



Day 1 (Site 1): Monday 2nd October 2023 Oaklands Wetlands

1. From disused driver training centre to functioning wetland

Located in the southern suburbs of Adelaide, Oaklands Wetlands is a beautiful public space to enjoy, but also serves many other purposes; it is a natural storm water filtration system, an important habitat for birds, animals and plants, and a threatened fish breeding area! It is home to more than 130 flora and fauna species (Discovery Circle BioBlitz August 2014, unpublished data).

But it wasn't always like this - The area was formerly a driver training centre. The City of Marion now manages the wetlands with support from NGT (fish management), Green Adelaide and Landscapes SA. As well as being a biodiversity hotspot, the wetlands provide the City of Marion with a clean water supply to local reserves and open spaces.



The driver training centre, before conversion to wetlands (Photo: Ryan Smith, Flickr)



The site during construction

The wetlands are a natural filter system which clean polluted stormwater as it runs off local streets and is also pumped in from the Sturt River Drain. Water goes through a rubbish trap and then into a sedimentation pond where larger particles drop out. At this stage the water is still full of pollution including nitrates, phosphates, and herbicides. Reed beds, submerged aquatic vegetation including *Vallisneria sp.*, open water and areas of shallow mud all help to remove pollutants and improve water quality. Microorganisms in biofilms on vegetation and the addition of oxygen into soils by the plants helps to break-down and remove pollutants and nutrients. The water takes three days to filter through the network of ponds. Clean water is then pumped into an underground aquifer, for later use on parks and open spaces in the City of Marion.



The different ponds that make-up the Oaklands Wetlands system. S10 is the first pond that receives the untreated water, whilst S1 contains the water which has travelled through the system over three days.

A biodiversity hotspot

Historically the Sturt River meandered through this area, but was straightened and converted to a concrete drain in the 60s to allow for urban development. Now the wetlands and surrounds have helped to restore vital habitat for native species in a suburban area. Thankfully the area has also retained many significant old trees such as the beautiful river red gums, which are keystone species, supporting many others. The Friends of Sturt River Landcare group have been active in revegetating the areas surrounding the wetland, providing understory habitat and removing weeds. It is an important area for native mammals, like possums, the grey-headed flying fox (*Pteropus poliocephalus*) and microbats including the white-striped freetail-bat (*Austronomus australis*), the southern free-tailed bat (*Ozimops planiceps*), Gould's wattled bat (*Chalinolobus gouldii*), the large forest bat (*Vespadelus darlingtoni*) and the southern forest bat (*Vespadelus regulus*).

The wetlands themselves provide important habitat for a range of native species. Many species of frogs use the habitat at Oaklands Wetland, as do macroinvertebrates, including freshwater shrimp and common yabby, as well as reptiles including the eastern long-necked turtle and Murray short-necked turtle. The most significant and threatened species to inhabit the wetland is one that has been reintroduced here from the brink of extinction: The southern purple-spotted gudgeon (*Modgurnda adpersa*).



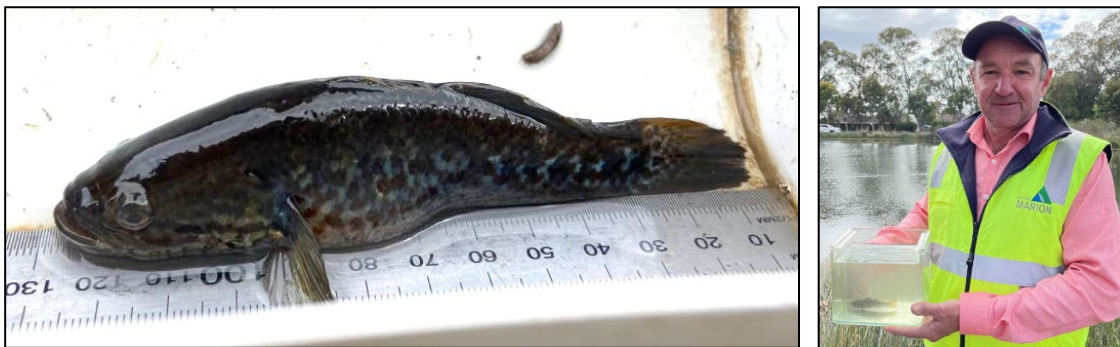
Right: white-striped freetail-bat (top) and the eastern banjo frog (bottom; Photos by Australian Museum)

2. A new home for threatened fish

The Southern Purple-spotted Gudgeon (*Mogurnda adspersa*) is a small native freshwater fish that was once found throughout the lower Murray River, but rapidly declined in abundance and distribution and by the 1990s was declared regionally extinct. In late 2002 a small population was rediscovered in SA. Since that time, with the collaboration of many organisations and state government agencies, surrogate breeding sites have been set up throughout the state to increase the numbers of the species, safeguarding it from extinction. Fish from these surrogate sites are used for wild reintroductions.

The Oaklands Wetland area is an example of a site that was deemed suitable for a surrogate breeding area. Baseline fish surveys were conducted by NGT in December 2014, and further surveys in 2016. Five freshwater fish species were sampled as well as macroinvertebrates (Whiterod 2015; Whiterod and Zukowski 2016). Further surveys were undertaken by NGT in 2020, 2021, and 2022 and drying events were instated by the City of Marion to enable NGT to remove alien fish species, including eastern gambusia, common carp, redfin perch and one rainbow trout.

At the site, aquatic vegetation and rocks were also added as habitat enhancements and after many years of preparation in November 2022, Southern Purple-spotted Gudgeon were released into Oaklands Wetlands. Once abundant here, this species has not been found in the Adelaide Plains for over 100 years and this was an exciting and groundbreaking opportunity. These beautiful fish are now thriving with hundreds of fish sampled of all size classes – a great sign that the species is successfully establishing in the wetland. This site will play an important role in the reintroduction of Southern Purple-spotted Gudgeon into wild sites in the Adelaide Plains region and in the Lower Murray.



Southern Purple-spotted Gudgeon being measured during a survey (left) and Glynn Ricketts of City of Marion with one of the Southern Purple-spotted Gudgeons before the initial release in 2021 (right).

Annual draining is required to remove alien fish, in order to keep the wetlands in suitable condition for the threatened native fish, with good water clarity and quality. Potentially well-meaning but mis-guided members of the public unfortunately keep reintroducing alien fish species into the wetlands, either for recreational fishing (which is actually prohibited here), or to dispose of unwanted aquarium fish. This means that the draining process must be repeated annually.

Draining involves the ten ponds of the wetland system being drained down and then further pumped out annually by the City of Marion, whilst alien fish are removed by the NGT team. Native fish and other native animals (such as the turtles and yabbies) are housed in tanks in the education centre temporarily whilst the alien fish are removed. We have been working with Green Adelaide to develop interpretive signage to educate the public about importance of the threatened fish breeding site, and why alien fish are such a problem here. Hopefully over time, this will help the wetlands stay clean and healthy, and free of alien fish.

Nature Glenelg Trust's project partners:





Day 1 (Site 2): Monday 2nd October 2023 Stipiturus Conservation Park

1. Home to a critically endangered ecosystem, a Fleurieu Peninsula Swamp!

Stipiturus Conservation Park, created in 2006, is 68 hectares in size and protects most of Glenshera Swamp. Despite being impacted by drainage and clearance under past agricultural land management for grazing from the 1940s, **Glenshera Swamp** is now widely considered to be **one of the most important remaining examples of a Fleurieu Peninsula Swamp**.

Fleurieu Peninsula Swamps (Fleurieu Swamps for short) are a geographically distinct ecological community that is listed as critically endangered under the Federal *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*. They are **very important** because they are:

A vital refuge and habitat

Fleurieu Swamps provide habitat for a number of threatened and unique flora and fauna species including the Mount Lofty Ranges (MLR) southern emu-wren (*Stipiturus malachurus intermedius*), Osborn's eyebright (*Euphrasia collina* subsp. *osbornii*), Fleurieu leek orchid (*Prasophyllum murfetii*) and Fleurieu guinea-flower (*Hibbertia tenuis*).

A natural filter, slowly releasing water

Fleurieu Swamps act as a natural water filter, and natural 'sponge' soaking up water during wet seasons and slowly releasing it, providing year-round water. The water regime of Fleurieu Swamps is usually dependent on the underlying rock/aquifer and soil types, some are peat swamps, others peat silt or black clay, usually with lots of organic matter (i.e. large stores of carbon). Some are also 'perched', which means they can occur at the top of watercourses, as a result of natural springs.

A huge store of carbon

Organic matter (i.e. carbon) slowly builds up in permanently saturated swamps and accumulates as peat. If the peat is wet, it doesn't break down and is stored. A lot more carbon is stored in peatlands than in the world's forests, despite them only covering a fraction of the area!



2. Drainage and clearance since the 1940s

Originally a much more extensive and connected feature of the Fleurieu region, the Fleurieu Swamps have **been highly degraded and fragmented by agricultural development** since European colonisation. The remaining swamps are small (usually approx. 1-5 ha in size) and have become isolated from each other. This is a problem for the critically endangered MLR southern emu-wren, which needs good habitat linkages, including the characteristic low/dense vegetation found in Fleurieu Swamps to move about the landscape.

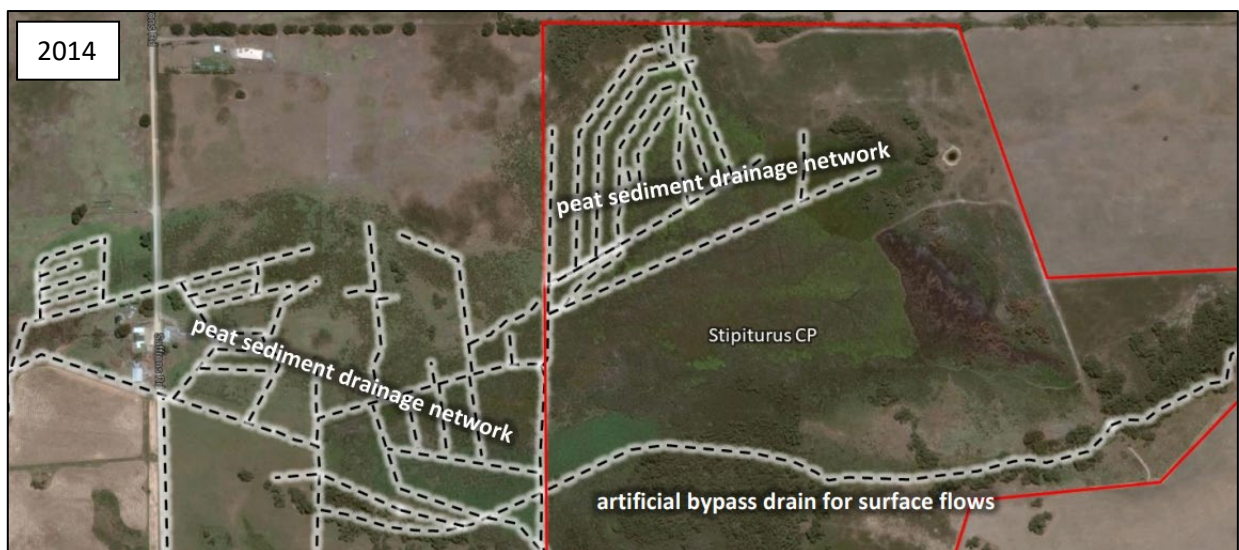


Diverse Fleurieu Peninsula Swamp plant community

At Stipiturus Conservation Park much of the native dry-heath and woodland vegetation of the sandy rises was **historically cleared**, whilst the wet swampy ground (Glenshera Swamp) was extensively drained by **cutting a network of deep channels across the bed of the swamp, and diverting the creekline past the swamp and into a larger drain**. Drainage lowered the groundwater level, and diverting surface water into drains instead of it naturally running into the swamp.



1949 aerial imagery, showing some clearance of surrounding vegetation and the early bypass drain (bottom right)



2014 aerial imagery, showing artificial drains (black dashed lines) that had been constructed since the 1940s, and the Stipiturus Conservation Park boundary (red line)

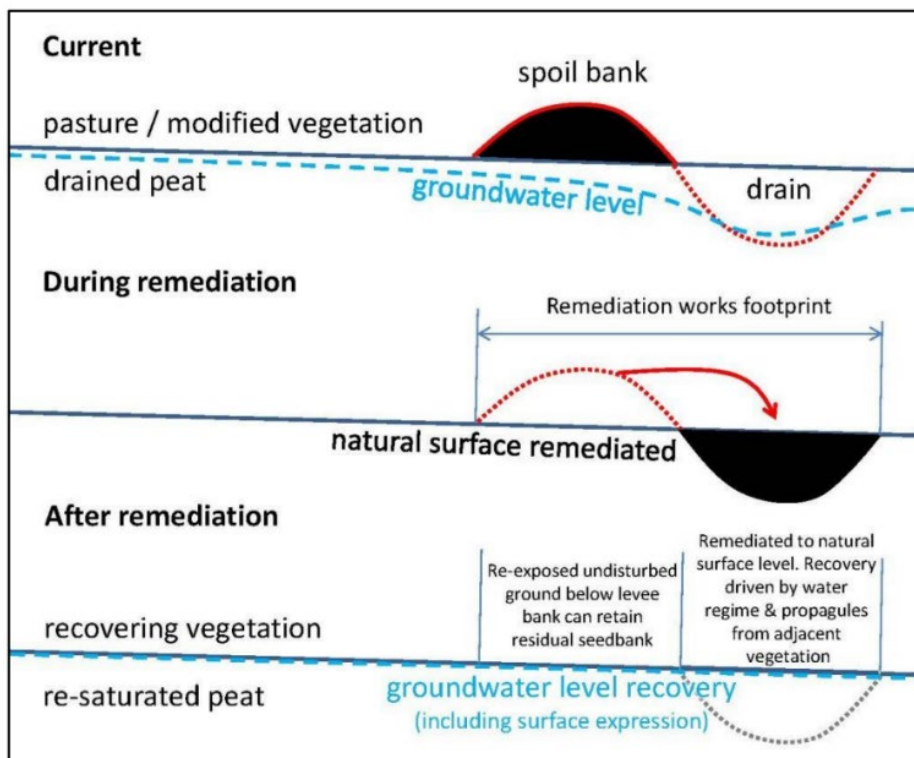
As you can see on the previous page, the full extent of Glenshera Swamp extends into a neighbouring property, beyond the western (red line) boundary of Stipiturus Conservation Park. Although the drainage channels were comprehensive and causing ongoing impacts, both in the Conservation Park and next door, many of the natural values remained despite this underlying threatening process.

3. Undoing the damage of artificial drainage (i.e. restoring site hydrology)

In autumn 2017, NGT was funded by the Department for Environment and Water (DEW) to undertake and supervise the first phase of remedial works to reverse the impacts of artificial drainage. **This involved backfilling drains to natural surface on the neighbouring private land portion of Glenshera Swamp**, thanks to the support of the owners (Chris and Helen Harvey). This portion of Glenshera Swamp (below) now shows a **striking transformation from weedy pasture grasses, back to swamp vegetation**

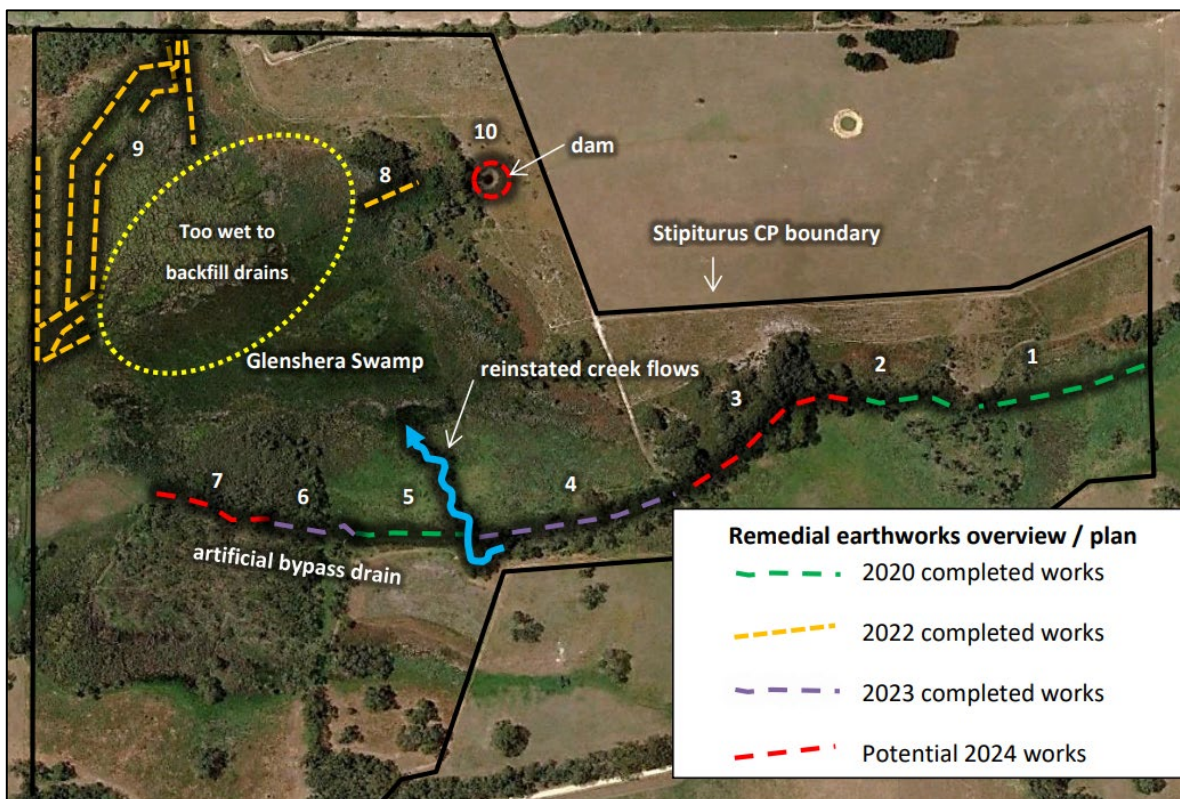


As you can see from the diagram below, we aim to utilise the original spoil bank material left from when the drains were dug and use it to remediate the drains through the peatland via continuous backfilling. This has the effect of raising groundwater and re-saturating the peat profile, restoring the groundwater hydrology and allowing vegetation to spontaneously recover.



The peat remediation and rehydration process.

In Stipiturus Conservation Park we have completed a range of works, including initial use of trial sandbag structures to block the bypass drain, to test redirection of surface flows from the drain back along the original creekline and into Glenshera Swamp, as well as drain backfilling in various locations, as shown.





Bypass drain remediation and assisted regeneration with supplementary revegetation



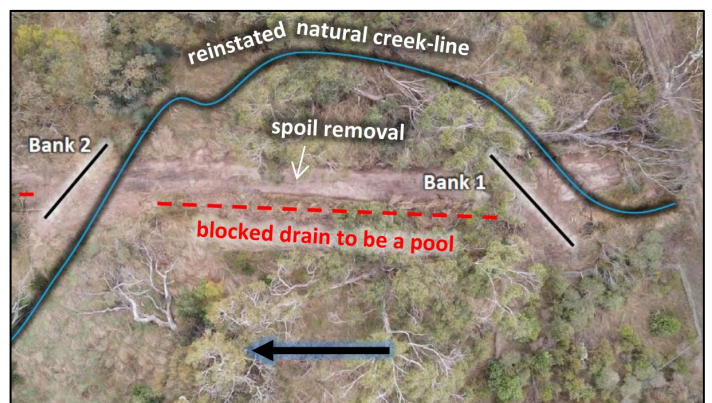
The artificial bypass drain before restoration (2017), which took surface water from rainfall away from the swamp and offsite.



Trial sandbag structure 1 of 6 in Stipiturus CP, plus breaking through the spoil bank to reinstate the natural creekline.



*First winter after the sandbag installation, and now the main drain is blocked. **Water is slowed down** and enters the reinstated natural creekline towards the swamp, instead of rapidly bypassing via the drain.*



Aerial photo after drain backfilling works in 2023. Trial sandbag structure 1 (as shown above) is now buried (labelled Bank 1) and will soon be covered in vegetation. Water must now follow the natural creekline into the swamp.



Drain backfilling in 2022 on the upper slopes of Glenshera Swamp (labelled '9' on previous page). There was not much swamp vegetation in this area as it had been dried from a network of drains. You can see the dark peat soils as the excavator scrapes the spoil mound into the drain to infill it.

The same area as shown left, 12 months later in 2023. The visible change in surface wetness/greenness and wetland vegetation growth seen here was spontaneous and is an example of assisted natural regeneration due to peat resaturation.

4. Rare and interesting species of Stipiturus Conservation Park



large river buttercup (*Ranunculus papulentus*; Photo: Mark Backmann)



Forked sundew (Photo: Tessa Roberts)



Jewel spider (Photo: Tessa Roberts)



Osborn's eyebright (*Euphrasia collina* ssp. *osbornii*; Photo: Denzel Murfet)

South Australian Seed Conservation Centre



Mount Compass oak-bush (*Allocasuarina robusta*; Seeds of South Australia)

South Australian Seed Conservation Centre



Mount Lofty Ranges southern emu-wren (*Stipiturus malachurus intermedius*; Photo: Marcus Pickett)



Yellow-footed antechinus (*Antechinus flavipes*; Photo: Rob McLean)

5. Dry-land revegetation of Stipiturus Conservation Park

Revegetation of the cleared areas surrounding Glenshera Swamp is important to create more habitat for the rare and threatened species that live here, particularly the MLR southern emu-wren. Stipiturus CP and surrounds supports one of the few remaining populations of MLR southern emu-wrens. In fact, the park is named after the bird – *Stipiturus* being the genus of Emu-wrens.

Since the creation of Stipiturus Conservation Park, revegetation has been undertaken by community groups, Friends of Stipiturus CP and park managers. **Swampfest**, an annual community planting day held at Stipiturus Conservation Park, has been running for about 10 years, with between 3000-7000 plants planted by members of the community each year (except 2020 due to COVID 19). It's been a well-supported by the local community and has been a fantastic way to engage the community in swamp conservation, as well as assisting in the revegetation of previously cleared areas.



SwampFest community planting day in 2018 – the hill adjacent to the main entry track was previously cleared and was mainly pasture grasses and bracken fern. It is now covered in native heath vegetation.

Targeted heathland revegetation for threatened species

Successful revegetation has also been achieved in the drier sandy areas of Stipiturus CP, where dry heathland has been successfully established through replanting. This project was managed by Randall Johnson, who previously worked with the AMLR NRM Board (now the Hills and Fleurieu Landscape Board). This part of the revegetation project began in 2017, via the *Creating Resilient Landscapes* project, funded through the Australian Government's BioFund.

Overcoming the challenge of overabundant kangaroo browsing was achieved by tall perimeter fencing (rather than via guarding individual plants), while the revegetation plantings themselves are at a very high density (and were supplemented over time by infill plantings) to replicate the structure of such heathlands in their natural state. While most grant funded revegetation projects can't mimic these methods, due the high cost per hectare, it has to be said that "you get what you pay for" – after all, the results have been nothing short of spectacular!

The birdlife is absolutely teeming in these areas, giving us a glimpse as to what is possible if enough resources are invested in habitat restoration.

Before the tall kangaroo fencing was installed, small 'exclosures' were built in an attempt to protect young plants from browsing kangaroos. This wasn't too successful as kangaroos often broke through and shrubs never got much taller than the height of the fence or the guard that protected them. Sheoaks are particularly favoured by kangaroos.



One part of the heathland revegetation. Note the difference between the cleared paddock on the left and the thriving revegetation on the right about 5 years later. The kangaroo proof fence is visible at the bottom.

2017 - Species	# of plants	2018 - Species	# of plants
<i>Acacia myrtifolia</i>	980	<i>Acacia verticillata</i>	320
<i>Acacia verticillata</i>	3800	<i>Allocas. striata</i>	2409
<i>Allocasuarina mackliniana</i>	5000	<i>Allocasuarina mackliniana</i>	1122
<i>Allocasuarina striata</i>	1000	<i>Banksia marginata</i>	1400
<i>Daviesia ulicifolia</i>	1260	<i>Calytrix tetragona</i>	88
<i>Leptospermum continentale</i>	720	<i>Correa reflexa</i>	600
<i>Leptospermum myrsinoides</i>	67280	<i>Davesia ulicifolia</i>	100
<i>Olearia ramulosa</i>	710	<i>Dillwynia hispida</i>	243
<i>Olearia teretifolia</i>	650	<i>Dillwynia sericea</i>	400
<i>Banksia marginata</i>	600	<i>Grevillea lavandulacea</i>	97
<i>Banksia ornata</i>	3200	<i>Hakea carinata</i>	1300
<i>Correa reflexa</i>	1150	<i>Leptospermum continentale</i>	3200
<i>Gahnia sieberiana</i>	50	<i>Leptospermum myrsinoides</i>	3260
<i>Hakea carinata</i>	2100	<i>Platylobium obtusangulum</i>	90
<i>Hakea rugosa</i>	1400	<i>Xanthorrhoea semiplana</i>	2500
Totals	89900	Totals	17129

Why plant heath and not woodland?

Because MLR southern emu-wrens prefer low and dense heath ecosystems!

The *Creating Resilient Landscapes* project focussed on the two groups of ecosystems identified in the *Landscape Assessment for the Southern Mount Lofty Ranges Landscape*.



Diverse sparsely-treed heath in an area of Deep Creek, where MLR southern-emu-wrens are present (left; Photo: Randall Johnson) and Banksia marginata thriving in the new heathland revegetation at Stipiturus CP (right; Photo: Tessa Roberts).

Many of the Region’s most threatened birds are associated with ‘heathy ecosystems’, including the MLR southern emu-wren, which is associated with both ‘wet’ and ‘dry’ heathy habitats. In both dry and wet heath, it prefers treeless or very sparsely treed, low habitats. This is why no trees were included in the revegetation, recognising that this is different to the original pre-European vegetation structure at this location. By not including trees, this project is attempting to optimise the habitat suitability for the most at-risk species in the landscape.

The MLR southern emu-wren is critically endangered, with the remaining birds numbering only in the hundreds. It’s vital to expand habitat in nearby existing populations as the birds are not strong flyers and don’t travel far across open ground. Their habitat has become highly fragmented and degraded, which is why it’s so important to expand the habitat available here at Stipiturus Conservation Park. This low and dense habitat is also vital for other threatened species like the southern brown bandicoot, which needs this kind of habitat to shelter from introduced predators such as cats and foxes.



A southern brown bandicoot, which also requires low and dense habitat to survive (Photo: Tessa Roberts).