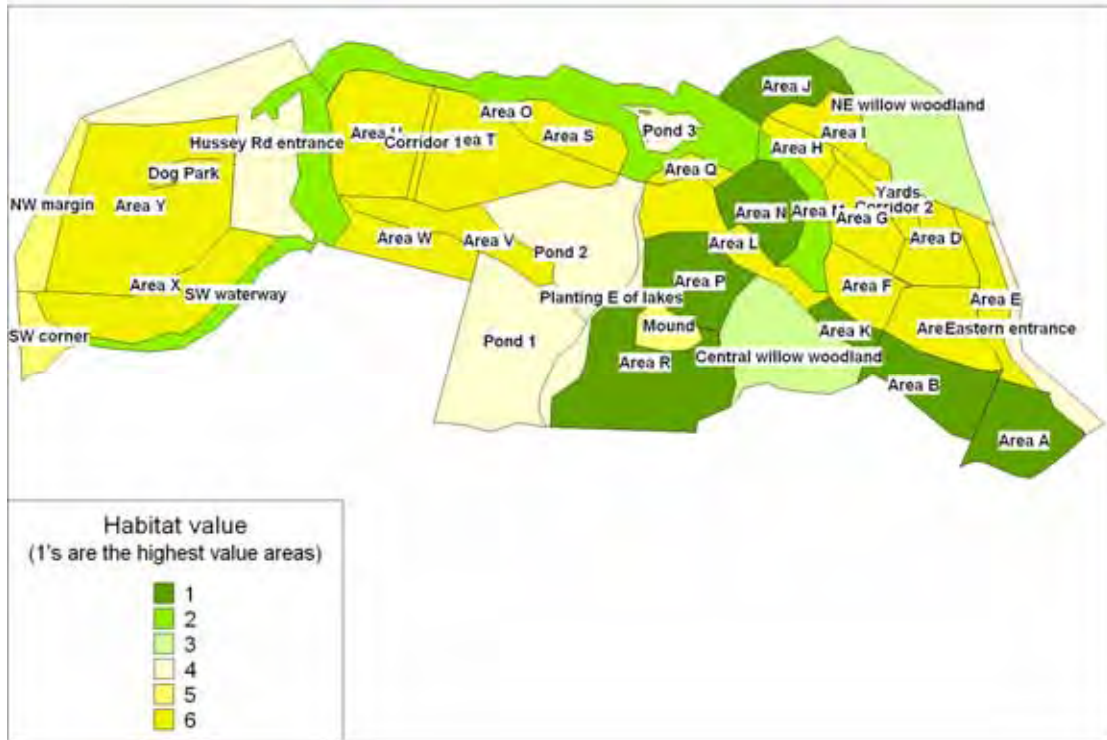


Figure 52. Management areas shaded by habitat value.

Proposed schedule for weed control

All of the factors in the previous section were taken into account to produce a detailed list of work, and the **order** it should be done in. There is a detailed list of work in the next section. Below is a summary of the control work:

1. Control all old mans beard (SW corner and near Northwood subdivision)
2. Eradicate the hyssop loosestrife (Area B)
3. Remove the cut sections of crack willow from Area O before they become fully established
4. Eradicate gunnera if on our land, otherwise discuss possible control with owners
5. Initiate light grazing areas of rush/sedge wetland areas (Areas J, P, R, N, mound) - see report by Meurk (1994), attached as Appendix 1
6. Control all female grey willow – mark the females while they are flowering in spring, even though control is likely to be later in the year (all areas where present).
7. Control gorse, broom and blackberry in the areas or rush/sedge wetland, along waterways and the willow woodlands
8. Control outliers and small patches of gorse, broom and blackberry in the planted areas, misc. areas and managed pasture
9. Control thistles throughout
10. Eradicate the isolated plants of barberry, hawthorn (Area F, B, SW waterway, SW corner)
11. Eradicate male fern (Area O, NE willow woodland, SW corner)
12. Control the Japanese honeysuckle (SW corner)
13. Control greater bindweed (Area O)
14. Control all spindle tree (Area O, SW waterway, SW corner)
15. Control periwinkle (SW waterway, NW margin)
16. Control any outliers of trees and shrubs such as sycamore, silver birch, alder, poplar, elder
17. Reduce populations of blackberry, gorse and broom
18. Gradual control of grey willow and crack willow should be planned in conjunction with replacement planting of native woodland species, so that increased light levels don't exacerbate other weed problems
19. Trial control of soft rush
20. Control ivy, stinking iris (SW corner)

Detailed control schedule

This is a detailed list of control work, in order of priority.

Management Area	Common Name(s)	Action
SW corner	old man's beard	Control all
Near NW subdivision	old man's beard	Control all
Area B	hyssop loosestrife	Eradicate asap
Area O	crack willow	Remove cut sections that are sprouting
Area O	gunnera	Eradicate
Area J	Yorkshire fog	Light grazing
Area P	Yorkshire fog	Light grazing
Area R	Yorkshire fog	Light grazing
Area N	cocksfoot	Light grazing
Mound	Yorkshire fog	Light grazing
Area Q	cocksfoot	Light grazing
Area A	grey willow	Target female plants
Area J	grey willow	Target female plants
Area N	grey willow	Target female plants
Area P	grey willow	Target female plants
Area R	grey willow	Target female plants
Area O	grey willow	Target female plants
Central willow woodland	grey willow	Target female plants
SW waterway	grey willow	Target female plants
NE willow woodland	grey willow	Target female plants
Hussey Rd entrance	grey willow	Target female plants
Eastern entrance	grey willow	Target female plants
Planting E of lakes	grey willow	Target female plants
Area L	grey willow	Target female plants
Area N	blackberry	Control all
Area R	blackberry	Control all
Area P	blackberry	Control all
Area P	gorse	Control all
Area K	gorse	Control boundaries where clear over the fence
Area B	gorse	Control all
Area R	gorse	Control all
Area N	gorse	Control outliers and along waterway
Area J	broom	Control all
Area P	broom	Control all
Area B	broom	Control all
Area K	broom	Control boundaries where clear over the fence
Area R	broom	Control all
Area O	blackberry	Control outliers and along waterway
Area O	gorse	Control outliers and along waterway
Area M	gorse	Control outliers and along waterway
Area O	broom	Control outliers and along waterway
Area M	broom	Control outliers and along waterway
SW waterway	blackberry	Control all
NE willow woodland	blackberry	Control outliers
Central willow woodland	blackberry	Control outliers

SW waterway	gorse	Control all
Central willow woodland	gorse	Control outliers
SW waterway	broom	Control all
Central willow woodland	broom	Control outliers
NE willow woodland	broom	Control outliers
Planting E of lakes	blackberry	Control all
Hussey Rd entrance	blackberry	Control outliers
Eastern entrance	gorse	Control all
Hussey Rd entrance	gorse	Control outliers
Eastern entrance	broom	Control all
Hussey Rd entrance	broom	Control outliers
Planting E of lakes	broom	Control all
SW corner	blackberry	Control outliers
SW corner	gorse	Control outliers
NW margin	broom	Control outliers
Mound	broom	Control all
Area S	blackberry	Control all
Area L	blackberry	Control outliers and along waterway
Area X	blackberry	Control outliers
Area Y	gorse	Control outliers
Area C	gorse	Control outliers
Area S	gorse	Control all
Area U	gorse	Control all
Area L	gorse	Control outliers and along waterway
Area X	gorse	Control outliers
Area Q	gorse	Control outliers and along waterway
Area V	gorse	Control outliers and along waterway
Area W	gorse	Control outliers and along waterway
Area E	gorse	Control outliers and along waterway
Area V	broom	Control outliers and along waterway
Area I	broom	Control outliers
Area W	broom	Control outliers and along waterway
Area H	broom	Control outliers
Area L	broom	Control outliers and along waterway
Area S	broom	Control all
Area E	broom	Control outliers and along waterway
Area U	broom	Control all
Area Y	broom	Control outliers
Area X	broom	Control outliers
Corridor 2	broom	Control all
Area Q	broom	Control outliers and along waterway
Area J	thistles	Control all
SW waterway	thistle	Control all
NE willow woodland	thistle	Control all
NW margin	thistle	Control all
Area O	thistle	Control all
Area O	Californian thistle	Control all
Area B	thistle	Control all
Planting E of lakes	thistle	Control all

Mound	thistle	Control all
Area H	thistle	Control all
Area V	thistle	Control all
Area Q	thistle	Control all
Area X	thistle	Control all
Area F	barberry	Eradicate
Area B	hawthorn	Eradicate
SW waterway	hawthorn	Eradicate
SW corner	hawthorn	Eradicate
NE willow woodland	male fern	Eradicate
SW corner	male fern	Control all
Area O	male fern	Eradicate
SW corner	Japanese honeysuckle	Control along waterway
Area O	bindweed	Control all
SW waterway	spindle tree	Control all
SW corner	spindle tree	Control all
Area O	spindle tree	Eradicate
SW waterway	periwinkle	Control all
SW corner	periwinkle	Control along waterway
SW waterway	alder	Control outliers
SW corner	alder	Control outliers
NW margin	alder	Control outliers
Area X	alder	Control outliers
SW waterway	silver birch	Control outliers
SW corner	silver birch	Control outliers
NW margin	poplar	Control outliers
Area X	poplar	Control outliers
Area O	poplar	None
SW corner	sycamore	Control outliers
SW waterway	crack willow	Gradual removal
Area M	crack willow	Gradual removal
NE willow woodland	crack willow	Gradual removal
Hussey Rd entrance	crack willow	Gradual removal
Eastern entrance	crack willow	Gradual removal
Area P	soft rush	Control all (trial)
Area R	soft rush	Control all (trial)
Area N	soft rush	Control all (trial)
SW waterway	soft rush	Control all (trial)
SW corner	ivy	Control all
SW corner	stinking iris	Control all

Recommendations

1. Estimate costs for the work outlined over the medium term.
2. Set targets for the coming year (using the schedule of control work) and include these into the appropriate work programmes.
3. Check once a year for any new species or changes in weed distributions.
4. Update list of priorities once a year.
5. Update cost estimates and pursue sufficient funding for each year.

Acknowledgements

Thanks to John Parry and Barry Samson who commented on an earlier draft.

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Appendix 1

Grazing report by C Meurk

Appendix 2

How to recognize female grey willow plants

