# Forbes Ecology

South Wairarapa District Council WWTP, April 2013

Summary of Freshwater Periphyton Sample Processing & Results

*prepared by*

**Ryder Consulting**

June 2013

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environment + planning + project management

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Summary of Freshwater Periphyton Sample Processing & Results

*prepared by*

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# 1. Introduction

## 1.1 Background

Frozen periphyton samples were provided to Ryder Consulting by Forbes Ecology. Forbes Ecology staff collected these samples in April 2013. Ryder Consulting Ltd was engaged to process the samples, and report the results of taxonomic composition and biomass.

## 1.2 Objectives

The objectives of this report are to present the methods and results of the South Wairarapa District Council WWTP sample processing.

# 2. Laboratory Analysis

## 2.1 General

In the laboratory each sample was tipped into a glass beaker and blended for about 30 seconds or until the mixture was free of obvious clumps of material. The blended liquid was then made up to a known volume (e.g., 100 ml).

## 2.2 Chlorophyll *a* analysis

Each sample was shaken and three 5 ml aliquots were withdrawn using an automatic pipette and filtered on to a Microscience MS-GC 47 mm glass fibre filter. The filter was placed in a tube containing 20 ml of 90% ethanol, immersed in a water bath (78 °C for five minutes) and into a refrigerator overnight. The tube was centrifuged for 10 minutes at 6000 rpm before the absorption of a 13.5 ml aliquot of the ethanol homogenate was measured at 665 nm and 750 nm using a 4 cm cuvette in a Shimadzu UV-120-01 spectrophotometer. The ethanol homogenate was then acidified with 0.375 ml of 0.3 M HCl then, following a 30 second delay, absorbances at 665 and 750 nm were re-read. The total amount of chlorophyll *a* was calculated using a standard formula (Biggs and Kilroy 2000) and scaled to the number of milligrams of chlorophyll *a* per $m^2$ of stream bed.

## 2.3 Ash-Free Dry Mass (AFDM)

Each sample was shaken and three 5 ml aliquots were withdrawn using an automatic pipette and filtered on to a pre-ashed (400 °C for 2 hours) and pre-weighed Microscience MS-GC 47 mm glass fibre filter. The filter and sample were dried for 24 hours at 105 ºC, cooled in a desiccator then weighed. The filter was ashed at 400 ºC for 4 hours, cooled in

a desiccator then reweighed. Values were scaled to calculate grams of AFDM per $m^2$ of stream bed.

### 2.4 Algal community composition (Relative abundance)

Five replicates from each site were examined for relative abundance of algae. Each sample was thoroughly mixed and three aliquots removed to an inverted microscope settling chamber then allowed to settle for 10 minutes. Samples were analysed according to the "relative abundance using an inverted microscope" method outlined in Biggs and Kilroy (2000). Samples were inspected under 200-400x magnification to identify algal species present using the keys of Biggs and Kilroy (2000), Entwisle *et al*. (1988) and Moore (2000). Algae were given an abundance score ranging from 1 (rare) to 8 (dominant) based on the protocol of Biggs and Kilroy (2000).

## 3. Results

Results are included below and have also been forwarded to Forbes Ecology in electronic form.

| Site | Sample | Chlorophyll *a* (mg per $m^2$) | AFDM (g per $m^2$) |
|---|---|---|---|
| FSTN 150 DS | 1 | 114.6 | 13.7 |
| | 2 | 182.5 | 35.8 |
| | 3 | 119.0 | 20.3 |
| | 4 | 107.0 | 18.5 |
| | 5 | 74.1 | 7.8 |
| | 6 | 69.4 | 15.8 |
| | 7 | 58.0 | 20.2 |
| | 8 | 58.8 | 9.6 |
| GTN UP | 1 | 31.2 | 6.0 |
| | 2 | 40.4 | 4.5 |
| | 3 | 56.3 | 7.5 |
| | 4 | 36.3 | 2.7 |
| | 5 | 51.1 | 5.4 |
| | 6 | 77.9 | 10.8 |
| | 7 | 69.8 | 7.1 |
| | 8 | 57.1 | 3.2 |
| | 9 | 52.0 | 5.4 |
| | 10 | 59.3 | 5.6 |
| MTB 150 DS | 1 | 177.3 | 37.8 |
| | 2 | 84.7 | 25.2 |
| | 3 | 273.7 | 38.6 |
| | 4 | 166.2 | 27.8 |
| | 5 | 281.3 | 20.9 |
| | 6 | 143.7 | 40.9 |
| | 7 | 164.5 | 41.8 |
| | 8 | 168.7 | 40.8 |
| | 9 | 194.9 | 14.2 |
| | 10 | 130.5 | 13.5 |
| MTB 50 DS | 1 | 179.0 | 32.5 |
| | 2 | 205.8 | 38.8 |
| | 3 | 307.6 | 65.0 |
| | 4 | 97.7 | 21.5 |
| | 5 | 152.3 | 37.9 |
| | 6 | 154.3 | 19.9 |
| | 7 | 139.9 | 41.3 |
| | 8 | 7.7 | 2.6 |
| | 9 | 158.4 | 61.0 |
| | 10 | 87.7 | 13.4 |
| MTB US | 1 | 46.3 | 8.9 |
| | 2 | 96.7 | 13.6 |
| | 3 | 57.6 | 4.8 |
| | 4 | 72.8 | 5.1 |
| | 5 | 63.5 | 9.0 |
| | 6 | 73.2 | 11.5 |
| | 7 | 66.8 | 8.8 |
| | 8 | 47.2 | 4.5 |
| | 9 | 67.7 | 14.2 |
| | 10 | 52.7 | 8.8 |

| | FSTN 150 DS | | | | GTN UP | | | | | MTB 150 DS | | | | | MTB 50 DS | | | | | MTB US | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 3 | 5 | 7 | 1 | 3 | 5 | 7 | 9 | 1 | 3 | 5 | 7 | 9 | 1 | 3 | 5 | 7 | 9 | 1 | 3 | 5 | 7 | 9 |
| **Filamentous green algae** | | | | | | | | | | | | | | | | | | | | | | | | |
| *Cladophora* | | | | | | | | | | 6 | 7 | 4 | | | 4 | 2 | | | | | | | | |
| *Mougeotia* | | | | | 4 | 4 | 5 | 5 | 4 | | | 1 | 4 | 2 | 7 | 7 | 5 | 5 | 5 | | | 2 | | |
| *Stigeoclonium* | | | | | 2 | 2 | 2 | 1 | | 3 | 6 | 6 | 4 | 4 | | | | | | 6 | 4 | 6 | 4 | 6 |
| **Filamentous red algae** | | | | | | | | | | | | | | | | | | | | | | | | |
| *Audouinella* | | 3 | 2 | | | | | | 3 | | | | | | | | | | | 2 | | | | |
| **Cyanobacteria** | | | | | | | | | | | | | | | | | | | | | | | | |
| *Oscillatoria/Phormidium* | | | | | | | | | | | | | | 2 | | | | | | | | | | |
| **Filamentous diatoms** | | | | | | | | | | | | | | | | | | | | | | | | |
| *Melosira* | 2 | 2 | | 2 | 3 | 3 | 2 | 1 | 2 | 4 | 5 | 4 | 3 | 4 | 3 | 1 | 2 | 3 | 2 | 4 | 4 | 3 | 4 | 4 |
| *Tabellaria* | | | | | 2 | 2 | 3 | 3 | 2 | 4 | 3 | 3 | 6 | 3 | 4 | 3 | 2 | 3 | 2 | 3 | 4 | 3 | 4 | 4 |
| **Diatoms** | | | | | | | | | | | | | | | | | | | | | | | | |
| *Achnanthes* | | | | | | 1 | 1 | | | | | | | | | | | | | | | | | |
| *Cocconeis* | | | 1 | | | | | 1 | | 1 | | | | | 2 | 1 | 3 | 4 | 3 | | 1 | | | 1 |
| *Cymbella* | 1 | 1 | 1 | | 4 | 2 | 2 | 5 | 4 | 2 | 2 | 1 | 4 | 3 | 4 | 3 | 1 | 1 | 2 | 3 | 2 | 2 | 2 | 2 |
| *Epithemia* | | | | | | | | | | | | | | | 2 | 1 | | | 1 | | | | | |
| *Frustulia* | | 1 | | 2 | 1 | 1 | | | | | | 1 | 2 | 1 | | | | | | 1 | | 1 | 1 | |
| *Gomphoneis* | 1 | | | 1 | | | 2 | 1 | | 3 | 1 | 1 | 2 | 1 | | | | | | | | 3 | | |
| *Gomphonema* | | 2 | | | | 2 | | | 3 | | 1 | | 3 | | | | 2 | | | | | | | |
| Naviculoid diatoms | | 1 | | | 1 | 2 | | 2 | 2 | | 1 | 2 | 2 | | 1 | | | | 2 | 2 | | 1 | 1 | 1 |
| *Nitzschia* | | | | | 1 | 2 | | | | | 2 | 2 | 1 | | 2 | | | | | 2 | | 2 | 1 | 1 |
| *Surirella* | | | | | 1 | | | | | 1 | 1 | | 2 | 2 | | 1 | | | | | | | | |
| *Synedra* | 8 | 5 | 7 | 3 | 3 | 2 | 2 | 4 | 5 | 3 | 2 | 2 | | 2 | 3 | 2 | 2 | 2 | 2 | 3 | 1 | 1 | 2 | 2 |
| **Planktonic green algae** | | | | | | | | | | | | | | | | | | | | | | | | |
| *Cosmarium* | | | | | | 2 | 2 | 4 | 2 | | | | | | | 1 | | | | 2 | | | | |
| *Scenedesmus* | 1 | 1 | | 4 | | | | | 2 | | | | | | | | | | | | | | | |

# 4. References

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