

Characterising the condition and function of the Greater Brixton Street Wetlands, Kenwick Western

Australia, to inform conservation management

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Background

The Greater Brixton Street Wetlands (GBSW) comprises a complex series of seasonally inundated or seasonally waterlogged areas classified as basins, palusplains, floodplains, sumplands and channels. The GBSW is spatially defined by the cadastral boundary of Bush Forever site BF387 and is situated at the foot slopes of the Darling Scarp within the geomorphological unit known as the Pinjarra Plain (Figure 1). Areas in the GBSW area have been mapped as Conservation Category, Resource Enhancement or Multiple Use wetlands. Bush Forever site BF387 has been identified as one of the most important conservation areas on the Swan Coastal Plain, providing a rare transect across the Pinjarra plain from Marri Woodlands through herb rich shrublands to seasonal wetlands (Plate 1). The area supports more than 550 native plant taxa, Declared Rare Flora, Priority Flora and Threatened Ecological Communities [1, 2].

Weed incursion, inappropriate fire regimes, altered hydrological processes, inappropriate access, and climate change (Figure 2) have been identified as key threats to the long-term ecological function of the biological values associated with the GBSW. The Department of Biodiversity, Conservation and Attractions works closely with the Friends of Brixton Street Wetlands, the City of Gosnells, the University of Western Australia, the Department of Planning, Lands and Heritage and other landholders to apply best practice principles, founded on robust science, for the management of key threatening processes that affect nationally listed ecological communities occurring across the GBSW.

Project description

In 2015, funding was successfully sought by the Armadale Gosnells Landcare Group through the Perth NRM's *Resilient Landscapes Program* as part of a three-year collaborative project with the Department of Biodiversity, Conservation and Attractions, the Friends of Brixton Street Wetlands, the University of Western Australia, and the City of Gosnells. The project "From Marri Woodlands to Seasonal Wetlands; restoring resilience across the Pinjarra Plain" aims to achieve the following outcomes:

- 70ha of Nationally Important Wetland will be managed to maintain or improve ecological condition through activities that include weed, fire and hydrological management actions;
- 175ha of Threatened Ecological Communities and Threatened Species habitat will be enhanced through activities that include weed, fire and hydrological management actions; and
- 2ha of Threatened Ecological Communities and Threatened Species habitat will be revegetated.

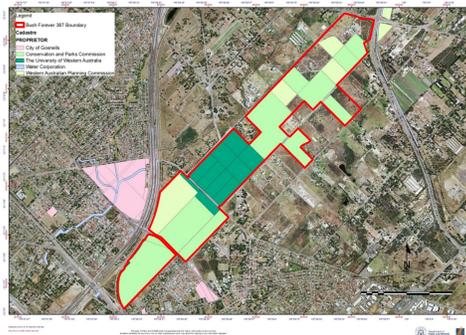


Figure 1. Cadastre and tenure of the Greater Brixton Street Wetlands as defined by Bush Forever site BF387.

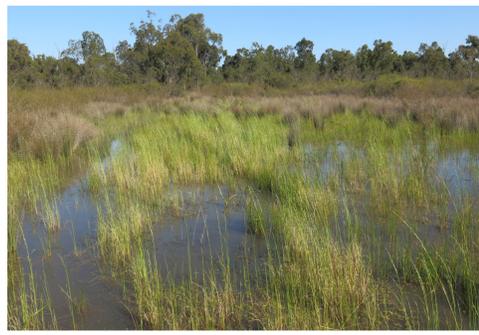


Plate 1. Central claypans in winter, Brixton Street Nature Reserve (Photo Kate Brown).

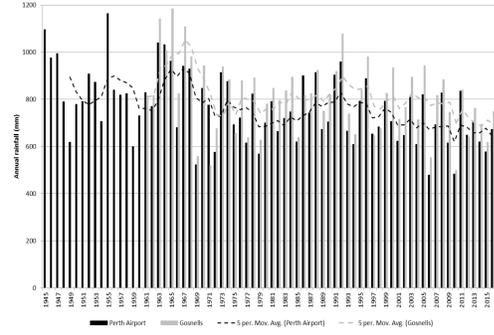


Figure 2. Long-term annual and 5-year moving average rainfall at Perth Airport and Gosnells (Source: Bureau of Meteorology).



Plate 3. *Ptilotus pyramidatus* flowers as the wetlands dry in late November (Photo Kate Brown)



Plate 4. *Comesperma griffinii*, only known location on the Swan Coastal Plain is the Greater Brixton Street Wetlands (Photo Kate Brown)



Plate 5. *Hydrocotyle lemnoides* a rare aquatic, found in winter inundated pools (Photo Kate Brown).

Hydrological Investigations

A review of the available information was undertaken to develop an understanding of the local-scale hydrological function of the GBSW under the current climate and review against predictions made in previous investigations [3]. Straw models were developed to conceptualise the likely behaviour of groundwater and surface water. Field observations of surface water flows following several heavy rainfall events were then used to validate the desk-top assessment (Figure 3). A series of preliminary recommendations were developed for prioritising remediation of tracks and drains to return surface water flows to "natural" flow paths.

Groundwater and surface water monitoring infrastructure were then commissioned to iterate the preliminary conceptual hydrological model. Infrastructure was instrumented with data loggers to record high resolution water level (Figure 4). This was supplemented with regular manual measurements undertaken by Departmental staff and volunteers from the Friends of Brixton Street Wetlands. Water samples taken at the end of summer (dry) and spring (wet) were analysed for major ions, nutrients and stable isotopes (^{18}O and D) (Plate 2). The interpretation and reporting of this data is in preparation.



Figure 3. DBCA monitoring infrastructure and watershed generation analysis for the Brixton Street Nature Reserve and Wanaping Block.

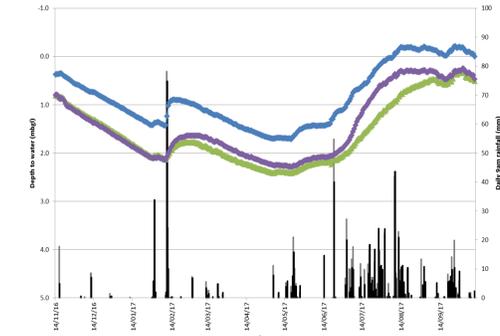


Figure 4. Daily rainfall and groundwater levels in the Wanaping block, GBSW, captured for the period November 2016 to November 2017



Plate 2. Sampling of groundwater in the Wanaping block, GBSW (Photo Lindsay Bourke).

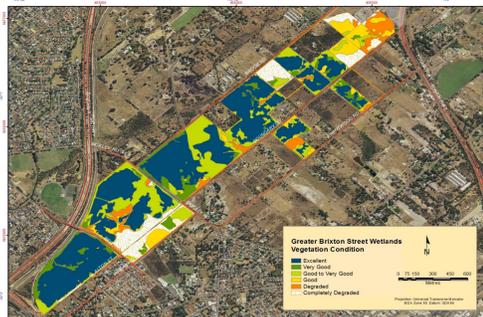


Figure 5. 2017 vegetation condition map of the Greater Brixton Street Wetlands.

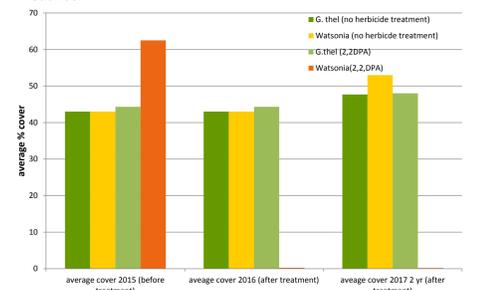


Figure 6. Trial results indicate the application of 2,2DPA to Watsonia has little impact on the co-occurring rare *Grevillea thelemanniana* subsp. *thelemanniana*.

Vegetation, flora and weeds

Baseline surveys of vegetation condition, distribution of serious weeds and targeted surveys for threatened flora were undertaken across the GBSW area. Mapping outputs were used to prioritise and implement management actions for the protection of significant biodiversity values (Figure 5). A Brixton Street Field Herbarium was developed to provide continued documentation of the incredibly diverse flora of the wetlands and as a flora identification tool for land managers. This resource is freely available on FloraBase[4].

Weed management and rare flora

Grevillea thelemanniana subsp. *thelemanniana* and *Ptilotus pyramidatus* (Plate 3) are two species of declared rare flora known only from the GBSW. Weed invasion is a serious threat to both species. Trials were undertaken to assess the impacts of 2,2-DPA, a herbicide for the specific control of Watsonia. Results indicate that the herbicide is effectively controlling co-occurring Watsonia without impacting the threatened *Grevillea* (Figure 6).

Ptilotus pyramidatus is known only from a small localised population in the GBSW and South African bulbous weeds including Sparaxis (*Sparaxis bulbifera*) and Cape Tulip (*Moraea flaccida*) are a major threat. Herbicide trials are not a viable option given the rarity of the species. Instead careful manual removal of the bulbs when the soil is still moist in spring is being trialled (Plate 6).

Fauna surveys

Aquatic invertebrates

The sampling of aquatic macro and micro invertebrates was undertaken in claypans in the Brixton Street Nature Reserve in 2013 and 2017 as part of a broader characterisation of aquatic fauna diversity in vegetated claypans (vernal pools) of the higher rainfall areas of the south-west. The study shows the site provides habitat for a rich aquatic invertebrate fauna, including a number of rare, uncommon and highly restricted species. A rare water flea and an undescribed ostracod species (Plate 7) known only previously from claypans in the Drummond Nature Reserve were found.

Invertebrates

The *Leioproctus douglasiellus*, Family Colletidae, is a small black bee which belongs to a group of species characterised by short tongues. The bee is listed as critically endangered under the EPBC Act 1999 and is listed as Schedule 1 (fauna that is rare or likely to become extinct) under the Western Australian Wildlife Conservation Act 1950. The bee appears to specifically frequent the yellow flowers of *Goodenia pulchella*, a small herb that prolifically flowers as the wetlands dry in November. Emergence of adult bees coincides with flowering of this species and targeted surveys for the bee in November and December 2017 located females visiting the *Goodenia*.

Rehabilitation

Work undertaken as part of the project has informed the prioritisation and implementation of rehabilitation programs. A track closure plan for example was drafted following recommendations of hydrological investigations. This further led to the rehabilitation of tracks in areas under the management of the Department. Seed collection has commenced for restoration planting across several areas and the construction of specialised fencing and reinforcement of areas prone to vandalism will further reduce degradation and will enhance these rehabilitation efforts.

Reference:

1. Keighery, G.J. and B.J. Keighery, *The Flora of the Greater Brixton Street Wetlands*, in *The Greater Brixton Street Wetlands Management Guidelines, Natural History and Research*, J.C. Marshall, Editor. 2000. p. 15-34.
2. Taus, C. and A.S. Weston, *The flora, vegetation and wetlands of the Maddington-Kenwick Strategic Employment Area: A survey of the rural lands in the vicinity of the Greater Brixton Street Wetlands*. Version 18.04.10. 2010, Report to the City of Gosnells, WA.
3. Bourke, L., *Hydrological function of the Greater Brixton Street Wetlands – Data sourcing and review*. 2017, Prepared for the Swan Region by the Wetlands Conservation Program, Science and Conservation Division, Department of Parks and Wildlife, Kensington, Western Australia.
4. Department of Biodiversity, Conservation and Attractions, *Brixton Street field herbarium: A field identification tool for managers of seasonal clay-based wetlands*. Available: <https://florabase.dpaw.wa.gov.au/projects/brixton/>. 1998-. Western Australian Herbarium, Department of Biodiversity, Conservation and Attractions.



Plate 6. Monitoring impacts of weed management on *Ptilotus pyramidatus* (Photo Kate Brown).



Plate 7. Image of the undescribed ostracod species (*Lacrimicypris* n.sp.), sampled from the GBSW, otherwise only known from Drummond Nature Reserve (Photo Adrian Pinder).