Christchurch District Plan
Site of Ecological Significance

Site Significance Statement

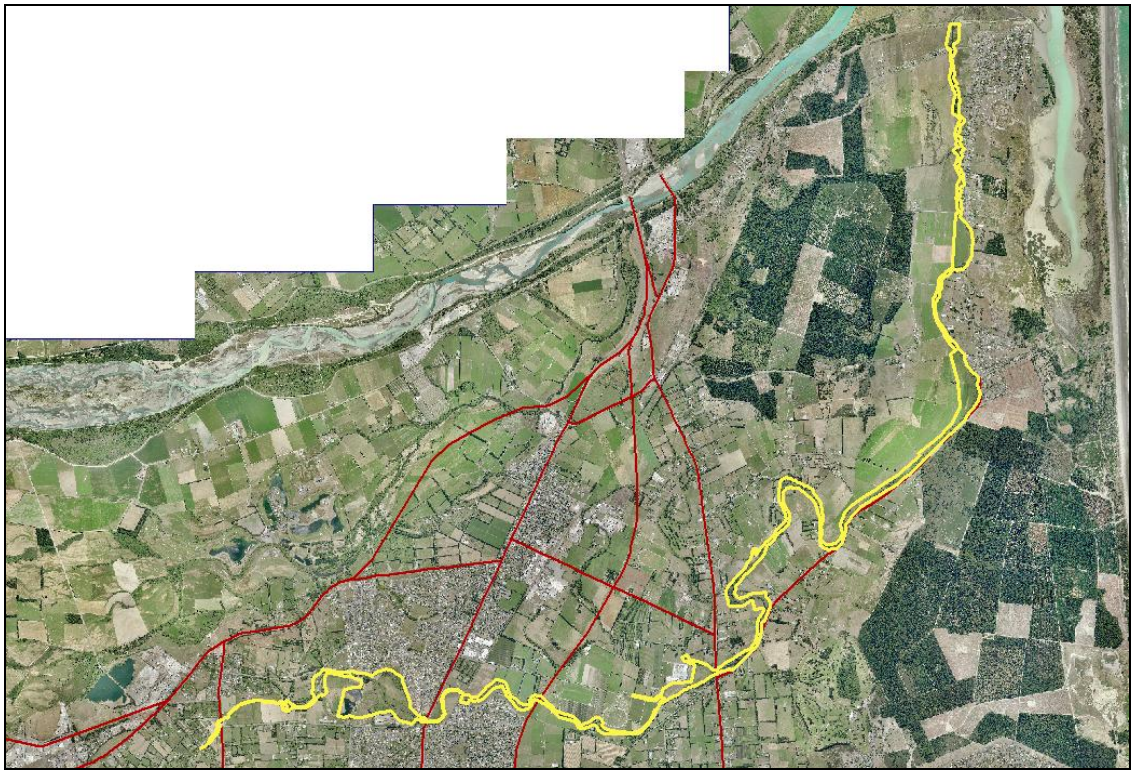
Site Name: Styx River

Site Number: SES/LP/23

Summary of Significance:

The site contains remnant wetland vegetation that is representative of the natural diversity of the Low Plains Ecological District, and supports the At Risk longfin eel.

Site Map: (Refer Appendix 1 for Detailed SES Areas)



Additional Site Information

Central point NZTM: N5187839, E1572409

Site Description

The Styx River SES covers a range of ecosystems including sequences of freshwater aquatic, remnant riparian vegetation, freshwater wetlands, riparian willow woodlands with native under-storey, ephemeral ponding and marsh areas, and planted lowland mixed podocarp forest modelled on local species assemblages including those historically occurring at Riccarton Bush. Although young, the planted lowland mixed podocarp component of the wider site (> 20 ha) is a relatively large and species rich area for the Low Plains Ecological District. The series of planted forest patches across the length of the SES contribute to an important link to a wider landscape-scale forest patch configuration and waterway corridor network throughout the Styx River catchment/northern Christchurch area.

Two extensive areas of ephemerally flooded exotic pasture (formerly natural wetland vegetation) are located along the true left bank of the Styx River opposite the end of Heyders Road in Spencerville, and immediately upstream from Earlham Street respectively. The site is used extensively by native waterfowl and waders for nesting, feeding and high-tide roosting.

Extent of Site of Ecological Significance

The Styx River SES spans from the western property boundary of the CCC tree nursery at 145a Claridges Road (accessed from 239 Gardiners Road) to the floodgates near the mouth of the Styx River at Brooklands. The SES covers the width of steam bed, flowing water, and extends to at least top-of-bank along both sides of the river to include the associated marginal riparian vegetation. However along most of the rivers length the width of the SES extends back from top-of-bank (Refer Appendix 1) to incorporate areas of indigenous vegetation and/or habitat features that are assessed as being ecologically significant under the criteria listed in this significance statement. The extent of specific areas within the Styx River SES are described in further detail below:

Styx Mill Conservation Reserve: At Styx Mill Conservation Reserve the SES covers the areal extent of the remnant wetland vegetation, constructed waterbodies and restored mixed-age forest and riparian plantings, and extends to include the pest proof fence and associated clear-zone/setback which is measured to 4.5 m out from the alignment of the physical structure of the fence. The inclusion of this clear zone/setback within the SES is important as it forms an essential component of the functioning and integrity of the site, with the fence as the appropriate management and maintenance of this zone preventing domestic, community and feral cats from entering the protected refuge.

Styx River Reserve No. 2 (Boyds Farm): The area of the SES for Boyds Farm covers a) the extent of planted native forest and shrubland communities within the CCC reserve areas, b) riparian planting along Radcliffe Rd Drain which extends approximately 220 m west from the CCC reserve boundary along the frontages of 275 and 283 Radcliffe Road, c) the extent of open constructed water-bodies within

the 303 Radcliffe Road site, and d) both the planted and un-planted margins of Kaputone Stream containing remnant native riparian vegetation.

Riparian Willow Woodlands: The extensive willow dominated riparian woodlands that provide habitat for indigenous avifauna downstream from the railway corridor to Brooklands are included within this SES, and are largely defined by the areal extent of their canopy, unless otherwise indicated on the maps in Appendix 1.

Spencerville Styx Marsh: The site at this point is approximately 850 m in length, running roughly parallel with the arc of the true left bank of the Styx River. The site is approximately 156 m wide at its widest point and tapers to approximately 20 m wide at the two ends as shown on the location diagram. The eastern edge of the SES is defined by the areal extent of the riparian willow woodland and/or native woody/shrub/reed-land riparian vegetation.

Earlham Street Marsh: The site extends southward from the Earlham Street bridge for a distance of 630 m, and extends west from the true left bank of the Styx River to the existing fence line to encompass a site that is approximately 190 m wide at its widest point as shown on the location diagram.

Zonta site: The site extends northward of Harbour Road to the Floodgates near the mouth of the Styx River, and extends to include the extent of remnant and restored native plant communities (including planted coastal forest and shrubland communities) along both banks of the river.

The SES area does not include areas of drive and road carriageway, lawn, and/or amenity planting within the SES.

Assessment Summary

The Styx River site has been evaluated against the criteria for determining significant indigenous vegetation and significant habitat of indigenous fauna listed in Appendix 3 of the Canterbury Regional Policy Statement (Environment Canterbury, 2013) (see below) referring also to the Wildland Consultants (2013) Guidelines and advice from the relevant Specialist Ecologist Groups. Under these criteria the site is ecologically significant because it meets representativeness (criteria 1 and 2), rarity/distinctiveness (criteria 3 and 4), diversity and pattern (criterion 7), and ecological context criteria (criteria 8 and 10).

Assessment of Significance Criteria

Representativeness

1. ***Indigenous vegetation or habitat of indigenous fauna that is representative, typical or characteristic of the natural diversity of the relevant ecological district. This can include degraded examples where they are some of the best remaining examples of their type, or represent all that remains of indigenous biodiversity in some areas.***

   The site is significant under this criterion.

Styx Mill Conservation Reserve: Vegetation in the vicinity of Styx Mill Conservation Reserve in 1856 is shown on the 'Black Map' (refer http://resources.ccc.govt.nz/files/blackmap-environmentecology.pdf) to comprise marshy land and swamp surrounded by grassland, fern, raupo, NZ flax/harakeke and toetoe. Very little of these original ecosystems exist locally, however some of these original features still remain in the diverse landforms within the area of the SES that support remnant native plant and animal communities (see Fagan and Meurk 2005).

Within the area of the SES, Fagan and Meurk (2004) record the presence of 63 native plant species that are considered to be representative of the original flora of the site. This amounts to approximately 22% of the predicted 289 species, based on historic and extrapolated potentials. Therefore, although degraded the SES contains some of the best remaining examples of the indigenous biodiversity in the area.

Styx Mill Conservation Reserve also supports a representative assemblage of indigenous bird species (30 indigenous species recorded between 1992 and 2013; Crossland 2013).

Styx River Reserve No. 2 (Boyds Farm): Young riparian, forest and shrubland plantings within Boyds Farm contain 84 species of locally sourced indigenous flowering plants and ferns identified by the Project Ecologist (Appendix 2), including 38 of the 50 local tree and shrub species recorded from Riccarton Bush (see Molloy 1995), as well as a range of other native tree and shrub species identified as likely to have naturally occurred locally by Lucas Associates (1995). Therefore although young the restoration plantings within this reserve are considered to be representative of local indigenous forest vegetation in the Low Plains Ecological District.

Earlham Street Marsh: This area provides winter and high tide feeding and roosting area for a representative assemblage of native waterfowl and waders (Refer Crossland 2014a).

Lower Styx River: James (2013) reports a high Quantitative Macroinvertebrate Community Index (QMCI) for the section of the Styx River immediately upstream from the Kainga Road/Harbour Road bridge in Brooklands.

2. ***Indigenous vegetation or habitat of indigenous fauna that is a relatively large example of its type within the relevant ecological district.***

The site is significant under this criterion.

Styx River Reserve No. 2 (Boyds Farm): The extent of locally sourced and planted indigenous forest and riparian areas within the proposed Boyds Farm SES cover an area of approximately 6.90 hectares, and is larger than the area of Riccarton Bush (the largest natural forest patch of it's type in the Low Canterbury Plains Ecological District). The site is therefore a relatively large example of its type in the region.

Rarity/Distinctiveness

3. Indigenous vegetation or habitat of indigenous fauna that has been reduced to less than 20% of its former extent in the Region, or relevant land environment, ecological district, or freshwater environment.

The site is significant under this criterion.

The Threatened Environment Classification reports that less that 10% of indigenous cover remains in the Low Plains Ecological District (See Walker *et al.* 2007; Lloyd *et al.* 2013). Lloyd *et al.* (2013) identify that *"any indigenous vegetation on the Canterbury Plains"* meets this Rarity/Distinctiveness criterion. Therefore indigenous vegetation within the SES meets this criterion.

Styx Mill Conservation Reserve: The Threatened Environment Classification System identifies the Low Canterbury Plains Ecological District as an 'Acutely Threatened' environment where less than 10% of the land area is under some form of indigenous vegetation cover (see Walker *et al.* 2007).

In the Low Plains Ecological District, freshwater wetlands such as those that occur within Styx Mill Conservation Reserve were once relatively extensive on the eastern parts of the plains (Harding 2009). While it is difficult to estimate the original extent of inland wetlands, it is assumed that these would once have occupied 1 - 5% of the Low Plains Ecological District, but are now represented by less than 1% of that area. Therefore it is likely that wetland vegetation is now reduced to less than 20% of its former extent in this Ecological District.

Styx River Reserve No. 2 (Boyds Farm): The site is significant under this criterion. Within the Boyds Farm part of the SES more than 6.5 hectares of kahikatea *(Dacrycarpus dacrydioides)*, matai *(Prumnopitys taxifolia)* and totara *(Podocarpus totara)* dominated forest have been planted; communitiss that once accounted for between 2 and 10% of the Low Plains Ecological District, but now combined are represented by less than 1% of the District (Harding 2009). These podocarp forest communities have been reduced to less than 20% of their former extent

4. Indigenous vegetation or habitat of indigenous fauna that supports an indigenous species that is threatened, at risk, or uncommon, nationally or within the relevant ecological district.

The site is significant under this criterion.

The site supports longfin eel *(Anguilla dieffenbachia)* (James 2013) which is classified as At Risk/Declining (Allibone *et al.* 2010). Lonfin eels were recorded at four sites within the Styx Mill Conservation Reserve, and in the Styx River as far upstream as the City Council's Harewood Nursery (145A Claridges Road) by James (2013). Because longfin eel are a migratory species, they require migration routes to the sea, and therefore the length of the Styx River downstream of the sampled locations is included as part of this SES.

James (2013) also sampled the Threatened/Nationally Vulnerable (Allibone *et al.* 2010) lamprey *(Geotria australis)* at one site in Styx Mill Conservation Reserve, and the At Risk/Declining (Grainger *et al.* 2014) koura *(Paranephrops zealandicus)* at three sites in Styx Mill Conservation Reserve.

Styx Mill Conservation Reserve: Within the SES, Fagan and Meurk (2005) record eight uncommon or regionally rare indigenous plant species, including the only record of sphagnum moss on the Canterbury east coast (See also Partridge 2007). Uncommon or regionally rare indigenous plant species include the following:

Starwort	*Callitriche petriei*
Mania	*Carex flagelifera*
Purei	*Carex flaviformis*
Purei	*Carex maorica*
Purei	*Carex sinclairii*
Flat-leaved Rush	*Juncus planifolius*
Swamp Tussock	*Schoenuspauciflorus*
Sphangnum moss	*Sphagnum cristatum*

The SES has recently been determined to possess a wetland type known as a fen, at the western end of the wetland. This is the largest fen in Christchurch and has plants found nowhere else in the city, such as ladies tresses orchid *Spiranthes sinensis*. As above, this fen also hosts the only known wild population of *Sphagnum* moss in the city (Partridge 2007).

Two locally uncommon Dipteran (fly) species have been collected within the SES (Macfarlane 2007):

A Saltmarsh Fly	*Hydriellia acutipennis*
	Certomerus crassinervis

Two species of skink have been recorded from the SES; common skink *(Oligosoma polychroma)* and McCanns skink *(O. maccanni)* (McClure 2010). Although Hitchmough *et al.* (2013) list both species as Not Threatened under the NZ Threat Classification System, the common skink is a cryptic species complex, and this classification refers to one described clade only (*O. polychroma* Clade 1). Of the four un-described clades, Clade 4 and Clade 5 occur in the Low Plains Ecological District (see Liggins *et al.* 2008), and are both described by Hitchmough *et al.* (2013) as being At Risk, where their total area of occupancy is estimated to be in excess of 10,000 ha, but with a predicted decline of 10-70% across their range.

Styx Mill Conservation Reserve supports small but increasing populations of several threatened or at risk bird species (see Robertson *et al.* 2013; Crossland 2013; Appendix 2), including:,

- Grey Duck — Threatened/Nationally Critical
- Black Billed Gull — Threatened/Nationally Critical
- Red Billed Gull — Threatened/Nationally Vulnerable
- Pied Stilt — At Risk/Declining
- Black Cormorant — At Risk/Naturally Uncommon

Styx River Reserve No. 2 (Boyds Farm): The Boyds Farm part of the SES contains the At Risk/Declining risk plant *Urtica linearifolia* (climbing nettle) along the margins of Kaputone Stream as recorded by the Project Ecologist. This species is considered to have a large population (>100,000 mature individuals), but with a predicted 10 – 70% decline (de Lange *et al.* 2013), and is abundant within this part of the SES.

The Boyds Farm ponds and adjacent waterways support the Threatened/Nationally Critical Grey Duck *(Anas supercilliosa),* and the At Risk/Naturally Uncommon Black Cormorant *(Phalacrocorax carbo novaehollandiae)* (Refer Crossland 2014b; Robertson *et al.* 2012).

Common skink (refer above) were recorded by the Project Ecologist and CCC Ranger staff within this site in November 2014, and also immediately downstream within the SES at Janet Stewart Reserve by McClure (2010).

Spencerville Styx Marsh: This site provides a significant nesting site for At Risk/Declining (Robertson *et al.* 2013) Pied Stilts *(Himantopus himantopus leucocephalus)* At Risk/Declining South island Pied Oystercatcher *(Haematopus finschi)* (Crossland 2014c; Appendix 1).

Earlham Street Marsh: This site provides a significant nesting site for At Risk/Declining (Robertson *et al.* 2013) Pied Stilts *(Himantopus himantopus leucocephalus)* (Refer Crossland 2014a)

Riparan Willow Woodlands: The willow woodland areas between Marshland Road and Spencerville support the Threatened/Nationally Critical (Robertson *et al.* 2013) Grey Duck *(Anas supercilliosa).* Grey Duck were photographed by the project ecologist within this area using Reconyx PC900 camera traps in 2012 and 2013.

The Styx River downstream from Mashsland Road supports populations of the At Risk/Declining plant *Urtica linearifolia* (climbing nettle) along the margins of the willow woodland as recorded by the Project Ecologist. This species is considered to have a large population (>100,000 mature individuals), but with a predicted 10 – 70% decline (de Lange *et al.* 2013).

5. ***The site contains indigenous vegetation or an indigenous species at its distribution limit within Canterbury Region or nationally.***

   Site not assessed under this criterion

6. ***Indigenous vegetation or an association of indigenous species that is distinctive, of restricted occurrence, occurs within an originally rare ecosystem, or has developed as a result of an unusual environmental factor or combinations of factors.***

   Does not meet this criterion

Diversity and Pattern

7. Indigenous vegetation or habitat of indigenous fauna that contains a high diversity of indigenous ecosystem or habitat types, indigenous taxa, or has changes in species composition reflecting the existence of diverse natural features or ecological gradients.

The site is significant under this criterion.

Styx Mill Conservation Reserve: The SES contains a high diversity of invertebrate fauna. Excluding Lepidoptera (moths), at least 354 insect species (possibly as many as 386) and at least 27 spiders were recorded by Macfarlane (2007), who estimates that the total number of resident species could be 800 – 1000 given that Diptera (flies) account for only 20% of New Zealand's insect species. Of these Macfarlane estimates that approximately 80% of species occurring within the SES are endemic, and if moth species were identified, more beetle species collected, and the occurrence of uncollected localised uncommon to rare were taken into account, this percentage could increase to as much as 88 – 95% (however without further investigation these latter estimates cannot be confirmed).

Ecological Context

8. Vegetation or habitat of indigenous fauna that provides or contributes to an important ecological linkage or network, or provides an important buffering function.

The site is significant under this criterion.

Styx River Reserve No. 2 (Boyds Farm): Dense plantings provide a buffering function fore natural values in the Styx River, Kaputone Stream, Radcliffe Road Drain and Mundy's Road Drain which pass through the site. This part of the SES contributes to an important ecological linkage and network throughout the Styx River catchment, and is linked to other areas of ecological significance by the river corridors and associated riparian vegetation (including willow dominated riparian woodlands with regenerating and/or remnant native under-storey). At 6.9 hectares in area, the riparian and forest plantings within the Boyds Farm part of the SES also make a significant contribution towards the landscape-scale forest patch configuration in terms of providing a core wildlife sanctuary (refer Meurk and Hall 2006).

9. A wetland which plays an important hydrological, biological or ecological role in the natural functioning of a river or coastal system.

Site not assessed under this criterion

10. ***Indigenous vegetation or habitat of indigenous fauna that provides important habitat (including refuges from predation, or key habitat for feeding, breeding, or resting) for indigenous species, either seasonally or permanently.***

The site is significant under this criterion.

Styx Mill Conservation Reserve: The construction of a cat and dog exclusion fence along the northern and eastern boundary of Styx Mill Conservation Reserve provides a degree of protection from large mammals (including domestic cats, dogs and to some degree people), providing an area of relatively undisturbed refuge for indigenous species within the eastern end of the SES.

Riparian Willow Woodlands: Camera trapping inventory work carried out by the Project Ecologist in 2013 have shown the riparian willow woodlands along the lower Styx River between Marshland Road and Spencerville to provide a core refuge and breeding site for several species of waterfowl including Grey Teal, Black Swan, Australasian Shoveler and Pukeko, New Zealand Scaup and possibly also for Grey Duck.

Earlham Street Marsh: This site provides important winter and high tide feeding and roosting area for wading birds, including (Crossland 2014a):

- Black Cormorant
- White Faced Heron
- Paradise Shelduck
- Pukeko
- Pied Stilt
- Spur Winged Plover

Zonta Site: Swampbird habitat (utilised by Marsh Crake, Pukeko, possibly Bittern and potentially several reintroduced species) exists in the Zonta revegetation project area downstream of the Harbour Road Bridge as well as upstream for the first 200 metres on the true right bank (Crossland 2008).

Site Management

Threats and risks	Management recommendations	Support package options
• Pest plant incursion	• Monitor pest plant infestations and implement control as required. • Assess new pest plant incursions and implement control as required	• Information packages for neighbouring properties (e.g. 'Plant Me Instead')
• Animal pest incursion into pest free areas	• Monitoring of possible animal pest incursions and trapping as necessary • Regular inspection and maintenance of pest proof fence • Maintenance of an effective clear zone around perimeter of pest proof fence to prevent animals jumping fence	• Provide advice and guidance on pest animal monitoring • Supply traps and related training as necessary to private land owners adjoining the SES
• Disturbance to wildlife from dogs	• Prohibit dogs within core wetland areas of the SES • Interpretation highlighting the impacts dogs can have on wildlife values • Plan for future relocation of Styx Mill Conservation Reserve dog park to new site nearby	• N/A
• Potential removal of the threatened climbing nettle (*Urtica linarifolia)* as a result of stream bank maintenance	• Highlight presence of plants to maintenance contractors • Interpretation signage on-site	• N/A
• Draining of ponded areas at Spencerville and South of Earlham Street	• Discourage draining, filling and/or cultivation of the ephemeral ponding areas	• N/A
• Disturbance of nesting sites by livestock and uncontrolled dogs	• Suggest de-stocking during Pied Stilt nesting season, and ensure dogs do not enter area during this period	• Education and interpretation plan for the area

• Loss of indigenous waterfowl habitat through removal of riparian willow woodland	• Ensure no net loss in riparian willow woodland area through re-planting any controlled willow with appropriate local native tree species • Phase removal of willows to ensure continuity of habitat (ie; tall riparian woodland) for bird species dependent on woodland habitat structure.	• N/A
• Anthropogenic change to water regime	• Any action relating to changes in the water regime need to be assessed in relation to impacts upon ecological state and functioning of wetlands.	• N/A
• Natural process of change	• If natural changes in wetland ecology, composition or functioning are determined to be detrimental to the ongoing viability of the values of the site, a recovery action plan should be initiated.	• N/A

• Inappropriate management of natural remnant low-nutrient wetlands (Styx Mill Conservation Reserve fen)	• Ensure that the area occupied by the fen receives only rain water and that no stream, ground or surface water overflow enters that area	• N/A
• Artificial riverbank retaining, substrates and/or other structures that adversely affect ecological function of waterways	• Naturalise banks (i.e. remove retaining and create sloping banks with appropriate native vegetation) during bank maintenance works and through capital projects • Prevent construction of fish barriers (e.g. weirs) and remediate current barriers	• N/A
• Deficiency of high-quality riparian margins, resulting in a lack of habitat, high water temperatures due to a lack of shading, no buffer/filtering from urban impacts and affects on the functioning of ecological corridors (i.e. species movement)	• Supplement riparian margins with dense, native and locally-sourced vegetation of varying heights (i.e. include tall trees to provide shading to the waterway) • Focus on planting areas of unstable ground, to reduce erosion and sediment discharges • To maintain the riparian margin and ecological corridors, ensure waterway setbacks are maintained (i.e. resource consent is required to build, fill or excavate) and closed fences are not built adjacent to waterways	• N/A
• Discharge of contaminants	• Treatment of stormwater to a high level prior to discharge into waterways • Reduction in occurrence of wastewater overflows to waterways • Prevent non-	• N/A

	stormwater discharges (e.g. trade-waste and agricultural runoff) from entering stormwater network or waterways • Effective sediment control mitigation measures during construction • Removal of instream sediment (and therefore other contaminants attached to sediment)	
• Excessive amount of leaf-fall from deciduous trees	• Plant indigenous locally-sourced evergreen species in riparian margins instead of deciduous trees	• N/A
• Artificial light impacting on freshwater fauna	• Minimise light-spill onto waterway	• N/A
• Lack of instream habitat for freshwater fauna	• Maintain or enhance species-specific habitat	• N/A
• Pathogen input from waterfowl and dog faeces affecting water quality	• Reduce ability for waterfowl to enter waterways, by densely planting riparian margins with appropriate native species • Encourage community not to feed the ducks • Encourage the community to pick up dog faeces	• N/A

References

Allibone, R., David, B., Hitchmough, R., Jellyman, D., Ling, N., Ravenscroft, P. & Waters, J. (2010). *Conservation status of New Zealand freshwater fish, 2009*. *New Zealand Journal of Marine and Freshwater Research*, 44(4): 271-287.

Crossland, A. C. (2008) *Brooklands Lagoon wetland complex: an overview of the site's importance to birdlife with habitat management recommendations*. Christchurch City Council.

Crossland, A. C. (2013) *Checklist to the birds of Styx Mill Conservation Reserve.* Unpublished CCC Report (TRIM 13/9142).

Crossland, A. C. (2014a) *Earlham Street Marsh bird monitoring*. Unpublished Dataset, Christchurch City Council. (TRIM Reference 14/1233674)

Crossland, A. C. (2014b) *Radcliffe Road pond bird monitoring 2006 to present*. Unpublished Dataset, Christchurch City Council. (TRIM Reference 14/519316).

Crossland, A. C. (2014c) *Spencerville Styx Marsh (Opposite Heyders Road)*. Unpublished Dataset, Christchurch City Council. (TRIM Reference 14/1313997).

de Lange, P. J., Rolfe, J. R., Champion, P. D., Courtney, S. P., Heenan, P. B., Barkla, J. W., Cameron, E. K., Norton, D. A., and Hitchmough, R. A. (2013) *Conservation status of New Zealand indigenous vascular plants, 2012*. New Zealand Threat Classification Series 3, Department of Conservation.

Environment Canterbury. (2013). *Canterbury Regional Policy Statement 2013*. Environment Canterbury.

Fagan. L., and Meurk, C. (2005) *Ecological restoration plan for Styx Mill wildlife sanctuary.* Landcare research, Lincoln, New Zealand.

Grainger, N., Collier, K., Hitchmough, R., harding, J., Smith, B., and Sutherland, D. (2014) *Conservation status of New Zealand freshwater invertebrates, 2013.* New Zealand Threat Classification Series 3, Department of Conservation.

Harding, M. A. (2009) *Canterbury land protection strategy; a report to the nature Heritage Fund committee*. Nature Heritage Fund, Wellington, New Zealand.

Hitchmough, R., Anderson, P., Barr, B., Monks, J., Lettink, M., Reardon, J., Tocher, M., and Whitaker, T. (2013) *Conservation status of New Zealand reptiles, 2012.* Department of Conservation, Wellington, New Zealand.

James, A. (2013) *Long-term monitoring of aquatic invertebrates and fish: Styx River catchment.* EOS Ecology, Christchurch, New Zealand.

Liggins, L., Chapple, D. G., Daugherty, C. H., and Ritchie, P. A. (2008) *A SINE of restricted gene flow across the Alpine Fault: phylogeography of the New Zealand common skink (Oligosoma nigriplantare polychroma).* Molecular Ecology 17: Pp 2668 – 3683.

Lloyd, K., McClellan, R., Hutchison, M., Patrick, B., and Shaw, W. (2013) *Guidelines for the application of ecological significance criteria for indigenous vegetation and habitats of indigenous fauna in Canterbury region.* Report prepared for Environment Canterbury by Wildlands Consultants, Rotorua, New Zealand.

Lovis, J. (1995) *Native ferns*. In Molloy, B. (Ed) *Riccarton Bush: Putaringamotu.* Riccarton Bush Trust, Christchurch, New Zealand. Pp 116 – 143.

McClure, C. (2010*) Survey of the lizard fauna of Janet Stewart Reserve and Styx Mill Conservation Reserve, Christchurch.* (TRIM 14/196860).

Macfarlane, R. (2007). Styx Mill Conservation Reserve: invertebrate assessment and implications for management.

Meurk, C. D., and Hall, G. M. J. (2006) *Options for enhancing forest biodiversity across New Zealand's managed landscape based on ecosystem modelling and spatial design.* New Zealand Journal of Ecology 20 (1): Pp 131 – 146.

Molloy, B. (1995) *Records of native conifers and flowering plants*. In Molloy, B. (Ed) *Riccarton Bush: Putaringamotu.* Riccarton Bush Trust, Christchurch, New Zealand. Pp 116 – 143.

Partridge, T. R. (2007) *Belfast Area Plan – natural values terrestrial habitats*. CCCECO 07/06. Christchurch City Council.

Robertson, H., Dowding, J., Elliott, G., Hitchmough, R., Miskelly, C. O'Donnell, C., Powlesland, R., Sagar, P., Scofield, P., Taylor, G. (2013) *Conservation status of New Zealand birds, 2012*. New Zealand Threat Classification Series 4, Department of Conservation.

Taylor, M. and M. Main (2011). *Ecological monitoring of Christchurch City waterways: Styx River.* Christchurch, Aquatic Ecology LTD.

Walker, S., Cieraad, E., Grove, P., Lloyd, K., Myers, S., and Porteous, T. (2007*) Guide to users of the threatened environment classification.* Landcare Research, Lincoln, New Zealand.

Assessment completed by: Dr Antony Shadbolt

Date: 17th November 2014

Statement completed by: Dr Antony Shadbolt
Date: 17th November 2014

Statement updated by: XXX
Date: XXX

Please note this statement is based on information available at the time of writing. Due to the dynamic nature of ecosystems, future reassessment of the site may be necessary to reflect any changes in knowledge of its ecological significance.

Appendix 1

Figure 1: Styx River - Harewood Park to Styx Mill Conservation Reserve

Figure 2: Styx River – Styx Mill Conservation Reserve (Upper)

Figure 3: Styx River – Styx Mill Conservation Reserve (Lower) to Redwood Springs

Figure 4: Styx River – Redwood Springs

Figure 5: Styx River – Redwood Springs to Selkirk Place (Highfield)

Figure 6: Styx River – Selkirk Place to Boyds Farm Reserve

Figure 7: Styx River – Boyds Farm Reserve

Figure 8: Styx River – Janet Stewart Reserve Living Laboratory Precinct

Figure 9: Styx River – Styx Living Laboratory Precinct to Lower Styx Conservation Reserve

Figure 10: Styx River – Lower Styx Conservation Reserve to S-bend

Figure 11: Styx River – Lower Styx Road (Upper)

Figure 12: Styx River – Lower Styx Road (Middle)

Figure 13: Styx River – Lower Styx Road (Lower)

Figure 14: Styx River - Spencerville

Figure 15: Styx River – Spencerville to Earlham Street (Brooklands)

Figure 16: Styx River – Earlham Street to Dartford Street (Brooklands)

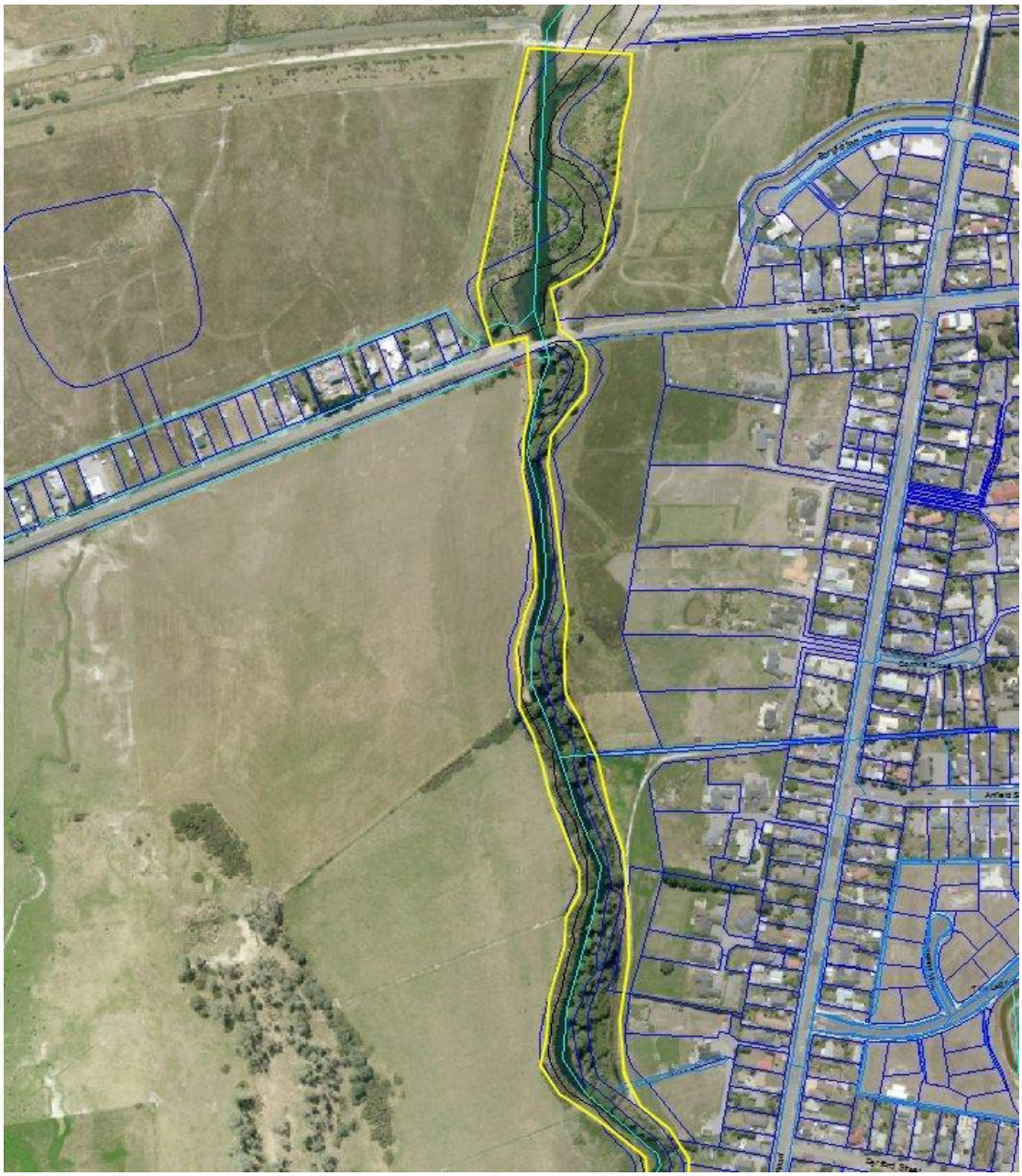


Figure 17: Styx River – Dartford Street to Floodgates (Brooklands)

Appendix 2: Native Flowering Plants & Conifers

List of native conifers, flowering plants and ferns recorded within the Boyds Farm Reserve.

Species marked with asterisks (**) indicate species considered local to the area, but not listed as ever being present in Riccarton Bush. Species underlined represent local species now extinct in Riccarton Bush. Species in gray font indicate species recorded from Riccarton Bush, but not occurring at Boyds Farm (Refer Lovis 1995, and Molloy 1995).

TREES & SHRUBS

BOTANICAL NAME	COMMON NAME(S)
Alectryon excelsus	titoki/NZ ash
Aristotelia serrata	wineberry/makomako
Carmichaelia robusta	NZ broom/makaka
Carpodetus serratus	marbleleaf/putaputaweta
*Cassinia leptophylla***	tahinu
Coprosma areolata	thin leaved coprosma
Coprosma crassifolia	stiff-stemmed coprosma
*Coprosma linarifolia***	
Coprosma lucida	karamu
Coprosma propinqua	mingimingi
Coprosma propinqua x C. robusta	hybrid coprosma
*Coprosma repens***	
Coprosma rhamnoides**	
Coprosma robusta	karamu
Coprosma rotundifolia	round leaved coprosma
*Coprosme rubra***	
*Coprosma virescens***	
Cordyline australis	cabbage tree/ti kouka
Coriaria sementosa	tutu
Corokia cotoneaster	korokio
Dacrycarpus dacrydioides	kahikatea/white pine
*Discaria toumatu***	matagauri
*Dodonaea viscosa***	akeake
Elaeocarpus dentatus	hinau
Elaeocarpus hookerianus	pokaka
Elaeocarpus dentatus x E. hookerianus	hybrid
Fuchsia excorticata	tree fuchsia/kotukutuku
Fuchsia excorticata x F. perscandens	hybrid fuchsia
Griselinia littoralis	broadleaf/kapuka
Hebe salicifolia	koromiko
*Hebe strictissima***	
Hoheria angustifolia	narrow leaved lacebark/houhere
Kunzea ericoides	white tea tree
*Leptospermum scoparium***	*manuka*
Lophomyrtus obcordata	NZ myrtle/rohutu
Melicope simplex	poataniwha
Melicytus micranthus	manakura/shrubby whiteywood
Melicytus ramiflorus	mahoe/whiteywood
Melicytus micranthus x M. ramiflorus	hybrid whiteywood
*Muehlenbeckia astonii***	shrubby pohuehue
Myoporum laetum	ngaio

Myrsine australis	red matipo
*Myrsine divaricata***	weeping maupo
Neomyrtus pedunculata	NZ myrtle/rohutu
*Olearia avicenniaefolia***	tree daisy
*Olearia paniculata***	golden akeake
Pennantia corymbosa	kaikomako
Pittosporum eugenioides	lemonwood/tarata
Pittosporum tenuifolium	kohuhu/black matipo
Plagianthus regius	ribbonwood/manatu
Podocarpus totara	totara
Prumnopitys ferruginea	miro/brown pine
Prumnopitys taxifolia	matai/black pine
Pseudopanax arboreus	five-finger/pauhou
Pseudopanax crassifolius	lancewood/horoeka
Pseudowintera colorata	pepper tree/horopito
Schefflera digitata	seven-finger/pate
Solanum aviculare	poroporo
Sophora microphylla	South Island kowhai
Streblus heterophyllus	milk tree/turepo
Urtica ferox	tree nettle/ongaonga

CLIMBING PLANTS

BOTANICAL NAME	**COMMON NAME(S)**
Calystegia turguriorum	NZ bindweed/powhiwhi
Clematis paniculata	NZ clematis/puawananga
Clematis fosteri	yellow clematis
Fuchsia perscandens	climbing fuchsia
Metrosideros diffusa	white rata/climbing rata
Muehlenbeckia australis	pohuehue/Maori vine
*Muehlenbeckia axillaris***	pohuehue
Muehlenbackia complexa	shrubby puhue
Muehlenbeckia australis x M. complexa	hybrid pohue
Parsonsia capsularis	NZ jasmine/kaiwhiria
Parsonsia heterophylla	NZ jasmine/kaiwhiria
Passiflora tetandra	Kohia/NZ passion flower
Ripogonum scandens	supplejack/kareao
Rubus australis	bush lawyer/taramoa
Rubus schmidelioides	bush lawyer/taramoa
Rubus squarrosus	bush lawyer/taramoa
Rubus australis x R. squarrosus	hybrid lawyer
Rubus australis x R. schmidelioides	hybrid lawyer
Rubus schmidelioides x R. squarrosus	hybrid lawyer
*Urtica linearifolia***	climbing nettle

MISTLETOES

BOTANICAL NAME	**COMMON NAME(S)**
Ileostylus micranthus	common mistletoe
Korthalsella lindsayi	dwarf mistletoe
Tuperia Antarctica	white mistletoe/pirita

MONOCOT HERBS

BOTANICAL NAME	**COMMON NAME(S)**
Anemanthele lessoniana	hunangamoho/NZ wind grass
Astelia fragrans	bush flax/kahaka
Astelia grandis	bush flax/kahaka

Astelia nervosa	bush flax/kahaka
Austroderia richardii	toetoe
Carax coriacea	sedge/rautahi
Carex flagelifera	shining sedge/mania
*Carex geminata***	
Carex lambertiana	sedge
*Carex maorica***	
Carex raoulii	sedge
Carex secta	sedge/purei
Carex solandri	sedge
Carex virgata	swamp sedge
Carex lambertiana x C. solandri	sedge
*Cyperus ustulatus***	
*Dianella nigra***	
*Elaeocharis acuta***	
Gahnia xanthocarpa	giant gahnia
Hierochloe redolens	holy grass/karetu
Juncus distegus	rush
Juncus gregiflorus	rush
*Juncus pallidis***	rush
Libertia ixioides	NZ iris/mikoikoi
Liuzula picta var. limosa	woodrush
Luzula rufa	woodrush
Microlaena avenacea	bush rice grass
Phormium tenax	NZ flax/harakeke
*Poa cita***	silver tussock
Poa imbecilla	weak poa
Rytidosperma gracile	danthonia/bush danthonia
Uncinia leptostachya	hooked sedge/matau
Uncinia uncinata	hooked sedge/kamu

DICOT HERBS

BOTANICAL NAME	**COMMON NAME(S)**
Acaena anserinifolia	piripiri/bidibidi
Cardamine debilis	*NZ cress/panapana*
Epilobium billardieraenum	*willowherb*
Epilobium komarovianum	*willowherb*
Epilobium macropus	*willowherb*
Epilobium nummulariifolium	*willowherb*
Epilobium pallidiflorum	*willowherb*
Epilobium pictum	*willowherb*
Epilobium rotundifolium	*willowherb*
Geranium solenderi	*cranesbill/cut-leaved geranium*
Gnaphalium involucratum	*creeping cudweed*
Hydrocotyle heteromeria	*NZ waxweed/hydrocotyle*
Hydrocotyle moschata	*hydrocotyle/marsh pennywart*
Microseris scapigera	-
Oxalis corniculata	*creeping oxalis*
Nertera depressa	*nertera*
Parietaria debilis	*NZ pellitory*
Pseudognaphalium luteoalbum	*common cudweed*
Ranunculus glabifolius	*NZ buttercup*
Rananculus reflexus	*NZ buttercup*
Rumex flexuosus	*Maori dock/nuna*

Scenecio minimus	*fireweed*
Stellaria parviflora	*NZ stichwort*
Urtica incisa	*dwarf nettle/forest nettle*
Wahlenbergia gracilis	*NZ harebell*

FERNS

BOTANICAL NAME	**COMMON NAME(S)**
Asplenium flabellifolium	necklace fern
Asplenium gracillimum	graceful spleenwart
Asplenium hookerianum	Hooker's spleenwart
Asplenium terrestre	ground spleenwart
*Azola filiculoides***	water fern
Blechnum discolor	crown fern/piupiu
Blechnum fluviatile	creek fern/kiwakiwa
Blechnum minus	swamp kiokio
Blechnum penna-marina	little hard fern
Dicksonia squarrosa	rough tree fern/wheki
Histiopteris incise	water fern/mata
Hypolepis ambigua	rough pig fern
Hypolepis rufobarbata	sticky pig fern
Leptopteris hymenophylloides	cape fern/heruheru
Pallaea rotundifolia	button fern/tarawera
Phymatosorus pustulatus	hounds tongue fern/kowaowao
Pneumatopteris pennigera	feather fern/pakau-roharoha
Polystichum richardii	black shield fern/tutoke
Polystichum vestitum	prickly shield fern/puniu
Pteridium esculentum	bracken/rahurahu
Pyrrosia eleagnifolia	leather leaf fern