

## Executive Summary

Stream frontage management (SFM), including rehabilitation measures, such as the removal of exotic vegetation, riparian revegetation, and improved stock management, have become increasingly common methods applied to attempt to improve water quality and reduce the transport of pollutants to waterways (Hughes and Quinn, 2014; McKergow et al., 2016). To understand the effectiveness of SFM actions in improving water quality and biodiversity, monitoring river condition during and following works is needed, but is rarely undertaken. The current program is unique as it is assessing the effects of stream frontage management works (SFMW) on ambient water quality and biodiversity. While also trying to understand whether other factors may be influencing water quality and instream health, over a 13 km stretch of the Upper Campaspe River, Snipes Creek and Post Office Creek around Kyneton over a 5-year period. As of December 2020, woody weed control, planting, fencing and installation of off stream watering had been completed across the four SFM sites included in the Caring for the Campaspe project. These sites are now largely in a management phase until June 2023.

In year 3, water quality, aquatic ecology, nutrient bioavailability, and ecotoxicology were surveyed at eight sites along the Campaspe River, and in two associated tributaries, between August and December 2020. While the benefits of SFM are not likely to be observed in three years of monitoring, results to date show evidence of differences in river condition emerging between sites based on riparian condition e.g., between SFMW sites, native vegetation sites and sites where no interventions have occurred (remain willow dominated with stock access).

At SFMW sites where works were conducted in Year 2 of Monitoring there are signs that works have led to initial increases in nutrient and sediment inputs, which has reduced water clarity. However, at sites where works were conducted prior to monitoring, vegetation has begun to establish and stabilise banks and abiotic conditions. For example, nutrient concentrations and water clarity appear to be stable or slightly improved. Similar abiotic conditions are observed at sites surrounded by established native vegetation. Across all SFMW and established native vegetation sites there has been an increase in macrophyte cover and a decrease in the occurrence of medium to long filamentous algae. At SFMW sites this is likely related to increased light and water temperatures, resulting from the lack of riparian shading. At native vegetation sites this is likely related to elevated nutrients delivered from upstream sources. Highest macroinvertebrate diversity and taxon richness occurs at the SFM influenced sites, followed by the native vegetation sites which is likely related to better habitat structure, food resources and the presence of relatively stable water levels during dry periods (notably at Campaspe River Sites 3-6) at these sites.

In contrast, sites where no interventions have occurred are in poorest abiotic and biotic condition. Sites are characterised by elevated concentrations of dissolved nutrients, often exceeding guideline values, lower dissolved oxygen levels and water temperatures and poorer water clarity. The increase in macrophyte cover was due to floating macrophyte species which blanket the water surface. Filamentous algal cover and biofilm biomass declined, likely due to shading effects on algal growth and nutrient uptake. These factors result in reduced instream processing and greater export of nutrients from these sites. Poorest macroinvertebrate diversity and taxon richness is observed at these sites, likely a result of poor habitat, lack of quality food resources and elevated nutrients.

Several additional pressures have consistently been detected across the study area, including the presence of toxicity and a range of pollutants associated with urban, industrial and agricultural runoff, and wastewater inputs. Several pesticides, pharmaceuticals, heavy metals and hydrocarbons have been detected at levels which could pose a risk to river ecological health.

Continued improvements to the ecological health of the river is expected at sites influenced by SFMW in subsequent monitoring years. However, improvements in the condition of many of these sites is complicated by the surrounding residential, industrial and agricultural land-uses which create additional challenges for stream management. Sampling for Year 4 was completed during August to December 2021.