



May 2005

# Styx River/ Pūrākaunui

## Natural Asset Condition Report



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## Christchurch River Environment Assessment System (CREAS)

CREAS is a GIS-based strategic management tool for Christchurch waterways developed by ecological consultants, NIWA and EOS Ecology. The purpose of CREAS is to provide comprehensive natural asset management data of Christchurch's waterways. CREAS will be implemented in several stages over a 5-year period. The first stage includes field surveys of **physical habitat** for the Avon, Heathcote, Cashmere and Styx Rivers (see bottom of page for list) completed during November 2004 through until May 2005.

### Data include:

**Habitat type:** substrate composition, bank height, bank angle, and bank material.

**Flow:** river depth and width, hydraulic type, water velocity, and springs.

**Vegetation:** riparian vegetation composition, bank vegetation cover, and aquatic plants, composition of land cover.

**Urban impacts:** bank stability/ erosion, siltation, notable riparian and aquatic weeds.

**Observations:** fish barriers, stormwater pipe outfalls, fish/ bird observations.

### Survey details

The river sections were sampled at a prescribed length (100 m or 200 m) with the starting point and end point of each river section marked with GPS waypoints and photographs taken up and downstream. The survey did NOT include ephemeral and dry waterways, and surveyors were confined to areas that they could wade through. Also, the first stage did NOT include a comprehensive survey of fish and invertebrates- this will be the second stage of the survey.

### Access to the data

A total of 612 field sheets and associated photos were collected from the 2004-2005 survey. The data are entered in Excel and held in the Greenspace Unit's shared drive (S: CREAS Christchurch River Environment Assessment System). These data are being incorporated into a data model, which will eventually be available for council staff use via the Christchurch City Council's Webmap.

### Survey data and reports are available for the following waterways:

*(Reports are not a full analysis, they are an overview only. A map of each catchment showing the waterways surveyed is attached with each report.)*

- The Avon River from Barbadoes Street to Corfe Reserve in Avonhead
- The Heathcote River from Ensors Road to Wigram Retention Basin
- The Cashmere Stream from Shalamar Drive to its source near Halswell (including Cashmere Stream tributaries throughout south-west Christchurch)
- The Styx River Mainstem from Main North Road and tributaries downstream to Janet Stewart Reserve in Marshlands
- Kaputone Creek from Marshlands Road to the Main North Road
- Horners/Tyson's Stream in north-west Christchurch.

# CREAS STYX RIVER MAINSTEM REPORT

## 1. Introduction

Between January and April 2005 approximately 35 km of waterways belonging to the upper Styx River system and its tributaries were surveyed as part of the Christchurch River Environment Assessment System (CREAS). The survey started upstream of the Styx Mill Bridge at the Main North Road and ended at Sawyers Arms Road where the channel dried up. Downstream of the Main North Road the Styx River was too deep to be surveyed and consequently only its tributaries between the Main North Road and Janet Stewart Reserve east of Marshlands Road were surveyed. In this document the Kaputone Creek and Horners/Tyson's Drain systems are not included. These are presented in separate documents.

The Styx River originates in mainly urban areas of north west Christchurch. North of Claridges Rd and northwest of Gardiners Road it moves through rural, pastoral/orchard land until it reaches Styx Mill Reserve. For roughly half the surveyed distance it flows through the Styx Mill Reserve. The Styx tributaries to the upper Styx originate partly in rural areas west of the Main North Rd. Feeding into the system from the south are the Papanui Railway Drain and the Regents Park Stream, the Styx Drain and tributaries, and Cavendish Drain. From the north, Smacks Creek and Hussey Swale feed into the system. Major tributaries between the Main North Road and Janet Stewart Reserve are McFaddens and Farquhar Drains, Radcliffe Road and Mundys Drains, Rhodes and Quaid's Road Drains including their branches, and finally Canal Reserve Drain and Gibsons Drain.

### 1.1 Key Features

The upper Styx River is a relatively fast flowing and deep system with crystal clear water and varied habitats along its course. More than 15 springs west of the Main North Road alone are contributing to its clear water. At least another 8 springs are feeding into the Styx between the Main North Road and Janet Stewart Reserve.

The main channels including Smacks Creek provide the most diverse habitats for wildlife of any of the surveyed areas in the North East Christchurch Area. The many pools, diverse substrate and relative abundance and diversity of aquatic plants provide good habitat for fish and presumably invertebrate animals. Several big trout (*Salmo spp.*) and eels (*anguilla spp.*) as well as *Galaxias* and bully species (*Gohiomorphus spp.*) were seen during the survey.

The river upstream of the western boundary of the Styx Mill Reserve, including Smacks Creek, provides excellent opportunities for restoration. Some landowners, including Willowbank Wildlife Reserve and the Harewood Crematorium, have already partially restored stretches of the river, which provide a continuation of the Styx Mill Reserve corridor. Unfortunately, the private plantings may consist of plants that are not locally sourced and hence pose a threat to the genetic integrity of the local gene pool. The source of Smacks Creek, a swamp area above Harewood Crematorium has good native regeneration under willow canopy.

The catchment from Sawyers Arms Road through to Gardiners Road has relatively light peaty soils and therefore the riverbanks are prone to erosion. In order to control the erosion, acquisition of a wide river margin (width of at least 15 m each bank) and restoration would be a high priority in this area.

The stretch of river between Gardiners Road and Styx Mill Reserve has a relatively wide river margin. Its high steep banks are fenced from stock and hence are protected to some extent. This area has excellent potential for restoration through natural succession. Dense stands of broom and bracken fern have established on the upper banks providing cover for native regeneration particularly of native ferns and trees.

Styx Mill Reserve stands out for its native vegetation remnants. Three of five rare native plant species found in this study in north east Christchurch, were seen in the reserve (*Utricularia monanthos*, *Centella uniflora*, *Carex buchananii*). The size of the reserve also provides the basis for a self-sustaining plant succession. Prolific regeneration of several fern species, *Pittosporum* species, broadleaf trees (*Griselinia littoralis*) and cabbage trees (*Cordyline australis*) has been found under willow canopy. However, cattle grazing is still adversely affecting the waterways in the reserve through cattle access to the waterways, cattle excrement and physical disturbance of the riparian margins.

Unfortunately, the many tributaries to the Styx River carry heavy silt loads and constitute relatively degraded aquatic habitat. For example, a previously known trout spawning area in Styx Stream near the first pond of Styx Mill Reserve has almost entirely been lost because of siltation. The areas around McFaddens Stream, Radcliffe Road Stream and Mundys Stream and both sides of Marshlands Road are prone to erosion due to peaty soils. Kaputone Creek and the waterways of the Cranford Basin are major silt contributors. This type of degradation is likely to be ongoing and exacerbated by encroaching subdivision and will impact adversely on the ecological, recreational, amenity and drainage values of the Styx mainstems.

## **2. Habitat**

### **2.1 Habitat Type**

The majority of habitat for the described area is run. However, 40 pools up to 170 cm deep were found in the Styx mainstem, most of them in the Styx Mill Reserve. Short stretches of riffle are in many sections of the river system. The best riffle stretches were found in the last 1 km of Regents Park and Papanui Railway Drains (2% on average), in a section of Smacks Creek 1 km upstream of Gardiners Road (5% on average), in Styx Drain and lower Cavendish Drain (2% on average), and in Rhodes Drain (1% on average)

### **2.2 Depth/Width**

The depth of the system varies over its length gradually getting shallower upstream. In the section from Styx Mill Bridge through to Gardiners Road the biggest variation was recorded (5-170 cm, averaging approximately 50 cm). The remaining system varies between 2 and 70 cm. The width also varies widely (40-6500 cm), especially due to several ponding areas in Styx Mill Reserve, Willowbank, Regents Park, Cavendish, Rhodes, and Gibsons Drains.

### **2.3 Substrate**

The Styx mainstem between Styx Mill Bridge and Gardiners Road has the most diverse substrate of the system, with frequent alternation of silt, sand and coarser substrate. Tributaries with a high proportion of coarser substrate are Regents Park, the upper Smacks, Styx, Rhodes, and Farquhars Drains. Gibsons Drain is very sandy (up to 75%).

### **2.4 Undercuts**

The best bank heterogeneity was found in the Styx mainstem with sporadic undercuts for the whole length of up to 65 cm, and the lower Smacks Creek with up to 35 cm deep undercuts.

### **2.5 Flow**

The velocity is very variable for the whole system (1.5 sec/m to almost stagnant (0.66 m/sec)). Faster flowing areas are in the Styx mainstem, with an approximate mean of 2 sec/m (0.5 m/sec), the Papanui Railway Drain and Rhodes Drain.

### **2.6 Springs**

At least 26 springs are in the surveyed area. Most were found in the Styx mainstem near Gardiners Road (5), Gardiners Road Drain (3), and Willowbank (4). Nine springs were found west of Marshlands Road.

## **3. Vegetation**

### **3.1 Riparian Vegetation**

The riparian vegetation of the upper Styx River system is relatively uniform comprising intermittent stretches of predominantly exotic deciduous canopy trees, (mainly grey (*Salix cinerea*) and crack willow (*Salix fragilis*)). Exotic shrubs, mainly broom (*Cytisus scoparius*) and gorse (*Ulex europaeus*), and sometimes native shrubs, as well as exotic grasses make up the understorey. Upstream of Gardiners Road the Styx mainstem channel canopy cover is far greater and remains so to the end of the section. This area also contains more diversity of native species, both shrubs and trees. Outstanding areas for their diversity and native regeneration are Styx Mill Reserve and the Styx River between Styx Mill Reserve and Gardiners Rd, Willowbank Reserve, Smacks Creek, Styx Mill Conservation Area, Rhodes Drain and the native plantings in Regents Park, Aylsham Reserve, Springvale Gardens on Gardiners Road, Harewood Crematorium, and Janet Stewart Reserve

### **3.1 Aquatic Plants**

The Styx mainstem and Smacks Creek have the greatest abundance and variety of aquatic plants. For the first two kilometres upstream of Styx Mill Bridge *Potamogeton crispus*, *Rorippa* sp., *Nitella* sp. and *Elodea canadensis* are the predominant species. Notable are smaller populations of *Potamogeton cheesemanii*. *Glyceria fluitans*, *Myriophyllum propinquum*, *Mimulus guttatus*, *Myosotis* and *Callitriche* sp. are also present. Outstanding are Rhodes Stream for its small *Potamogeton cheesemanii* population, a pond from which Regents Park Stream originates, and Janet Stewart Reserve for their *Potamogeton ochreatus* populations.

In the tributaries, the abundance of aquatic plants is reduced and filamentous algae are more dominant. *Azolla filiculoides* and *Lemna minor* dominate stagnant or slow flowing water. Smaller proportions of woody debris, detritus and tree root are present throughout the system.

## **4. Urban Impacts**

### **4.1 Bank stability/erosion**

Banks are moderately stable (between 5-50% unstable) for most of the Styx system. The bank stability decreases (up to 75% bank instable) for the Styx mainstem, upstream of Gardiners Road and the last 400 m of Papanui Railway Drain. Both banks are relatively steep but recovering since stock has been removed and vegetation (largely exotic shrubs and native bracken fern) is beginning to re-establish. The banks of the north branch of the Styx in Styx Mill Reserve are also up to 75% unstable due to earthmoving works.

### **4.2 Siltation**

Siltation is low in the section of the Styx mainstem between Styx Mill Bridge and Gardiners Road. The substrate of the tributaries is generally silt (up to 100%). Styx Drain and the concrete channel section of Papanui Railway Drain are much less silted.

### **4.3 Notable Weeds**

Grey willow (*Salix cinerea*), gorse (*Ulex europaeus*) and broom (*Cytisus scoparius/multiflorus*) are ubiquitous. Four extensive stands of Chilean mayten (*Maytenus boaria*) were found; one on Smacks Creek west of Gardiners Road, one on the corner of Sturrocks and Cavendish Roads, one on the Styx mainstem near Johns Road, and one on Gibsons Drain. One small patch of African clubmoss (*Selaginella kraussiana*) was found on the banks of Smacks Creek in Springvale Gardens. Several plants of Hyssop loosestrife (*Lythrum hyssopifolia*) were found in Styx Mill Reserve. Yellow flag iris (*Iris pseudacorus*) is widespread, with populations on Regents Park Stream, on the shores of pond 1 in Styx Mill Reserve, in the Styx Mill Conservation Area and Janet Stewart Reserve. Old man's beard (*Clematis vitalba*) grows only along Papanui Railway Drain.

#### **4.4 Fish Barriers**

There are a total of 22 fish barriers, ranging in drop height from 10 to 135 cm, in the upper Styx system. Regents Park Drain has most weirs (7). The tributaries between Marshlands and Cavendish Road have 20 fish barriers.

#### **5. Observations**

The Styx River appears to have a healthy biodiversity. Several big trout and eels were observed. *Galaxias* and bully species were also seen. The section from the Styx Mill Bridge to Gardiners Road offers some of the best habitat for fish and invertebrates anywhere in the catchment. Deep pooling, large aquatic plant communities, clean water, deep bank undercuts and overhangs, diverse and abundant aquatic vegetation and variable substrate provide excellent conditions for aquatic life. Lack of disturbance (mowing of banks, channel clearing, etc.) and the regeneration of native plant species also enhance the habitat quality here.

Large populations of pukeko (*Porphyrio melanotus*) were observed throughout this system. Mallard (*Anus platyrynchos*), grey duck (*Anus superciliosa*), scaup (*Aythya novaeseelandiae*), Canada goose (*Branta canadensis*) and paradise shelduck (*Tadorna variegata*) are abundant in Styx Mill Reserve. Black and mute swans (*Cygnus astratus* and *Cygnus olor*), kingfishers (*Halcyon sanita vagans*), Australian coot (*Fulca atra australis*), and New Zealand shoveler (*Anus rhynchotis variegata*) are present.

