# Vegetation monitoring in the Lower Finniss River, Currency Creek and Tookayerta Creek

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## Executive Summary

The Finniss River, Currency Creek and Tookayerta Creek drain the eastern slopes of the southern Mt Lofty Ranges, one of the wettest and agriculturally productive areas in South Australia. The catchment and watercourses have been highly modified due to water resource development and land use. Thus, the majority of reaches in the aforementioned streams are in poor ecological condition. Nevertheless, the Finniss River, Currency Creek and Tookayerta Creek support populations river blackfish and southern pygmy perch, which are protected species under the South Australian Fisheries Act and in recent years have been a major source of freshwater for Lake Alexandrina. However, there is little information on the vegetation of these systems and how the plant communities change through time is largely unknown.

Vegetation monitoring sites were established in the Finniss River, Currency Creek and Tookayerta Creek in the areas influenced by water levels in Lake Alexandrina and upstream of the aforementioned area. Three, 1x3 m quadrats were established at different elevations (the top of the bank and middle of the channel for sites upstream of the area influenced by Lake Alexandrina and at +0.8, +0.6, +0.4, 0 and -0.5 m AHD for sites in the area influenced by Lake Alexandrina). Abundance of each species was measured using Braun-Blanquet cover abundance scores and surveys were undertaken in spring 2008 and autumn 2009. Differences in floristic composition between elevations and seasons were analysed using PERMANOVA and indicator species analysis.

The plant community changed significantly between spring 2008 and autumn 2009 in the area influenced by the Lower Lakes but the changes were not consistent between elevations. Emergent aquatics declined in abundance at +0.8 and +0.4 m AHD but was no significant change at +0.6 m AHD, *Cotula coronopifolia* was more abundant in spring 2008 at 0 m AHD and there were no plants at -0.5 m AHD in spring 2008 or autumn 2009. Upstream of the area influenced by Lake Alexandrina there was no significant change in plant community between spring 2008 and autumn 2009; however, there were different plant communities at the top of the bank and centre of the stream.

The decline in abundance of emergent aquatics in the area influenced by Lake Alexandrina was observed on lakeshores throughout Lakes Alexandrina and Albert during the study period at higher elevations and there was generally no vegetation below 0 m AHD. The sites upstream of the area influenced by the Lower Lakes were generally dominated by emergent aquatics at the top of the bank and emergent aquatics and free floating species in the centre of the channels, which did not change significantly in abundance over the study period.

# 1. Introduction

The Finniss River, Tookayerta Creek and Currency Creek drain the eastern slopes of the Southern Mt Lofty Ranges (Deegan 2007). The Southern Mt Lofty Ranges is one of the wettest areas in South Australia with mean annual rainfall in excess of 1000 mm in areas of the headwaters of the aforementioned streams; however, mean annual rainfall in the lowland reaches is below 500 mm in some areas (Savadamuthu 2003; Deegan 2007). The majority of the rainfall in the catchment falls in winter from frontal systems that sweep across from the Southern Ocean, which results in the highest stream flows in late winter to early spring and low flows (or often no flow) during late summer to autumn (Savadamuthu 2003; Deegan 2007).

The Southern Mt Lofty Ranges is one of the most agriculturally productive areas in South Australia. Major land uses include: grazing (broad acre and intensive), horticulture, floriculture and viticulture, with limited protected areas (Deegan 2007). Water resource development for industries such as horticulture, viticulture, floriculture and to a lesser extent stock and domestic use, has modified the hydrological regimes of the streams. Total discharge from the streams is now reduced, streams commence to flow later, cease to flow earlier and water levels in streams are generally lower (Deegan 2007). Hence, the catchment and watercourses of the Southern Mt Lofty Ranges have undergone major changes.

Deegan (2007) assessed the condition of 86, 100 m long reaches along the Finniss River (53 reaches), Currency Creek (13 reaches) and Tookayerta Creek (22 reaches) using a modified index of stream condition (*sensu* Ladson *et al.* 1999). The Finniss River was the only stream where any reaches were reported to be in excellent condition (four reaches in total) (Deegan 2007). In the Finniss River, Currency Creek and Tookayerta Creek there were eight, four and six reaches respectively in good condition (Deegan 2007). The remaining 64 reaches were in average, poor or very poor condition (Deegan 2007).

Despite the generally poor ecological condition of the Finniss River, Currency and Tookayerta Creeks they do support populations of river blackfish and southern pygmy perch, which are protected under the South Australian Fisheries Act (2007) (Hammer and Walker 2004). In addition, the streams of the south eastern Mt Lofty Ranges have been a major source of freshwater for Lake Alexandrina due to low flows in the River Murray.

There is little information regarding the vegetation of the Finniss River, Currency Creek and Tookayerta Creek and what information is available is generally from one off surveys (e.g. Armstrong *et al.* 2003; Casanova 2004; Earth Tech Engineering Pty Ltd 2004; Deegan 2007) and thus seasonal changes are not well understood. The aim of this study was to investigate the changes in plant community composition between spring (high water) and autumn (low water) in the lower Finniss River, Currency Creek and Tookayerta Creek at several locations including areas where water levels are influenced by Lake Alexandrina. This information can be used as a baseline to assess the impacts of environmental water allocations, land management changes, stream restoration activities and the impacts of the Clayton regulator.

## 2. Methods

Vegetation monitoring was conducted in November 2008 and March 2009 at 11 sites across the lower reaches of the Finniss River, Currency Creek and Tookayerta Creek using the same methods as the SAMDBNRM Board community wetland monitoring program and the Lower Lakes Living Murray vegetation condition monitoring (Marsland and Nicol 2009).

For each site a transect running perpendicular to the bank was established and three 1 x 3 m quadrats separated by 1 m were established at regular elevation intervals. For reaches where water levels were influenced by the Lower Lakes, quadrats were positioned at +0.8, +0.6, +0.4, 0 and -0.5 m AHD. For reaches upstream of the influence of the Lower Lakes (upstream of Winery Road) quadrats were positioned at the top of the bank and middle of the channel.

Cover and abundance of each species present in the quadrat were estimated using the method outlined in Heard and Channon (1997) except that N and T, in this instance were replaced by 0.1 and 0.5 to enable statistical analyses (Table 1).

**Table 1.** Modified Braun-Blanquet (1932) scale estimating cover/abundance as per Heard and Channon (1997).

| Score | Modified Score | Description |
|---|---|---|
| N | 0.1 | Not many, 1-10 individuals |
| T | 0.5 | Sparsely or very sparsely present; cover very small (less than 5%) |
| 1 | 1 | Plentiful but of small cover (less than 5%) |
| 2 | 2 | Any number of individuals covering 5-25% of the area |
| 3 | 3 | Any number of individuals covering 25-50% of the area |
| 4 | 4 | Any number of individuals covering 50-75% of the area |
| 5 | 5 | Covering more than 75% of the area |

Plants were identified using keys in Cunningham *et al.* (1981), Jessop and Tolken (1986), Dashorst and Jessop (1998), Romanowski (1998), Sainty and Jacobs (1981), Sainty and Jacobs (2003), Prescott (1988) and Jessop *et al.* (2006). In some cases due to immature individuals or lack of floral structures plants were identified to genus only. Nomenclature used follows Barker *et al.* (2005).

The changes in floristic composition through time (seasonal) and between elevations were analysed for each site using the multivariate analyses; two-factor (elevation and season) PERMANOVA (Anderson 2001) and indicator species analysis (Dufrene and Legendre 1997) using the package PCOrd (McCune and Mefford 2006). Each stream and sites historically under the influence of the Lower Lakes were analysed separately.

## 2.1. Indicator species analysis

Dufrene and Legendre's (1997) indicator species analysis combines information on the concentration of species abundance in a particular group (season or elevation) and the faithfulness of occurrence of a species in a particular group (McCune *et al.* 2002). A perfect indicator of a particular group should be faithful to that group (always present) and exclusive to that group (never occurring in other groups) (McCune *et al.* 2002). This test produces indicator values for each species in each group based on the standards of the prefect indicator. Statistical significance of each indicator value is tested by using a Monte Carlo (randomisation) technique, where the real data is compared against 5000 runs of randomised data (Dufrene and Legendre 1997). For this study, the groups were assigned according to season or elevation; therefore, this procedure was used for hypothesis testing (planned comparisons) and gives an indication of whether a species has increased or decreased significantly in abundance or is more abundant at a particular elevation. A species that is deemed not to be a significant indicator of a particular group is either uncommon or widespread. An uncommon species is only found in one group but in low numbers and a widespread species is found in more than one group in similar numbers (Dufrene and Legendre 1997). Whether a species was classed as a widespread or uncommon non-significant species was determined by examination of the relative frequency tables or the raw data.

# 3. Results

A total of 43 species (including 17 exotics) were recorded from the vegetation surveys undertaken in spring 2008 and autumn 2009 (Appendix 1).

## 3.1. Areas influenced by the Lower Lakes

A total of 28 species (including 13 exotics) were recorded in spring 2008 and autumn 2009 from the two sites in Currency Creek and one site in the Finniss River that are influenced by Lake Alexandrina (Table 2). PERMANOVA results showed that the plant community was significantly different between elevations and seasons with a significant interaction (Table 3), which shows that the change in floristic composition between seasons was not uniform across elevations. At -0.5 m AHD there were no live plants present in either spring 2008 or autumn 2009. At 0 m AHD *Cotula coronopifolia* and at +0.4 m AHD *Juncus* sp. were significantly more abundant in spring 2008 (Table 2). There was no significant change in floristic composition between seasons at +0.6 m AHD and at +0.8 m AHD *Calystegia sepium* and *Typha domingensis* were significantly more abundant in spring 2008 (Table 2).

**Table 2:** Species list and indicator species analysis results comparing the vegetation community between spring 2008 and autumn 2009 from each elevation (except -0.5 m AHD which was completely bare for both surveys) in the lower Finniss River and Currency Creek in the area influenced by the Lower Lakes (*denotes exotic species, NS=not significant, U=uncommon, W=widespread).

| | Elevation | | | |
|---|---|---|---|---|
| **Species** | **0 m AHD** | **+0.4 m AHD** | **+0.6 m AHD** | **+0.8 m AHD** |
| *Agrostis avenacea* | NS (U) | NS (U) | NS (U) | NS (U) |
| *Asparagus officinalis** | | | | NS (U) |
| *Aster subulatus** | | NS (U) | | |
| *Atriplex prostrata** | NS (W) | NS (W) | | |
| *Atriplex semibaccata* | NS (W) | NS (W) | | |
| *Calystegia sepium* | | NS (U) | NS (U) | 0.04 (spring) |
| *Centaurea calcitrapa** | | | NS (U) | |
| *Chenopodium glaucum** | NS (U) | NS (U) | | |
| *Cotula coronopifolia** | 0.03 (spring) | | | |
| *Cyperus gymnocaulos* | | | | NS (W) |
| *Distichlis distichophylla* | NS (U) | | | |
| *Epilobium pallidiflorum* | | NS (W) | | |
| *Juncus kraussii* | | NS (W) | NS (W) | NS (W) |
| *Juncus* sp. | | 0.01 (spring) | NS (U) | |
| *Lolium* sp.* | NS (U) | | NS (U) | NS (U) |
| *Lycopus australis* | | | NS (W) | NS (U) |
| *Muehlenbeckia florulenta* | | | NS (W) | NS (W) |
| *Paspalum distichum** | | NS (W) | NS (W) | NS (W) |
| *Phragmites australis* | NS (W) | NS (W) | NS (W) | NS (W) |
| *Picris hieracoides* | | NS (U) | | |
| *Plantago coronopus** | | | | NS (W) |
| *Polypogon monspeliensis** | | NS (U) | | NS (U) |
| *Schoenoplectus validus* | | | NS (U) | |
| *Sonchus oleraceus** | | NS (U) | | |
| *Spergularia marina** | | | | NS (U) |
| *Triglochin striatum* | | NS (U) | | |
| *Typha domingensis* | NS (W) | NS (W) | NS (W) | 0.03 (spring) |
| *Urtica urens** | | NS (U) | NS (U) | |

**Table 3:** Two factor PERMANOVA results comparing the vegetation communities of the lower Finniss River and Currency Creek in the area influenced by the Lower Lakes between elevations and spring 2008 and autumn 2009 at different elevations.

| **Factor** | ***df*** | ***F*** | ***P*** |
|---|---|---|---|
| Season | 1,59 | 3.52 | 0.003 |
| Elevation | 4,59 | 8.18 | <0.001 |
| Season x Elevation | 4,59 | 3.19 | 0.004 |

### 3.2. Currency Creek

A total of four species (including one exotic) were recorded from Currency Creek upstream of the area influenced by Lake Alexandrina (Table 4). PERMANOVA results showed that there was no significant change in the plant community through time; however, the community present in the channel was different from the edge community and there was no significant interaction (Table 5). The middle of the channel was generally bare and the edges were dominated by the perennial species *Phragmites australis* and *Pennisetum clandestinum* (Table 4). The abundance of the aforementioned species did not change significantly between spring 2008 and autumn 2009 (Table 4). *Convolvulus erubescens* and *Cyperus exaltatus* were also present on the edges of Currency Creek but in low numbers (Table 4).

**Table 4:** Species list and indicator species analysis results comparing the vegetation community in the channel and at the top of the bank for Currency Creek upstream of the area historically influenced by the Lower Lakes (*denotes exotic species, NS=not significant, U=uncommon, W=widespread).

| Species | Elevation |
|---|---|
| *Convolvulus erubescens* | NS (U) |
| *Cyperus exaltatus* | NS (U) |
| *Pennisetum clandestinum** | 0.013 (edge) |
| *Phragmites australis* | 0.036 (edge) |

**Table 5:** Two factor PERMANOVA results comparing the vegetation communities of Currency Creek upstream of the area historically influenced by the Lower Lakes spring 2008 and autumn 2009 in the centre of the channel and top of the bank.

| Factor | *df* | *F* | *P* |
|---|---|---|---|
| Season | 1,23 | 0.82 | 0.431 |
| Elevation | 1,23 | 8.15 | <0.001 |
| Season x Elevation | 1,23 | 0.93 | 0.396 |

## 3.3. Finniss River

A total of 16 species (including four exotics) were recorded in the Finniss River upstream of the area influenced by the Lower Lakes (Table 6). Similar to Currency Creek the PERMANOVA results showed that there was no change in floristic composition between seasons but the plant community in the channel was significantly different from the edge community and there was no significant interaction (Table 7). The floating species *Azolla filiculoides* and *Lemna* sp. were more abundant in the channel and emergent *Phragmites australis* was more abundant on the edges (Table 6). *Typha domingensis* and *Rubus ulmifolius* were present in the channel and on the edges in similar abundances and all other species were present only on the edges in low numbers (Table 6).

**Table 6:** Species list and indicator species analysis results comparing the vegetation community in the channel and at the top of the bank for the Finniss River upstream of the area historically influenced by the Lower Lakes (*denotes exotic species, NS=not significant, U=uncommon, W=widespread).

| Species | Elevation |
|---|---|
| *Aster subulatus** | NS (U) |
| *Azolla filiculoides* | 0.021(channel) |
| *Callistemon* sp. | NS (U) |
| *Calystegia sepium* | NS (U) |
| *Cyperus exaltatus* | NS (U) |
| *Eucalyptus camaldulensis* | NS (U) |
| *Hydrocotyle verticillata* | NS (U) |
| *Lemna* sp. | 0.019 (channel) |
| *Lycopus australis* | NS (U) |
| *Paspalum distichum** | NS (U) |
| *Phragmites australis* | 0.001 (edge) |
| *Picris hieracoides* | NS (U) |
| *Plantago major* | NS (U) |
| *Rubus ulmifolius** | NS (W) |
| *Schoenoplectus pungens* | NS (U) |
| *Senecio pterophorus** | NS (U) |
| *Typha domingensis* | NS (W) |

**Table 7:** PERMANOVA results comparing the vegetation communities of the Finniss River upstream of the area influenced by the Lower Lakes between spring 2008 and autumn 2009 in the centre of the channel and top of the bank.

| Factor | *df* | *F* | *P* |
|---|---|---|---|
| Season | 1,35 | 2.23 | 0.089 |
| Elevation | 1,35 | 8.18 | 0.001 |
| Season x Elevation | 1,35 | 1.87 | 0.135 |

## 3.4. Tookayerta Creek

A total of eight species (including two exotics) were recorded in Tookayerta Creek in spring 2008 and autumn 2009 (Table 8). Similar to the Finniss River and Currency Creek PERMANOVA results showed that there was no change in plant community through time but the edge and channel had different plant communities and there was no interaction (Table 9). *Calystegia sepium, Lycopus australis* and *Phragmites australis* were more abundant on the edges of the stream (Table 8). *Rubus ulmifolius* and *Typha domingensis* were present in the channel and on the edges in similar abundances and the remaining species were present on the edges in low numbers (Table 8).

**Table 8:** Species list and indicator species analysis results comparing the vegetation community in the channel and at the top of the bank for Tookayerta Creek (*denotes exotic species, NS=not significant, U=uncommon, W=widespread).

| Species | Elevation |
|---|---|
| *Calystegia sepium* | 0.049 (edge) |
| *Hydrocotyle verticillata* | NS (U) |
| *Lycopus australis* | 0.034 (edge) |
| *Persicaria lapathifolium* | NS (U) |
| *Phalaris arundinacea** | NS (U) |
| *Phragmites australis* | 0.021 (edge) |
| *Rubus ulmifolius** | NS (W) |
| *Typha domingensis* | NS (W) |

**Table 9:** PERMANOVA results comparing the vegetation communities of Tookayerta Creek between spring 2008 and autumn 2009 in the centre of the channel and top of the bank.

| Factor | *df* | *F* | *P* |
|---|---|---|---|
| Season | 1,35 | 2.21 | 0.091 |
| Elevation | 1,35 | 3.74 | 0.019 |
| Season x Elevation | 1,35 | 1.99 | 0.117 |

# 4. Discussion

These results do not represent the total number of species present in the Finniss River, Currency Creek and Tookayerta Creek. To gain an indication of species richness in the aforementioned streams greater spatial coverage is required (i.e. larger quadrats at more locations). The aim of the study was to detect changes in the plant community through time; hence, a large number of small quadrats were used to maximise statistical power. In addition, only the centre of the channel and top of the bank were surveyed upstream of Winery Road and the area below the high water mark in the lower reaches influenced by Lake Alexandrina. Floodplains were not surveyed; however, the floodplains at each site were highly modified due to agricultural production (similar to the majority of streams in the eastern Mt Lofty Ranges) (Deegan 2007) and often dominated by agricultural weeds (J. Nicol pers. obs.).

The plant community of the lower reaches of Currency Creek and Finniss River that are influenced by Lake Alexandrina was similar to the lakeshore community present throughout Lake Alexandrina (Marsland and Nicol 2009). During the study period Lake Alexandrina was hydrologically connected to the lower reaches of the Finniss River and Currency Creek; hence, the plant community reflected the low water levels (Marsland and Nicol 2009). Submergent taxa have been lost, species that require exposed sediment to germinate have recruited in areas that were historically inundated (*sensu* Nicol *et al.* 2003) and species that are not desiccation tolerant (e.g. *Typha domingensis*) have declined in abundance over the study period (especially at +0.8 m AHD) (Table 2).

Construction of regulators at Clayton and at the mouths of Currency Creek and the Finniss River, which will impound water from the eastern Mt Lofty Ranges and potentially control acid sulfate soils, may result in water levels during winter and spring that will inundate areas of the lower reaches of the Finniss River and Currency Creek that historically supported submergent plants (+0.2 to +0.6 m AHD) (Seaman 2003; Phillips and Muller 2006). In addition, areas dominated by perennial emergent species (e.g. *Typha domingensis, Phragmites australis*) will receive water as a result of construction of the regulators.

However, preliminary modelling results indicate that water levels will fall below +0.2 m AHD over the summer and early autumn unless there is above average summer rainfall. In addition, modelled surface water electrical conductivity is predicted to be greater than 5000 EC throughout the lower reaches of the Finniss River and Currency Creek year round (except in small areas immediately downstream of the Winery Road fords) for the first three years of regulated flooding. The modelled salinity and water level predictions are based on 1982 rainfall and flow data, which was the driest year on record and probably represent a "worst case"' scenario for water levels and conductivities. Perennial submergent species would probably not persist in areas they historically existed under the modelled water level due to these areas being exposed for several months during summer and autumn. In addition, the modelled conductivity of the surface water exceeds the thresholds for survival of many of the submergent and emergent species recorded during the current surveys (Bailey *et al.* 2002).

Nevertheless, preliminary data from a seed bank trial investigating the floristic composition of the soil seed bank in the lower Finniss River and Currency Creek has shown that there are submergent species (*Myriophyllum salsugineum, Myriophyllum caput-medusae, Ruppia megacarpa, Ruppia polycarpa, Ruppia tuberosa, Potamogeton crispus* and *Chara* spp.) present (J. Nicol unpublished data). There is potential for *Ruppia* spp. (Brock 1982), *Chara* spp., *Lamprothamnium* spp. (Bailey *et al.* 2002) and *Lepilaena* spp. (Sainty and Jacobs 1981; Vollebergh and Congdon 1986; Sainty and Jacobs 2003) to recruit and persist in permanently inundated areas under the modelled salinity regime providing the euphotic depth is sufficiently deep. In addition, results from the seed bank trial have shown that *Myriophyllum salsugineum* will geminate underwater at conductivities between 15,000-20,000 EC (J. Nicol unpublished data)

Under the modelled conductivity regime the large stands of emergent freshwater macrophytes that currently persist along the pre 2007 shoreline may be killed by elevated surface water conductivity. However, healthy *Typha domingensis* stands with large numbers of new shoots were observed during the spring survey of the Living Murray vegetation condition monitoring at sites in the lower Finniss River and Currency Creek in October 2008, despite surface water conductivities in excess of 9000 EC (J. Nicol pers. obs.).

Upstream of the area influenced by Lake Alexandrina the plant community on the edges of the streams was dominated by perennial species that did not change significantly in abundance over the study period. Streams in the eastern Mt Lofty Ranges show signs of severe degradation and the dominant species upstream of Winery Road (*Typha domingensis, Phragmites australis* and *Rubus ulmifolius*) are often associated with channelized degraded reaches in Mt Lofty Ranges watercourses (Deegan 2007). The degradation is probably the result of the area being heavily impacted by agricultural development (Seaman 2002).

# 5. Implications for management and further studies

The lower Currency Creek and Finniss River influenced by Lake Alexandrina has changed significantly in the last three years due to low lake levels, which has resulted in exposure of sediment that has been submerged for thousands of years. Construction of the regulators at Clayton and at the mouths of Currency Creek and the Finniss River will result in an increase in water levels; however, the predicted salinity and water level regime may result in significant changes to the plant communities present (*sensu* Nicol *et al.* 2003; Nielsen *et al.* 2003; Brock *et al.* 2005; Nielsen *et al.* 2007) and it is likely that it will not resemble the community present before water levels were drawn down unless salinities and water levels return to pre 2005 levels.

Upstream of the area influenced by the Lower Lakes streams are dominated by perennial emergent native and exotic species that are common to degraded channelized reaches of Mt Lofty Ranges watercourses (Deegan 2007). Fencing and provision of alternate water sources to exclude domestic stock from watercourses, the creation of riparian buffer zones and pest plant control should be considered.

Further studies to aid in the management of the Lower Finniss River, Currency Creek and Tookayerta Creek include:

- Increase the number of sites in the area influenced by the Clayton regulator to investigate the impacts of regulated flooding and the influence of water quality on floristic composition.
- Increase the number of monitoring sites upstream of Winery Road and better link with fish and invertebrate sampling sites.
- Statistically robust BACI (*sensu* Underwood 1992) type monitoring programs to evaluate the impact of stream restoration projects.

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# 7. Appendices

**Appendix 1:** Lower Finniss River, Currency Creek and Tookayerta Creek plant species list (*denotes exotic species).

*Agrostis avenacea*
*Asparagus officinalis**
*Aster subulatus**
*Atriplex prostrata**
*Atriplex semibaccata*
*Azolla filiculoides*
*Callistemon* sp.
*Calystegia sepium*
*Centaurea calcitrapa**
*Chenopodium glaucum**
*Convolvulus erubescens*
*Cotula coronopifolia**
*Cyperus exaltatus*
*Cyperus gymnocaulos*
*Distichlis distichophylla*
*Epilobium pallidiflorum*
*Eucalyptus camaldulensis*
*Hydrocotyle verticillata*
*Juncus kraussii*
*Juncus* sp.
*Juncus usitatus*
*Lemna* sp.
*Lolium* sp.*
*Lycopus australis*
*Muehlenbeckia florulenta*
*Paspalum distichum**
*Pennisetum clandestinum**
*Persicaria lapathifolium*
*Phalaris arundinacea**
*Phragmites australis*
*Picris hieracoides*
*Plantago coronopus**
*Plantago major*
*Polypogon monspeliensis**
*Rubus ulmifolius**
*Schoenoplectus pungens*
*Schoenoplectus validus*
*Senecio pterophorus**
*Sonchus oleraceus**
*Spergularia marina**
*Triglochin striatum*
*Typha domingensis*
*Urtica urens**

**Appendix 2:** GPS coordinates (UTM format, map datum WGS84) for vegetation monitoring sites.

| Site | Easting | Northing |
|---|---|---|
| Currency Creek 1 | 296772 | 6074222 |
| Currency Creek 2 | 293056 | 6075900 |
| Currency Creek 3 | 301013 | 6071800 |
| Currency Creek 4 | 302147 | 6070678 |
| Finniss River 1 | 306108 | 6074992 |
| Finniss River 2 | 302581 | 6080856 |
| Finniss River 3 | 300432 | 6082925 |
| Finniss River 4 | 298054 | 6085825 |
| Tookayerta Creek 1 | 300433 | 6078603 |
| Tookayerta Creek 2 | 296964 | 6080673 |
| Tookayerta Creek 3 | 294850 | 6082464 |