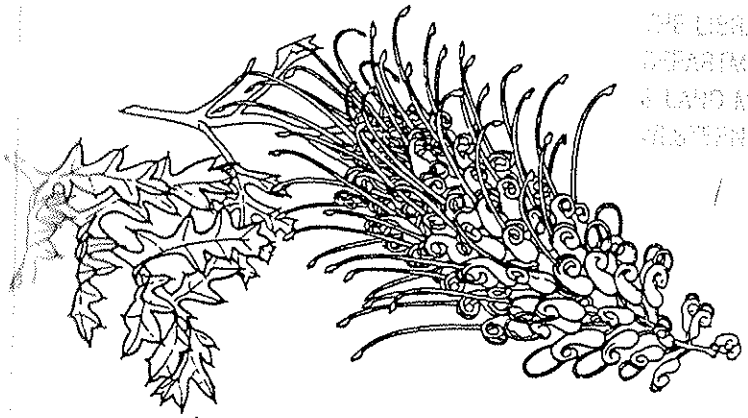
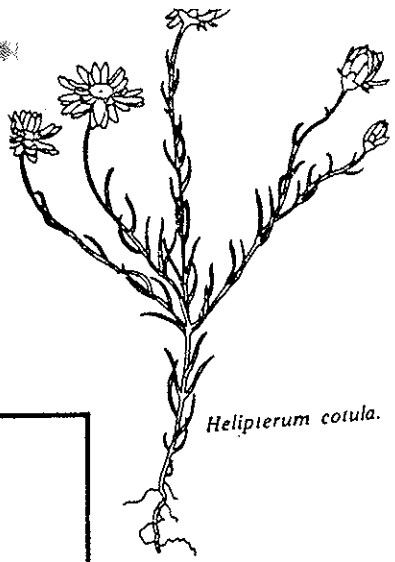


*Grevillea bipinnatifida.*



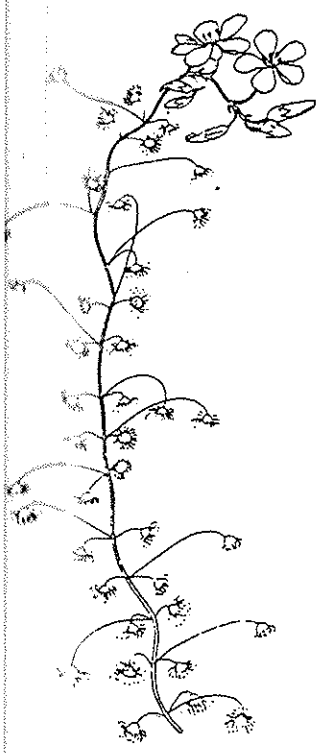
*Helipterum cotula.*

# *Knowing and Managing the Brixton Street Wetlands*

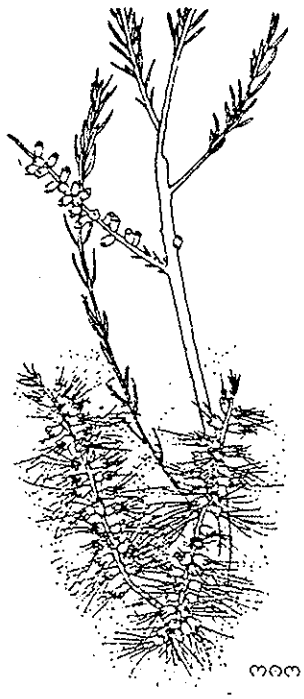
*compiled by Bronwen Keighery*
*for*
*The Friends of Brixton Street Wetlands and the Perth Branch of the Wildflower Society of WA (Inc.) in cooperation with the Department of Conservation and Land Management.*

*This project was funded by the State Government in the interest of protecting and enhancing our environment.*

*September 1995*

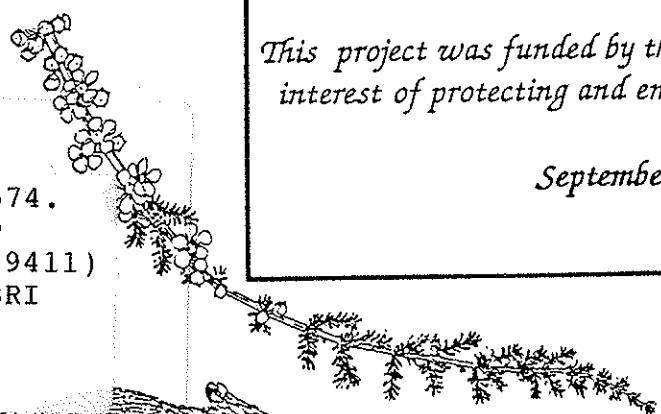


*Drosera macrantha.*

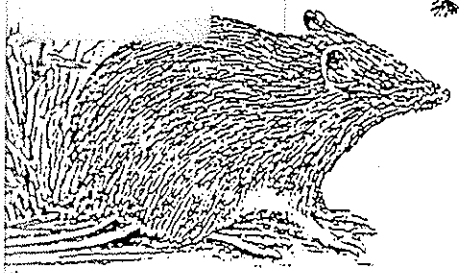


*Melaleuca lateritia.*

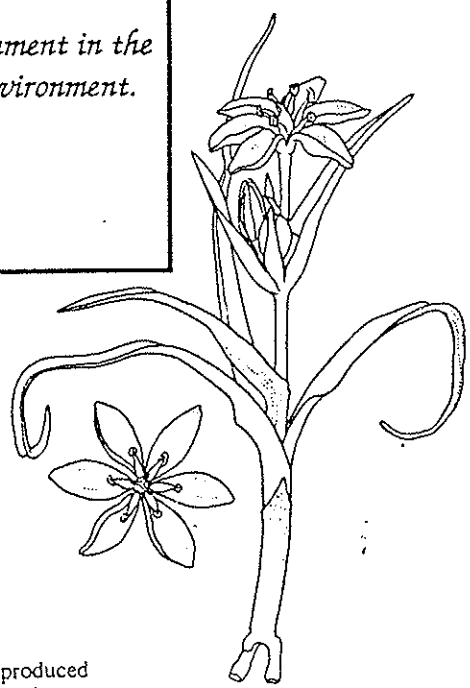




*Baeckea camphorosmae.*



*Isoodon obesulus*



*Burchardia multiflora*

Wildflower drawings by Margaret Menadue reproduced with permission from the "Flora of the Perth Region"

# *Contents*

# Acknowledgements

The long history of the recognition and preservation of the Brixton Street Wetlands has been characterised by the dedication of many individuals and groups. This project is dedicated to these people.

The planning and preparation for the workshop and the actual workshop on which this report is based involved many people. All those who attended the workshop are thanked for their enthusiastic participation. Special thanks should go to those who prepared talks for the workshop: Luke Penn, Gregory Keighery, John Dell, James Mumme, Regina Drummond and Paul Brown. Regina and Trevor Drummond, Brian Moyle, Gregory, Kristin and Sarah Keighery and Mary Gray are also thanked for their help in organising the workshop.

This project was made possible through a 1995 Community Conservation Grant from the Minister for the Environment, the Honorable Peter Foss.

# *Introduction*

The Brixton St Wetlands (Lots 37 and 47 Brixton St, Kenwick) are of outstanding conservation value, both at a local, regional and national level.

The Wetlands are on government land, owned by Homeswest and in the late 1980's the Homeswest put forward a proposal to develop the Wetlands for housing. This proposal was the subject of environmental assessment and in recognition of the natural values of the Wetlands the Environmental Protection Authority recommended against their development and supported the formation of a Nature Reserve to include these Wetlands.

Presently the Wetlands are still with in Homeswest but negotiations are proceeding for the transfer of the land to the National Park and Nature Conservation Authority for management by the Department of Conservation and Land Management (CALM).

A local 'Friends of Brixton Street' group has been managing the area on a voluntary basis for several years. This involves organising wildflower walks on a regular basis in spring, rubbish cleanups and weed removal (several members of the group are qualified bush regenerators). Partial temporary fencing and signage was erected by the group and in early 1995 the CALM arranged with Homeswest's approval to fence and signpost the Wetlands.

In an effort to support and progress the management of the Wetlands the Perth Branch of the Wildflower Society of WA (Inc.) and the Friends of Brixton Street applied for and obtained a 1995 Community Conservation Grant to prepare management guidelines for the Wetlands and begin weed control.

The Minister for the Environment, Hon. Peter Foss launched the Community Conservation Grants in the Brixton Street Wetlands with the Friends of Brixton Street Wetlands, the Perth Branch of the Wildflower Society, the Australian Trust for Conservation Volunteers and the Urban Bushland Council, all recipients of Grants in 1995. This event received coverage on ABC television and in the Sunday Times (see below).

Sunday Times 6/8/95

# Wetlands lovers get boost

FROM the road it looks like an eerie forest of tall charred sticks but Kenwick's Brixton St Wetlands are living proof of people power.

One of the few remaining natural wetlands along the eastern boundary of the Swan coastal plain, the 19ha plot has been cared for by volunteers since a proposal to develop the land was rejected in 1989.

Yesterday, those volunteers and others were rewarded for their long hours of back-breaking labor.

Friends of Brixton St Wetlands and the Perth branch of the Wildflower Society were among 20 groups to receive community conservation grants.

By INGRID JACOBSON

During a ceremony at the wetlands, Environment Minister Peter Foss awarded representatives from the two groups – along with members of the Urban Bushland Council of WA and WA's Australian Trust for Conservation Volunteers – with native plant seeds.

Mr Foss stressed the importance of volunteers who cared for the environment and pointed to the Brixton St Wetlands as an example.

Once littered with rubbish, abandoned car bodies and scarred by mining and off-road drivers, the wetlands have been painstakingly restored.

Its landscape now boasts more than 280 species of native flora, despite a temporary setback when a fire was lit there earlier this year.

☐ The Environment Minister, Peter Foss, centre, congratulates nature's volunteers.

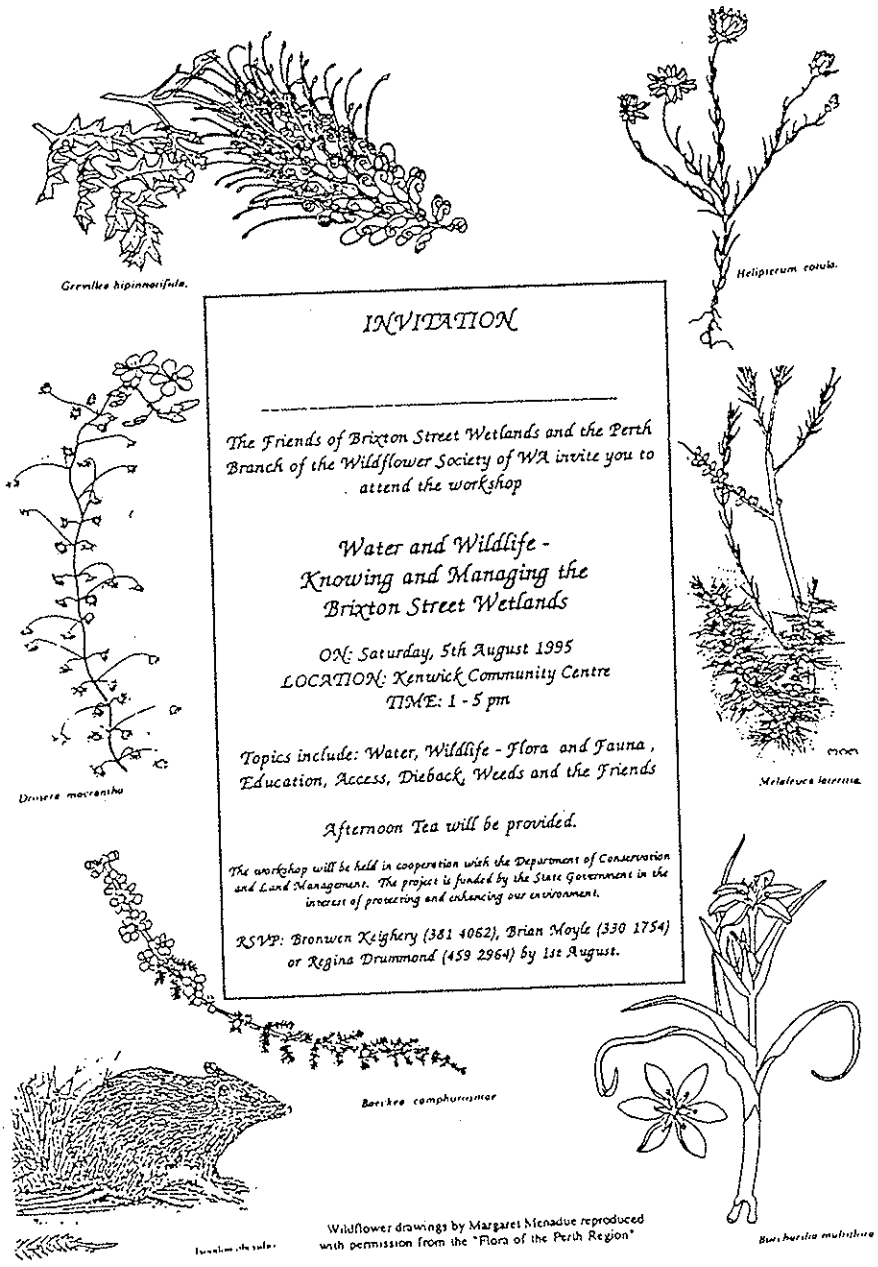
A committee of members of all groups presently involved in the management of the area, Friends of Brixton Street (Regina Drummond and Elizabeth Buteres), Perth Branch of the Wildflower Society (Brian Moyle and Bronwen Keighery) and CALM (Paul Brown) was formed to manage the Community Conservation grant. This committee determined that the management guidelines preparation take the form of a workshop to bring together current information and management options. It was felt that the community and the appropriate experts should participate in the formation of the guidelines, based on the best available information on the Wetlands.

## The Workshop

A series of individuals were invited to address the workshop on topics related to the natural values of the Wetlands. Each speaker was asked to:

(i) detail the values of the Wetlands within their area of interest
(ii) outline management guidelines required to be followed to maintain these values.

Invitations (see below) were sent to the Gosnells City (staff and Councilors), local schools, CALM, Department of Environmental Protection, local members of Parliament, conservation groups (Wildflower Society branches, WA Naturalist Club, Conservation Council, Urban Bushland Council) and the Wetland's neighbors. The wider local community was invited to attend through an article in the local paper and the West Australian.




*INVITATION*

*The Friends of Brixton Street Wetlands and the Perth Branch of the Wildflower Society of WA invite you to attend the workshop*

*Water and Wildlife - Knowing and Managing the Brixton Street Wetlands*

*ON: Saturday, 5th August 1995*
*LOCATION: Kenwick Community Centre*
*TIME: 1 - 5 pm*

*Topics include: Water, Wildlife - Flora and Fauna, Education, Access, Dieback, Weeds and the Friends*

*Afternoon Tea will be provided.*

*The workshop will be held in cooperation with the Department of Conservation and Land Management. The project is funded by the State Government in the interest of protecting and enhancing our environment.*

*RSVP: Bronwen Keighery (381 4062), Brian Moyle (330 1754) or Regina Drummond (459 2964) by 1st August.*

The workshop, titled Water and Wildlife - Knowing and Managing the Brixton Street Wetlands, was held on the afternoon of Saturday, 5th August in the Kenwick Community Centre (see programme below). Over thirty five local residents, conservationists and specialist's outlined the values of the Wetlands and how the area should be managed to maintain these values. Poster displays on the natural values of the Wetlands and the Friends' management activities were also presented at the workshop. One of the poster displays, 'Water and Wildlife', was prepared for the workshop and has since been on display at the Wildflower Society Spring Fling and the Kings Park Wildflower Festival. The other displays are periodically presented to the local community and bushland management groups.

This report brings together background information and the talks and the management guidelines developed at the workshop. Copies of the report will be distributed to parties responsible for managing the Wetlands and other appropriate bodies and individuals.

WILDFLOWER SOCIETY OF WESTERN AUSTRALIA (Inc.)
PERTH BRANCH

and the *Friends of Brixton Street*

present

## *Water and Wildlife -*
## *Knowing and Managing the Brixton Street Wetlands*

### *Programme*
*Saturday, 5th August 1995, 1 - 5 pm*

| | | | |
|---|---|---|---|
| Welcome and Introduction | | Bronwen Keighery | |
| Part A | Chair | Brian Moyle | |
| 1. | Water | Luke Penn<br>(Water Resources Division, WAWA) | 20 mins |
| 2. | Flora | Bronwen and Gregory Keighery<br>(Wildflower Soc/CALM)<br>Presented by Bronwen Keighery | 25 mins |
| 3. | Fauna (terrestrial) | John Dell (Museum)<br>Presented by Gregory Keighery | 25 mins |
| 4. | Education | James Mumme (Environmentalist) | 20 mins |
| 5. | Friends | Regina Drummond (Friends) | 20 mins |
| Afternoon Tea | | | 20 min |
| Part B | Chair | Bronwen Keighery | |
| 6. | Dieback and Access | Paul Brown (CALM) | 20 mins |
| 7. | Weeds | Greg Keighery (CALM) | 20 mins |
| 8. | Discussion of Management Guidelines<br>All members of the workshop will be invited to participate in developing the guidelines. | | approx. 60 mins |

The workshop is held in cooperation with the Department of Conservation and Land Management. The project is funded by the State Government in the interest of protecting and enhancing our environment.

# Part 1: Knowing the Brixton Street Wetlands

## General Background

### *Location*

The Brixton Street Wetlands, Lots 37 and 47 Brixton Street, Kenwick, are found within the City of Gosnells in the Perth Metropolitan Area (Map 1 and 2, pages 6 and 7).

### *Geomorphology and Soils*

The Brixton Street Wetlands are located within the band of alluvial soils on the eastern side of the Swan Coastal Plain. Two major geomorphic units are associated with the alluvial soils, the Pinjarra Plain and the Ridge Hill Shelf (McArthur and Bettenay, 1974). The Wetlands are found on the Pinjarra Plain which is a series of alluvial tracts that slope very gently to the west. The surface of the Plain is flat to very slightly undulating and consists predominantly of Pleistocene fluvial sediments and some Holocene alluvium associated with the major current drainage systems. Soils are naturally poorly drained with considerable areas of seasonally inundated wetlands (floodplains, palusplain, sumplands and damplands, Semeniuk, 1989). These soils form a band to the east from 1-25 km wide (Beard, 1990). The Pinjarra Plain shows it greatest development along the main drainage lines of the Swan Coastal Plain.

### *Remnant Vegetation on the Pinjarra Plain*

It has been estimated that the eastern side of the entire Swan Coastal Plain is 97% cleared of vegetation (CALM, 1990).

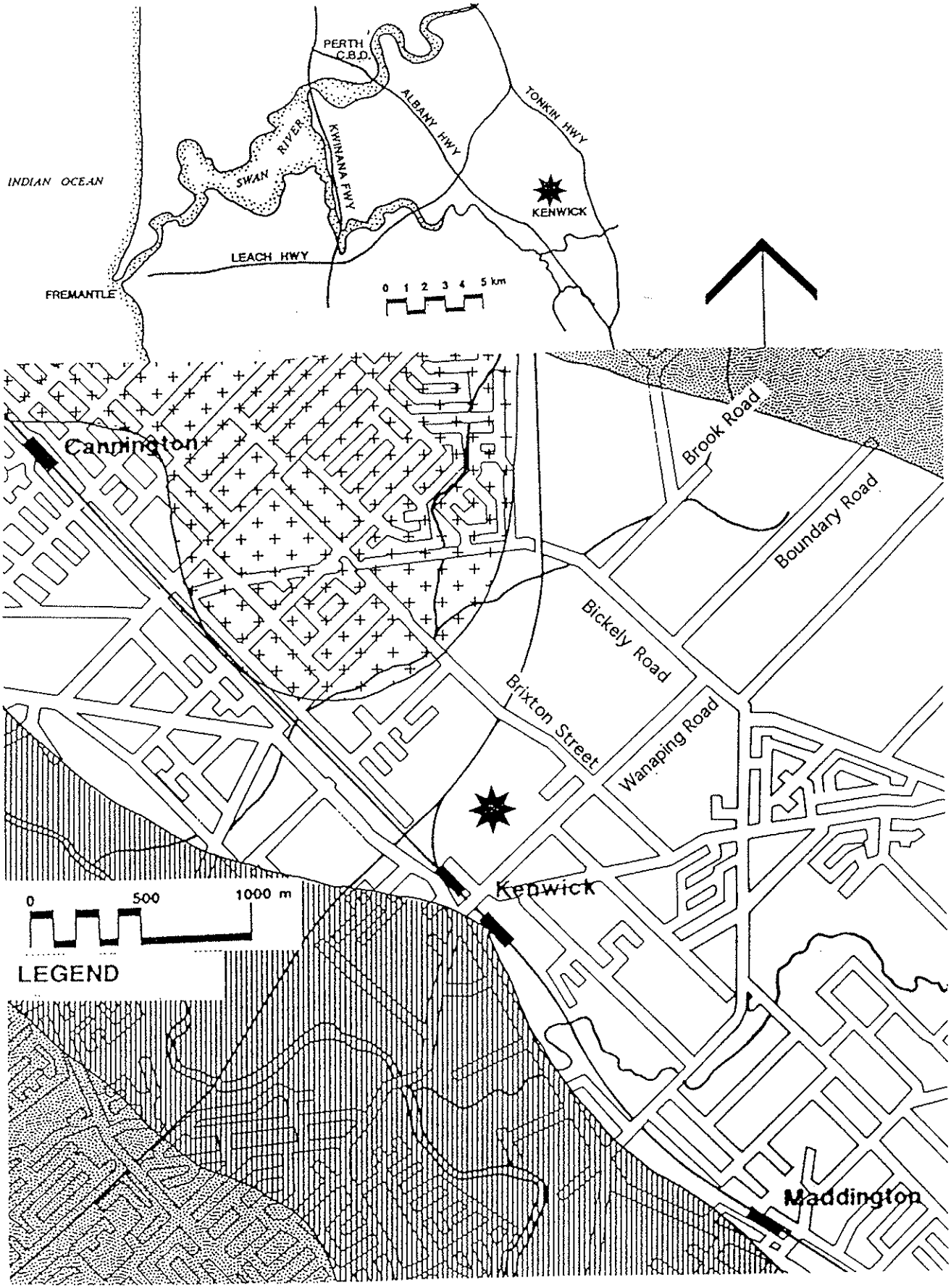
Recent remnant vegetation mapping for the Perth Metropolitan Area (Dixon *et al.* 1994) indicates that between 88% and 99% of the Pinjarra Plain vegetation complexes (Guildford, Beermullah, Swan, Serpentine and Cannington, Heddle *et al.* 1983) that occur in the vicinity of the Brixton Street Wetlands are cleared. The Brixton Street Wetlands are mapped entirely within the Guildford Complex which, within the Metropolitan Area, is 94% cleared.

Heddle et al.(1983) describes the Guildford Complex as "A mixture of open to tall forest of *E. calophylla - E. wandoo - E. marginata* and woodland of *E. wandoo.* Minor components include *E. rudis - M. rhaphiophylla.*". In the smaller scale study by Keighery and Trudgen (1992) of the vegetation of the Pinjarra Plain a complex suite of vegetation associations were identified on the Pinjarra Plain. The main associations were:

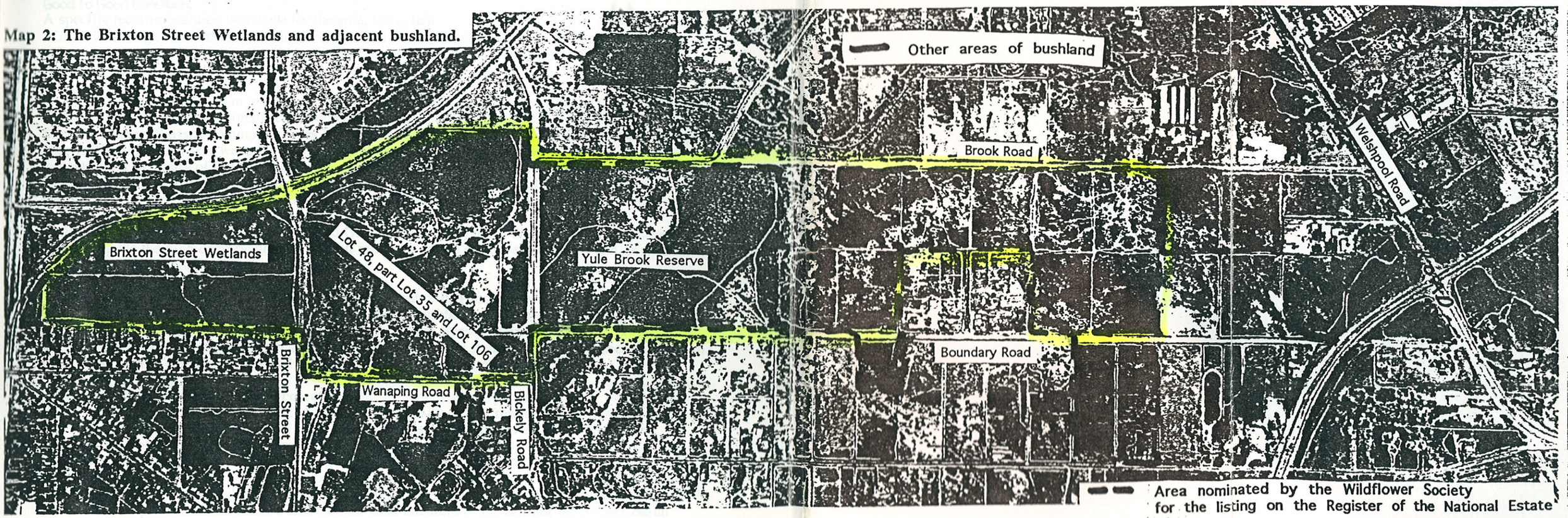
*Eucalyptus calophylla* (Marri) Woodland to Open Forest
*Casuarina obesa* (Salt Water Sheoak) Woodland to Open Forest
*Eucalyptus calophylla* and *Eucalyptus wandoo* (Wandoo) Woodland to Open Forest
*Eucalyptus wandoo* Woodland to Open Forest
*Eucalyptus rudis* (Flooded Gum) Woodland to Forest
Ephemeral Wetlands, a complex mosiaic of shrublands, heaths, sedgelands and herblands.

Three of these associations, the *Eucalyptus calophylla* Woodland to Open Forest, *Casuarina obesa* Woodland to Open Forest and the ephemeral wetlands are recognised as having been the most common vegetation association of the Pinjarra Plain prior to European settlement. Only one of these associations, the wetlands, is presently significantly represented in the remnant vegetation areas. Previous studies of the Pinjarra Plain underestimated the extent of the wetlands. This confusion was undoubtedly due to the small fragmented nature of the remnant vegetation.

**Map 1: Location of the Brixton Street Wetlands**



**Map 2: The Brixton Street Wetlands and adjacent bushland.**



***The Brixton Street Wetlands and adjacent bushland areas***

The Brixton Street Wetlands are part of a larger area of bushland which similarly has outstanding flora conservation value (Map 2). Numerous studies and reports have identified the conservation value of these other bushland area and many have recommended the inclusion of areas within a large conservation reserve centred on the Brixton Street Wetlands and the Yule Brook Reserve.

- **Regional Studies**

- Keighery and Trudgen (1992) in a report on the remnant vegetation of the alluvial soils of the eastern side of the Swan Coastal Plain made a specific recommendation about much of the bushland in the area of the Brixton Street Wetlands. This area, called the "Canning Wetlands" (Map 2) was described as:

"This area is the only substantial area of Wetland Mosaic Associations characteristic of the heavy seasonally inundated soils of the flats of the Pinjarra Plain extant. The wetlands encompassed in these locations give some idea of the complexity and diversity of these wetlands that were once widespread on the Pinjarra Plain. The characteristic associations are: *Viminaria juncea* High Shrubland, *Melaleuca* Open Heath, Mixed Low Open Heath, Samphire Low Shrubland, Herblands and Sedgelands. The *Melaleuca* Open Heath and Mixed Low Open Heath are extremely variable depending on the dominant species, generally a suite of myrtaceous shrubs often with scattered clumped *Actinostrobus pyrimidalis*, *Viminaria juncea* and *Melaleuca rhaphiophylla*. Although there are areas in Very Poor Condition and areas of severe localised disturbance much of the area is in Very Good to Good Condition.
A specific recommendation was made for the area, being that
"CALM liaise urgently with the owners to retain and manage the area for its flora conservation values. Locations 63 and 65 should be acquired for a Nature Reserve encompassing all four locations, vested in the NPNCA."

- Gibson et al (1994) in a report on the floristic variation in plant communities of the Swan Coastal Plain identified six floristic community types (3a, 7, 8, 10a, 21c & 23a) from the Brixton Street Wetlands (floristic community types 3a & 8) and Yule Brook Reserve (floristic community types 10a, 7, 21c & 23a). There was no overlap of the floristic community types from the two areas, indicating the diversity of floristic units in the area. Other bushland in the area was not sampled as at the time of this study these were all private lands, and private lands were excluded from the study. All but two (21c & 23a) of these community types are associated with the eastern side of the Plain.

Both studies (Keighery and Trudgen 1992 and Gibson *et al.* 1994) made direct recommendations concerning the the high conservation value of all remnants on the eastern side of the Plain, regardless of the size of the remnant.

- the System 6 Update (1994 - ongoing Department of Environmental Protection project for the Environmental Protection Authority) identified a series of bushland areas were identified as being in need of interim protection under the System 6 Update. These areas contain threatened or poorly reserved plant communities identified in the previous two regional studies. The boundaries of "Brixton 1"are those of the "Canning Wetlands" (Map 2, Keighery and Trudgen (1992).

- **Detailed long term research projects**

- Yule Brook Reserve (Map 2). As this is a University of WA research area there have been a series of studies on the area, Speck and Baird (1984) details the vegetation and flora of the area.
- Brixton Street Wetlands (Map 2), Keighery and Keighery (1990)

The results of these two detailed detailed long term studies establish that the vegetation associations in the the study area are complex and varied containing a rich and endemic flora. A compilation of the flora of these two areas (Keighery 1993) that allowed for taxonomic changes and duplications lists 517 native vascular plant taxa in these two areas, that is over one third of the flora of the Swan Coastal Plain.

- **Environmental Assessments**

- Lot 37 and Lot 47 Brixton Street (Map 2), Hames and Sharley 1991 and EPA Bulletin September 1991. This document included a brief reports on the hydrology of the Brixton Street

Wetlands that indicated that the Wetlands are surface water features, filled annually from rainwater, rather than groundwater (Australian Groundwater Consultants 1989, 1990).

- Glenhaven Estate, Lot 48 and part Lot 35 Brixton Street (Map 2), Hames and Sharley 1991 and EPA Bulletin July 1992.

These environmental assessments related to housing proposals for the various lots. Lots 37, 47 and part 48 were subsequently identified as conservation areas to be vested in the NPNCA.

- **Planning Studies**
  - Foothills Environmental Audit (Map 2), Semeniuk 1991
  - Boundary and Brook Road (Map 2) Mattiske and Associates (1992)

These studies recognised the conservation values of the area north -east of Yule Brook Reserve, some of which has been acquired by the WA Planning Commission.

- **Rare Flora of the Metropolitan Region**

Populations of four taxa of Declared Rare Flora have been identified in the area; *Aponogeton hexatepalus*, *Hydrocotyle lemnoides*, *Diuris purdei* and *Calytrix breviseta* subsp. *breviseta* (Atkins 1994, Kelly *et al.* 1993). Over 20 priority taxa are found in the area.

- **Community recognition of the area's outstanding flora conservation value**

The Conservation Council and the Friends of Brixton Street Wetlands have proposed that much of the "Cannington Wetlands" become the Yule Brook Nature Reserve (Map 2).

- **National recognition of the area's outstanding flora conservation values**
  - Nomination for listing on the register of the National Estate (Gray 1993). In 1993 the approximate area of the "Cannington Wetlands" was nominated for listing on the National Estate by the Wildflower Society of WA (Inc.).
  - The Brixton Street Wetlands are listed on the Australian Register of Significant Wetlands (Australian Nature Conservation Authority 1993).

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# *Water*

Luke Pen, Water Resources Planning and Allocation, Water Authority of Western Australia

## 1. What is a wetland?

Wetlands are defined as follows:

"areas of seasonally, intermittently or permanently waterlogged soils or inundated land, whether natural or otherwise, fresh or saline eg waterlogged soils, ponds, billabongs, lakes, swamps. . ." (Wetlands Advisory Committee, 1977).

Up until recently only wetlands with standing water and mostly with permanently standing water were recognised as wetlands. This has meant that many wetlands have been lost or managed inappropriately because they were miss identified or undervalued. For example, most of the marshes of the Swan-Canning River system have been filled with earth or refuse to "improve" the rivers.

The Brixton St wetland is one of many wetlands which has been recognised, relatively recently, as having great natural value.

## 2. Values of wetlands

Wetlands on the Swan Coastal Plain provide a number of beneficial uses to the human community. These values are listed below:

**Ecosystem function**. Wetlands help to support a range of animal and plant species populations which still manage to survive in the highly fragmented urban and rural landscapes of the coastal plain.

**Habitat**. Wetlands represent habitat in their own right, supporting a wide range of plants and animals closely associated with wetland environments.

**Hydrological function**. Wetlands are an important components in the natural and partially artificial hydrological systems which control the movement and quality of water across the coastal plain. For example, stormwater is often directed to wetlands which in turn may discharge to the groundwater or to streams. Wetland vegetation is known to filter out nutrients and thus improve water quality.

**Recreation**. Water bodies of all descriptions are major recreational resources. Wetlands without standing water are valued for bird watching, wild flower walks and eco-tourism generally.

**Scientific research and education**. Wetlands in south-west Western Australia are often major sites of scientific research and are becoming increasingly used as educational facilities.

**Landscape.** Wetlands dotted in and about the urban and rural areas of the coastal plain contribute towards local landscape and character and are often points of reference. Certainly the Brixton St wetlands are synonymous with Kenwick.

**Cultural values.** Areas of aboriginal or broader historical significance are often located in or near wetlands.

Heritage and conservation of natural resources. The plants and animals and the ecosystems they constitute together with the surrounding physical environment represent natural resources which are part of the heritage of Australia and are of potential value to future generations.

## 3. Types of wetlands and Brixton Street

Wetlands can be classified on the basis of land form and fluctuations in water level. This is known as a geomorphic approach to wetland classification. Landforms are divided into basins, flats and channels. If a basin is mostly permanently inundated to some extent, it is called a lake, if only seasonally inundated, a sumpland, and if the groundwater rises only enough to dampen the surface, it is called a dampland. If the land is flat then the latter two types are called a floodplain and palusplain, respectively. The Brixton St wetland is mostly a palusplain with some very tiny sumplands and a tiny creek known as Yule Brook.

## 4. Importance of damplands and palusplains

Damplands and palusplains, while having been, until recently, greatly ignored as water resources, are now showing themselves to have great natural value. As ecosystems they have great genetic diversity, with a wide range and large number of highly variable and unique plant species. Although little work has been done on animals in these systems, it is known that south coast damplands and palusplains support a number of rare crayfish, frogs and even fish. On the Swan Coastal Plain, remnant palusplains and damplands are important water bird breeding habitat and habitat for the southern brown bandicoot and other large native animals, perhaps because the waterlogged nature and dense vegetation of the wetlands in winter and spring disadvantages foxes and cats.

## 5. Threats to damplands and palusplains

By far the greatest threat to palusplains and damplands is clearing for rural and urban development. In fact over 90% of these wetland types have been cleared already. Those remaining must contend with the altered hydrological regimes which are a consequence of that development. Alterations to the natural hydrology, which once supported the wetlands, can result from the loss of water consuming trees, compacted road and building bases and stormwater drainage. Even if the underlying environment has not changed there are the problems of nutrient enrichment, physical disturbance and vandalism and excessive fires, all of which can encourage the establishment and invasion of weeds and introduced animals. Once the plant and animal communities

become stressed through environmental perturbations, diseases, such as dieback, can contribute to the decline and even extinction of certain native species.

## 6. Wetland evaluation and management

The Water Resources Division of the Water Authority and the Department of Environmental Protection carry out wetland evaluation in order to encourage the wise use of wetland resources and to prescribe appropriate management. Wetlands are evaluated into five categories, high conservation (H), conservation (C), open space (O), resource enhancement (R) and multiple use (M) (EPA 1990). H and C value wetlands are outstandingly natural with H value wetlands being near pristine or retaining highly unique features such as rare species and communities. O and R wetlands are modified but retain natural attributes, R less so than O. M value wetlands are completely degraded, retaining no natural attributes. The Brixton St and associated wetlands are all H value, the highest evaluation possible.

## 7. Significance of Brixton St

The significance of the Brixton St wetlands and the associated wetlands to the north west, including the Yule Brook Reserve, is that they represent the second largest and most floristically diverse palusplain between Gingin and Mandurah.

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# Flora

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## Background

In 1991 the Wildflower Society published a report on the flora of the Brixton Street Wetlands (Keighery and Keighery 1991). This report presented the results of 10 years of work on the Wetlands. This long term study became the benchmark work on the flora and vegetation of the eastern side of the Swan Coastal Plain. A series of features of the flora and vegetation were described that have since been found to be characteristic of the eastern side of the Swan Coastal Plain, these are:

- a complexity of plant communities exists over a small area
- a high diversity of flora over a small area
- the close relationship with the flora of the heavy soils of the Plateau and Scarp
- the presence of a significant number of endemic taxa
- the occurrence of many poorly known taxa.

The only long term study is that of Speck and Baird (1984) on the Yule Brook Reserve which supports these same trends. Further work on the eastern side of the Plain by Keighery and Trudgen (1992) and on the entire Plain by Gibson *et al.* (1994) established these same trends over the entire area of the eastern side of the Plain.

This treatment of the plant communities and flora is a summary and update of Keighery and Keighery (1991).

## Plant Communities

The principal communities of the Wetlands are listed below and mapped in Map 3 (page 15).

Flora Table 1: Plant Communities

| Landscape Position | Plant Community | Sites Keighery and Keighery (1991) | Floristic community type (Gibson *et al.* 1994) |
|---|---|---|---|
| Claypans | *Melaleuca lateritia* Shrubland | D | 8 |
| | *Amphibromus* Grassland | B | |
| | *Pericalymma* Open Heath | A | |
| Wet flats | *Viminaria* Tall Shrubland | C | 8 |
| Dry flats | Mixed Low Shrublands | E | 8 |
| Uplands. | Marri Woodland | F | 3a |

These communities are characteristically associated with species rich Sedgelands, Herblands and Grasslands. Keighery and Trudgen (1992) mapped the claypans, wet flats and dry flats as a 'Wetland Mosaic' to convey the complexity of communities within the area. The 'Wetland Mosaic' was found to be characteristic of the seasonally inundated areas of the eastern side of the Swan Coastal Plain.

In the regional floristic study of the Swan Coastal Plain by Gibson *et al.* (1994) two floristic community types (Flora Table 1) were identified, floristic community types 3a (Marri/*Kingia* Woodlands on heavy soils) and 8 (Herb rich shrublands on claypans). As floristic community types of the almost completely cleared eastern side of the Plain the conservation status of these types was described as 'vulnerable' (a community likely to move into the endangered category in the near future if the causal factors continue operating). Floristic community type 3a was also unreserved.

**Map 3: Plant Communities** (modified from Figure 5.5 in Hames Sharley 1991)

**Key** (see Flora Table 1 and Map 3)

Deep claypan communities (Clay) - *Melaleuca lateritia* Shrubland/*Amphibromus* Grassland

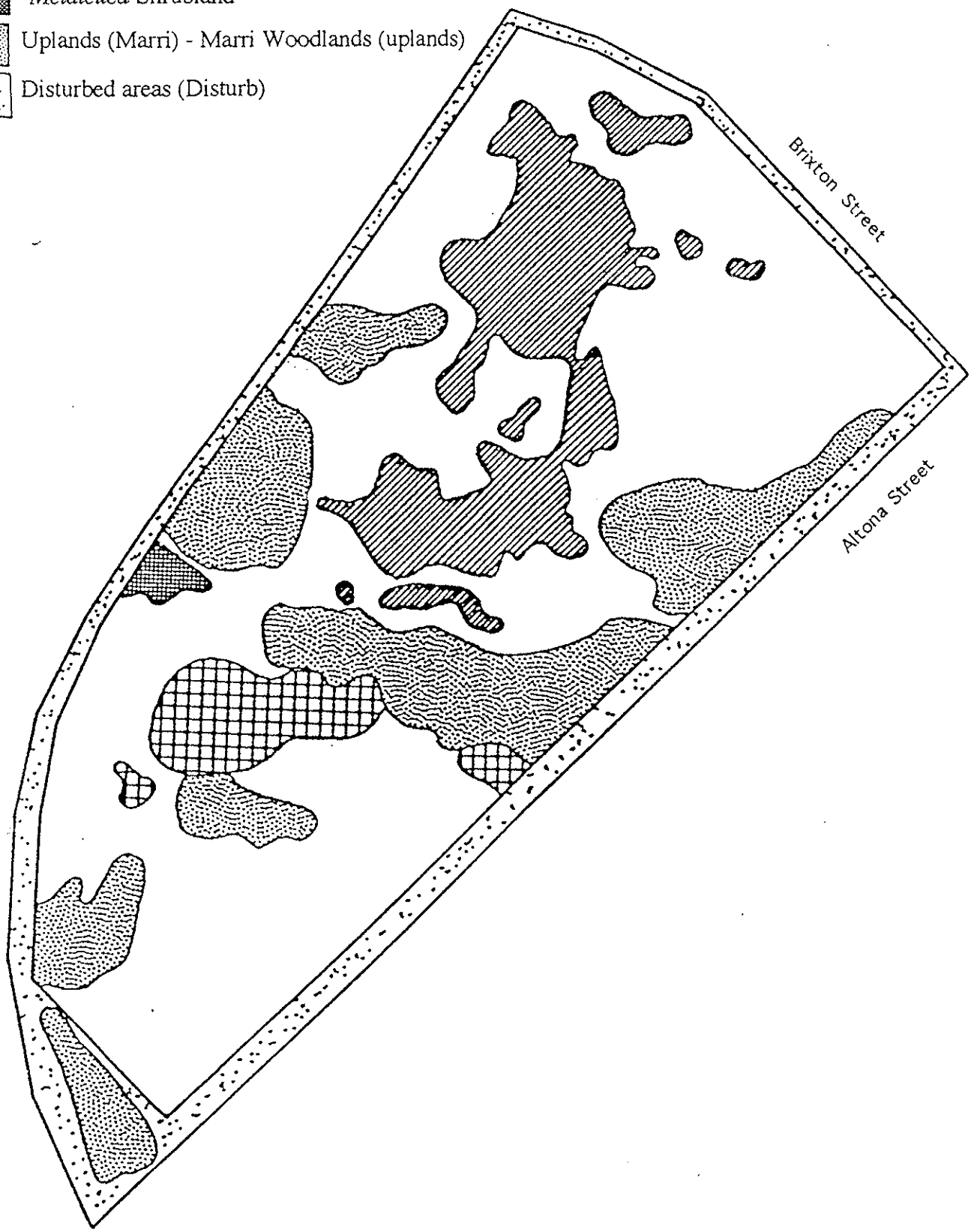
Wet Flats (Vim) - *Viminaria juncea* Tall Shrubland/Dry flats (Dry)- Mixed Low Shrublands

Shallow claypans (Wet) - *Pericalymma* Open Heath

*Melaleuca* Shrubland

Uplands (Marri) - Marri Woodlands (uplands)

Disturbed areas (Disturb)



## Flora

The Wetlands support a highly diverse flora of 307 native taxa of ferns/fern allies and flowering plants (Flora Table 2) and 64 taxa of naturalised aliens (weeds). Forty nine additional taxa have been recorded since 1991. These additional records reflect a better knowledge of the flora of the eastern side of the Plain, recognition of new taxa, changed environmental conditions (fires and floods) and four years additional survey. That is the Wetlands contains over 20% of the known flora of the Perth Region in less than 0.005% of the area.

Fifty percentage of the native taxa are annual or perennial herbs. Most of these (about 45% of the total flora) are annually renewed from seeds, rhizome, bulbs and tubers. As a consequence nearly half of the Wetlands's flora is only visible in winter/spring when these taxa are growing and flowering.

Many of these 307 native taxa have special significance (Flora Table 2 and Keighery and Keighery 1991). Within the area of the Wetlands there are:

- 2 species Declared Rare Flora
- 17 rare species (CALM Priority Flora)
- 16 species endemic eastern side Swan Coastal Plain
- approximately 40 taxa are found on the eastern side Plain and Darling Scarp/Plateau
- many taxonomically significant taxa.

Also a series of the taxa are at the ends of their geographic ranges, naturally occurring hybrids and unusual co-occurences. More detail on these taxa can be found in Keighery and Keighery (1991).

## Flora Conservation Values

The Brixton Street Wetlands have outstanding flora conservation values containing

- rare plant communities
- many rare and restricted taxa
- a great diversity of plant taxa.

These flora conservation values of the area have been significant in identifying the Wetlands as a wetland of national significance (Australian Nature Conservation Authority 1993), the nomination for the National Estate (Gray 1993) and the recognition of the Wetlands conservation value (EPA 1991).

As one of the largest of the few remaining remnants in excellent condition on the eastern side of the Swan Coastal Plain the Wetlands well deserve their recognition as part of the conservation estate.

## Management Guidelines- Flora

1. Maintain the hydrological status of the wetlands.
   Issues - lack knowledge hydrology (relationship ground water and surface water)
   - complexity of soils/geomorphology (significance of the ironstone layer)
   - adjacent urban development (roads, drains, sewers, power lines etc)

2. No further clearing should occur and degraded areas should be restored to native vegetation.

3. Restoration should focus on augmenting natural regeneration.

4. All propagation material must be derived from locally collected seed/cuttings etc. Areas proposed for clearing in adjacent areas could be used to source these requirements and plantings in adjacent areas.

5. Principal management activities should be confined to summer.

6. A locally based education programme should be established that highlights the special values of the flora. and lessens the chance of frequent deliberately lit fires.

7. Fire management should ensure that
   - the fire frequency is not less than 10 years
   - any burning is based on small patch burns

## References

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**Flora Table 2: Flora of the Brixton Street Wetlands**
Updated from Keighery and Keighery 1991, September 1995

**Key**

**Column 1**
- e Taxa from the eastern side of the Plain
- p East and the Darling Plateau.
- U unusual record
- t taxonomically significant taxa

**Column 2** Conservation Code, Priority Code. Atkins, 1994.
- R: Declared Rare Flora - Extant Taxa
- X: Declared Rare Flora - Presumed Extinct Taxa
- 1: Priority One - Poorly Known Taxa
- 2: Priority Two - Poorly Known Taxa
- 3: Priority Three - Poorly Known Taxa
- 4: Priority Four - Rare Taxa
- 5: Priority Five - Proposed Declared Rare Flora

**Column 3** Taxa in family, listed alphabetically. Names follow Gibson *et al.* 1994.

**Columns 4 - 6 Plant Communities (see Map 3)**
- Clay = Deep claypan communities (*Melaleuca lateritia* Shrubland/*Amphibromus* grassland)
- Vim = *Viminaria juncea* Tall Shrubland (wet flats)
- Wet = *Pericalymma* Open Heath (shallow claypans)
- Dry = Mixed Low Shrublands
- Marri = Marri Woodlands (uplands)
- Disturb = disturbed areas, dominated by weed taxa

| Taxon | Clay | Vim | Wet | Dry | Marri | Disturb |
|---|---|---|---|---|---|---|
| | | | | | | |
| Amaranthaceae | | | | | | |
| Ptilotus declinatus | | | | | • | |
| Ptilotus drummondii | | • | | | | |
| U Ptilotus esquamatus | | | • | | | |
| Ptilotus manglesii | | | | | • | |
| Ptilotus stirlingii | | • | | | | |
| | | | | | | |
| Anthericaceae | | | | | | |
| Borya scirpoidea | | • | | | • | |
| Borya sphaerocephala | | • | | | • | |
| Caesia occidentalis | | | | | • | |
| Chamaescilla corymbosa | | • | | | • | |
| e/t Chamaescilla aff. spiralis (GJK 12501) | • | | | | | |
| Dichopogon capillipes | | | | | • | |
| Dichopogon preissii | • | | • | | | |
| Laxmannia sessiliflora ssp. australis | | • | | | • | |
| Laxmannia squarrosa | | | | | • | |
| Sowerbaea laxiflora | | • | | • | • | |
| Thysanotus arbuscula | | • | | | | |
| Thysanotus manglesianus | | • | | | • | |
| Thysanotus patersonii | | • | | | | |
| Thysanotus sparteus | | • | | | • | |
| Thysanotus tenellus | | • | | | | |
| Thysanotus thyrsoideus | | • | | | • | |
| Thysanotus triandrus | | • | | | • | |
| Tricoryne elatior | | | | | • | |
| Tricoryne humilis | | • | | | | |

| Taxon | Clay | Vim | Wet | Dry | Marri | Disturb |
|---|---|---|---|---|---|---|
| Apiaceae | | | | | | |
| e/t1Eryngium pinnatifidum ssp. "palustre" (GJK 8757) | • | | | | | |
| e/t1Eryngium subdecumbens (GJK 5390) | • | | | | | |
| Homalosciadium homalocarpum | | • | | | • | |
| Hydrocotyle callicarpa | | • | | | | |
| Hydrocotyle diantha | • | • | | | | |
| R Hydrocotyle lemnoides | • | | | | | |
| Schoenolaena juncea | • | • | | | | |
| Xanthosia huegelii | | • | | | • | |
| | | | | | | |
| Aponogetonaceae | | | | | | |
| eR Aponogeton hexatepalus | • | | | | | |
| | | | | | | |
| Asteraceae | | | | | | |
| * Arctotheca calendula | | | | | | • |
| Centipeda cunninghamii (minima) | | • | | | | |
| * Conyza albida (canadensis) | | | | | | • |
| Craspedia sp. | | | | | • | |
| * Gazania linearis | | | | | | • |
| Gnephosis tenuissima - dummondii complex | | | | • | | |
| Hyalosperma cotula | | • | | | • | |
| * Hypochaeris glabra | • | • | • | • | • | • |
| Ixiolaena viscosa | | | | | • | |
| e Myriocephalus helichrysoides | • | | | | | |
| Myriocephalus isoetes | • | | | | | |
| Myriocephalus occidentalis | • | | | | | |
| Podolepis canescens | | • | | | | |
| t Podolepis gracilis "swamp" (GJK 13126) | • | | | | | |
| Podolepis gracilis | | | | | • | |
| Pogonolepis stricta | • | | | | | |
| P Rhodanthe pyrethrum | • | | | | | |
| Senecio diaschides(GJK 6665) | | • | | | • | |
| Senecio minimus | | • | | | | |
| Siloxerus humifusus | | • | • | • | | |
| * Sonchus oleraceus | | • | • | • | • | • |
| e/t Trichocline sp. (GJK 6382) | • | | | | | |
| * Ursinia anthemoides | • | • | • | • | • | • |
| | | | | | | |
| Campanulaceae | | | | | | |
| * Wahlenbergia capensis | | | | | • | |
| Wahlenbergia gracilenta | | • | | | • | |
| | | | | | | |
| Caryophyllaceae | | | | | | |
| * Silene gallica var. gallica | | | | | • | |
| | | | | | | |
| Centrolepidaceae | | | | | | |
| Aphelia cyperoides | | • | | | • | |
| Brizula drummondii | • | | | | | |
| Brizula muelleri | | • | | | | |
| Centrolepis drummondiana | | | | • | • | |
| Centrolepis aristata | | • | • | • | • | |

| Taxon | Clay | Vim | Wet | Dry | Marri | Disturb |
|---|---|---|---|---|---|---|
| Centrolepis glabra | • | • | • | | • | |
| Centrolepis humillima | • | • | • | | | |
| Centrolepis polygyna | • | | | | | |
| | | | | | | |
| Colchicaceae | | | | | | |
| Burchardia multiflora | | • | | • | • | |
| Burchardia congesta | | | | | • | |
| t Wurmbea dioica subsp. aff. alba | • | | | | | |
| | | | | | | |
| Crassulaceae | | | | | | |
| Crassula colorata | | | | | • | |
| * Crassula natans | • | | | | | |
| | | | | | | |
| Cuscutaceae | | | | | | |
| Cuscuta australis | • | | | | | |
| | | | | | | |
| Cyperaceae | | | | | | |
| Baumea arthrophylla | • | • | | | | |
| Baumea juncea | | • | | | | |
| Chorizandra enodis | • | • | | | | |
| Cyathochaeta avenacea | | • | • | • | • | |
| * Cyperus tennellus | | • | • | • | • | • |
| Eleocharis acuta | • | | | | | |
| e/t1Eleocharis sp. Kenwick (GJK 5179) | • | | | | | |
| * Isolepis cyperoides | • | • | • | | | |
| Isolepis cernua | | | | | • | |
| * Isolepis hystrix | • | • | | | | |
| Isolepis marginata | • | | | | | |
| Isolepis oldfieldiana | | | | | | |
| Isolepis setiformis (GJK 4178) | • | | | | | • |
| Isolepis sp. (GJK 6458) | • | | | | | |
| Isolepis stellata | | • | | | | |
| Lepidosperma angustatum | | | | | • | |
| Lepidosperma leptostachyum | | | • | | • | |
| Lepidosperma longitudinale | • | • | | | | |
| Mesomelaena tetragona | | • | | • | • | |
| 4 Schoenus andrewsii | | • | | | | |
| Schoenus asperocarpus | | • | | | | |
| 3 Schoenus benthamii | | • | • | | | |
| Schoenus bifidus | | • | • | | | |
| e2 Schoenus capillifolius | • | | | | | |
| Schoenus elegans | | • | | | | |
| Schoenus grandiflorus | | | | | • | |
| Schoenus odontocarpus | • | | | | | |
| 1 Schoenus pennisetis | • | | | | | |
| Schoenus rigens | | • | • | • | | |
| Schoenus sculptus | • | | | | | |
| Schoenus tenellus | • | | • | | | |
| Schoenus sp. 2 (GJK 12803) | • | • | | | | |
| Tetraria octandra | | | | | | |

| Taxon | Clay | Vim | Wet | Dry | Marri | Disturb |
|---|---|---|---|---|---|---|
| Dasypogonaceae | | | | | | |
| Acanthocarpus canaliculatus | | • | | • | | |
| Calectasia cyanea | | | | • | | |
| Calectasia grandiflora | | • | | • | | |
| Kingia australis | | | | • | • | |
| Lomandra caespitosa | | | | | • | |
| Lomandra micrantha | | | | | • | |
| Lomandra odora | | | | • | • | |
| | | | | | | |
| Dilleniaceae | | | | | | |
| Hibbertia aurea | | | | | • | |
| Hibbertia hypericoides | | | | | • | |
| | | | | | | |
| Droseraceae | | | | | | |
| Drosera rosulata | | • | | • | | |
| Drosera erythrorhiza | | | | | • | |
| Drosera gigantea | • | • | | | | |
| Drosera glanduligera | | • | | • | • | |
| Drosera heterophylla | | • | | | | |
| e/t Drosera macrantha | | | | | • | |
| Swan Coastal Plain form (BJK & NG 228) | | | | | | |
| Drosera menziesii subsp. menziesii | • | • | | | | |
| Drosera menziesii subsp. penicillaris | | | | • | • | |
| 4 Drosera occidentalis subsp. occidentalis | | • | | | | |
| Drosera stolonifera subsp. stolonifera | | | | | • | |
| Drosera tubaestylis | | • | | | • | |
| | | | | | | |
| Epacridaceae | | | | | | |
| U Andersonia aristata | | | • | | | |
| Astroloma pallidum | | • | | | • | |
| Lysinema ciliatum | | | | • | • | |
| | | | | | | |
| Euphorbiaceae | | | | | | |
| Monotaxis grandiflora | | | | | | |
| Poranthera microphylla | | | | • | • | |
| | | | | | | |
| Gentianaceae | | | | | | • |
| * Centaurium erythraea | | | | | | |
| * Cicendia filiformis | • | • | | | | |
| | | | | | | |
| Goodeniaceae | | | | | | |
| 4 Anthotium junciforme | • | • | | | | |
| Dampiera linearis | | • | | | • | |
| Goodenia caerulea | • | • | | | • | |
| Goodenia pulchella | | • | | | | |
| Goodenia micrantha | • | • | | | | |
| Scaevola glandulifera | | | | | • | |
| Scaevola lanceolata | • | • | | | | |
| Velleia aff. trinervis (GJK 10429) | | • | | | | |
| | | | | | | |
| Haemodoraceae | | | | | | |
| Anigozanthos bicolor | | • | | | • | |

| Taxon | Clay | Vim | Wet | Dry | Marri | Disturb |
|---|---|---|---|---|---|---|
| Anigozanthos bicolor x manglesii | | | | • | | |
| Anigozanthos bicolor x viridis | | | | • | | |
| Anigozanthos manglesii | | | | | • | |
| Anigozanthos viridis | • | • | | | | |
| Conostylis aculeata subsp. aculeata | | | | | • | |
| Conostylis festucacea subsp.festucacea | | | | • | | |
| Conostylis setigera | | • | | • | • | |
| Haemodorum laxum | • | • | | | | |
| Haemodorum paniculatum | | | | | • | |
| Haemodorum simplex | • | | | | | |
| Haemodorum sparsiflorum | • | • | | | | |
| Haemodorum spicatum | | | | | • | |
| t Tribonanthes aff. uniflora (GJK 6259) | • | | | | | |
| Tribonanthes australis (GJK 6248) | | • | | • | • | |
| t Tribonanthes australis x brachypetala | | | | | | |
| Tribonanthes brachypetala (GJK 6249) | • | • | | | | |
| Tribonanthes longipetala (GJK 6262) | | • | | • | • | |
| t Tribonanthes uniflora x australis (GJK 6260) | | • | | | | |
| | | | | | | |
| Haloragaceae | | | | | | |
| Gonocarpus nodulosus | | • | | | | |
| Gonocarpus pithyoides | | | | | • | |
| Myriophyllum crispatum | • | | | | | |
| | | | | | | |
| Hydatellaceae | | | | | | |
| e2 Hydatella dioica | • | | | | | |
| Trithuria bibracteata | • | • | | | | |
| Trithuria submersa | • | | | | | |
| | | | | | | |
| Hydrocharitaceae | | | | | | |
| Ottelia ovalifolia | • | | | | | |
| | | | | | | |
| Hypoxidaceae | | | | | | |
| Hypoxis occidentalis | | • | | | | |
| | | | | | | |
| Iridaceae | | | | | | |
| * Babiana stricta | | | | | | • |
| * Chasmanthe floribunda | | | | | | • |
| * Freesia leichtlinii | | | | | | • |
| * Gladiolus caryophyllaceus | | | | | • | • |
| * Hesperantha falcata | | | | | | • |
| * Hexaglottis lewisiae | | | | | | • |
| Patersonia juncea | | • | | | | |
| Patersonia occidentalis | | • | | • | • | |
| * Romulea rosea | | • | | • | • | |
| * Sparaxis bulbifera | | • | | • | | • |
| * Watsonia bulbillifera | | • | | | | • |
| * Watsonia marginata | • | | | | | |
| | | | | | | |
| Isoetaceae | | | | | | |
| Isoetes drummondii | • | | | | | |

| Taxon | Clay | Vim | Wet | Dry | Marri | Disturb |
|---|---|---|---|---|---|---|
| Juncaceae | | | | | | |
| Juncus bufonius | | | | • | • | |
| * Juncus capitatus | | | | | | • |
| Juncus holoschoenus | | | | • | | |
| | | | | | | |
| Juncaginaceae | | | | | | |
| t Triglochin aff. calcitrapa (GJK 10430) | | | | • | | |
| Triglochin calcitrapum | | • | | | • | |
| Triglochin minutissimum | | • | | | | |
| Triglochin procerum | • | | | | | |
| 2 Triglochin stowardii | • | • | | | | |
| | | | | | | |
| Lamiaceae | | | | | | |
| * Stachys arvensis | | | | | | • |
| | | | | | | |
| Lauraceae | | | | | | |
| Cassytha glabella | | | | • | | |
| | | | | | | |
| Lentibulariaceae | | | | | | |
| Polypompholyx multifida | • | • | | • | | |
| Polypompholyx tenella | | • | | • | | |
| Utricularia menziesii | • | | | | | |
| Utricularia violacea | • | | | | | |
| | | | | | | |
| Lobeliaceae | | | | | | |
| Isotoma hypocrateriformis | | | | | • | |
| Isotoma pusilla | • | | | | | |
| Isotoma scapigera | • | | | | | |
| * Monopsis debilis | • | • | | | | |
| | | | | | | |
| Loranthaceae | | | | | | |
| Nuytsia floribunda | | | | | • | |
| | | | | | | |
| Linaceae | | | | | | |
| * Linum trigynum | | | | | | • |
| | | | | | | |
| Lycopodiaceae | | | | | | |
| Phylloglossum drummondii | • | • | • | • | | |
| | | | | | | |
| Lythraceae | | | | | | |
| * Lythrum hyssopifolia | | | • | | | • |
| | | | | | | |
| Marsileaceae | | | | | | |
| Pilularia novae-hollandiae | • | | | | | |
| | | | | | | |
| Meliaceae | | | | | | |
| * Melia azedarach | | | | | | • |
| | | | | | | |
| Menyanthaceae | | | | | | |
| Villarsia capitata | • | • | | | | |
| 4 Villarsia submersa | • | | | | | |

| Taxon | Clay | Vim | Wet | Dry | Marri | Disturb |
|---|---|---|---|---|---|---|
| Mimosaceae | | | | | | |
| Acacia lasiocarpa | | • | | | • | |
| Acacia pulchella | | • | | • | • | |
| Acacia saligna | | | | | | |
| Acacia sessilis | | | | | • | |
| | | | | | | |
| Myoporaceae | | | | | | |
| e/t Eremophoia glabra subsp. Brixton (GJK 6246) | | | • | | | |
| | | | | | | |
| Myrtaceae | | | | | | |
| e/t Astartea aff. fascicularis | | • | • | • | | |
| Baeckea camphorosmae | | • | | | • | |
| Calytrix aurea | | • | • | • | | |
| Eucalyptus calophylla | | | | | • | |
| Hypocalymma angustifolium | | • | • | • | | |
| Hypocalymma robustum | | | | | • | |
| Kunzea aff. recurva (GJK 6830) | • | • | | | | |
| Kunzea micrantha | | | • | | | |
| Melaleuca lateritia | • | | | | | |
| Melaleuca rhaphiophylla | | • | | | | |
| Melaleuca viminea | • | • | | | | |
| Pericalymma ellipticum | | • | | | | |
| Verticordia acerosa | | • | • | | | |
| Verticordia densiflora | | • | • | | | |
| Verticordia huegelii var. huegelii | | • | • | | | |
| e4 Verticordia lindleyi var. lindleyi | | | • | • | | |
| Verticordia pennigera | | • | • | • | | |
| | | | | | | |
| Onagraceae | | | | | | |
| * Oenothera mollissima | | | | | | • |
| | | | | | | |
| Ophioglossaceae | | | | | | |
| Ophioglossum lusitanicum subsp. coriaceum | | | • | | | |
| | | | | | | |
| Orchidaceae | | | | | | |
| Caladenia deformis | | • | | | | |
| Caladenia ferruginea | | • | | | • | |
| Caladenia flava | | | | • | | |
| Caladenia paludosa | | • | | | • | |
| Caladenia longicauda | | • | | | • | |
| Caladenia pectinata | | • | | | • | |
| Diuris emarginata | • | • | | | | |
| t Diurus longifolia (early flowering race) | | • | | | • | |
| Eriochilus dilatatus | | • | | | • | |
| Eriochilus scaber | | | | | • | |
| Leporella fimbriata | | | | | • | |
| Lyperanthus serratus | | | | | • | |
| Microtis unifolia | | • | | | | |
| Prasophyllum drummondii | • | • | | | | |
| Pterostylis sanguinea | | | | | • | |
| Thelymitra antennifera | | • | | | | |

| Taxon | Clay | Vim | Wet | Dry | Marri | Disturb |
|---|---|---|---|---|---|---|
| Thelymitra crinita | | • | | | | |
| Thelymitra flexuosa | | • | | | | |
| Thelymitra villosa | | • | | | | |
| | | | | | | |
| Oxalidaceae | | | | | | • |
| * Oxalis glabra | | | | | | • |
| * Oxalis pes-caprae | | | | | | • |
| * Oxalis polyphylla | | | | | | • |
| * Oxalis purpurea | | | | | | |
| | | | | | | |
| Papilionaceae (Fabaceae) | | | | | • | |
| Daviesia decurens | | | | | • | |
| Daviesia physodes | | | | | • | |
| t Dillwynia aff. cinerascens | | • | | | | |
| Eutaxia virgata | • | • | • | | | |
| Gompholobium aristatum | | | | | • | |
| Gompholobium marginatum | | • | | | • | |
| Kennedia prostrata | | | | | • | |
| * Lupinus consentinii | | | | | | • |
| Nemcia capitata | | • | | | • | |
| * Ornithopus compressus | • | | | | | • |
| * Robinia pseudoacacia | | | | | | • |
| Sphaerolobium linophyllum | | • | | | | |
| * Trifolium angustifolium | | | | | | • |
| * Trifolium arvense | | | | | | • |
| * Trifolium cernuum | | | | | | • |
| * Trifolium dubium | | | | | • | • |
| * Vicia sativa subsp. nigra | | | | | • | • |
| Viminaria juncea | | • | | • | • | |
| | | | | | | |
| Philydraceae | | | | | | |
| Philydrella drummondii | • | • | | • | | |
| Philydrella pygmaea | • | • | | • | | |
| | | | | | | |
| Phormiaceae | | | | | | |
| U Agrostocrinum scabrum (glabrous form) | | • | • | | | |
| Dianella revoluta var. divaricata | | | | | • | |
| | | | | | | |
| Poaceae | | | | | | |
| Agrostis avenacea | • | • | | | • | |
| Agrostis plebia | • | | | | | |
| * Aira caryophyllea | | • | | | • | |
| Amphibromus neesii | • | | | | | |
| Amphipogon debilis var. fallax | | | | | • | |
| Amphipogon laguroides | | • | | | • | |
| Amphipogon turbinatus | | | | | • | |
| * Arundo donax | | | | | | • |
| * Avena fatua | | | | | | • |
| * Briza maxima | | • | • | • | • | • |
| * Briza minor | | • | • | • | • | • |
| * Cynodon dactylon | • | | | | | |
| Danthonia caespitosa (GJK 9666) | • | | | | | |

| Taxon | Clay | Vim | Wet | Dry | Marri | Disturb |
|---|---|---|---|---|---|---|
| * Ehrharta calycina | | | | | • | • |
| * Ehrharta longiflora | | • | | | • | • |
| * Eragrostis curvula | | | | | | |
| Eragrostis elongata | | • | • | | | |
| * Lagurus ovatus | | | | | | • |
| * Lolium temulentum | • | | | | | |
| Microlaena stipoides | | | | | • | |
| Neurachne alopecuroidea | | • | | | • | |
| * Paspalum dilatatum | • | | | | | • |
| * Phalaris minor | | | | | | • |
| * Pennisetum clandestinum | | | | | | • |
| Polypogon tenellus | • | | | | | |
| * Rynchelytrum clandestinum | | | | | | • |
| Stipa compressa | | | | | • | |
| Stipa semibarbata | | | | | • | |
| Stipa trichophylla | | | | | • | |
| * Stenotraphrum repens | | | | | | • |
| * Tribolium uniolae | | | | | | • |
| * Vulpia myuros | • | • | | | | |
| | | | | | | |
| Polygalaceae | | | | | | |
| Comesperma calymega | | | | • | | |
| Comesperma volubile | | • | | | | |
| | | | | | | |
| Portulacaceae | | | | | | |
| Calandrinia composita | • | • | | | | |
| e/t1Calandrinia sp. Kenwick (GJK 10905) | • | | | | | |
| | | | | | | |
| Primulaceae | | | | | | |
| * Anagallis arvensis | | | | | • | • |
| * Anagallis minor | • | | | | | |
| | | | | | | |
| Proteaceae | | | | | | |
| U Conospermum huegelii | | • | | | | |
| Dryandra nivea | | • | | | • | |
| Grevillea bipinnatifida | | • | | | • | |
| Hakea candolleana | | • | | | | |
| Hakea erinacea | | • | | | | |
| Hakea incrassata | | • | | | • | |
| Hakea lissocarpha | | • | | | • | |
| Hakea prostrata | | | | | • | |
| Hakea sp. ? auriculata (GJK 8014) | | • | | | | |
| Hakea sulcata | | • | | • | | |
| Hakea trifurcata | | | | | • | |
| Hakea undulata | | | | | • | |
| Hakea varia | | | • | | | |
| Isopogon asper | | | | • | | |
| Isopogon dubius | | • | | | | |
| t Petrophile media var. juncifolius ms | | • | | | • | |
| Petrophile seminuda | | • | | | | |
| Stirlingia simplex | | • | | | | |
| 3 Synaphea acutiloba | | • | | | | |

| Taxon | Clay | Vim | Wet | Dry | Marri | Disturb |
|---|---|---|---|---|---|---|
| Synaphea petiolaris | | • | | | • | |
| | | | | | | |
| Restionaceae | | | | | | |
| Anarthria laevis | | • | | | | |
| Leptocarpus canus | • | • | | | | |
| Leptocarpus coangustatus | | • | | | | |
| Lepyrodia glauca | • | | | | | |
| Loxocarya fasciculata | | • | | | • | |
| Hypolaena exsulca | | | | | • | |
| | | | | | | |
| Rubiaceae | | | | | | |
| Opercularia vaginata | | • | | | • | |
| | | | | | | |
| Rutaceae | | | | | | |
| U Boronia cymosa | | | | | • | |
| Eriostemon spicatus | | • | | | • | |
| | | | | | | |
| Scrophulariaceae | | | | | | |
| Glossostigma drummondii | • | | | | | |
| Gratiola peruviana | • | | | | | |
| * Parentucellia viscosa | • | • | | | | |
| | | | | | | |
| Selaginellaceae | | | | | | |
| Selaginella gracillima | | • | • | | | |
| | | | | | | |
| Solanaceae | | | | | | |
| * Solanum nigrum | | | | | • | |
| | | | | | | |
| Stackhousiaceae | | | | | | |
| Stackhousia pubescens | | | | | • | |
| Tripterococcus brunonis | | • | | • | • | |
| | | | | | | |
| Stylidiaceae | | | | | | |
| Levenhookia pusilla | | • | | | | |
| Stylidium brunonianum | | • | | | • | |
| Stylidium bulbiferum | | • | | • | | |
| Stylidium calcaratum | | | | | • | |
| Stylidium calcaratum (rose form) | • | • | | | | |
| Stylidium canaliculatum | | • | | | | |
| Stylidium carnosum | | | | | • | |
| Stylidium dichotomum | | | | • | • | |
| Stylidium divaricatum | | • | | | | |
| Stylidium ecorne | • | | | | | |
| Stylidium inundatum | • | | | | | |
| e1 Stylidium mimeticum | • | | | | | |
| Stylidium perpusillum | • | | | | | |
| Stylidium periscelianthum | • | | | | | |
| Stylidium petiolare | • | • | | | | |
| Stylidium pulchellum | • | • | | | | |
| Stylidium repens | | | | | • | |
| Stylidium roseo-alatum | • | • | | | | |
| Stylidium utricularioides | • | • | | | | |

| Taxon | Clay | Vim | Wet | Dry | Marri | Disturb |
|---|---|---|---|---|---|---|
| Thymelaeaceae | | | | | | |
| e Pimelea imbricata var. major | • | | | | | |
| | | | | | | |
| Xanthorrhoeaceae | | | | | | |
| Xanthorrhoea ?brunonis | | • | | • | | |
| Xanthorrhoea preissii | | | | | • | |
| | | | | | | |
| Zannichelliaceae | | | | | | |
| Lepilaena australis | • | | | | | |

# *Fauna*

Terrestrial Fauna - John Dell, Western Australian Museum presented by Greg Keighery

## Background

There appears that there is little fauna survey information on the terrestrial fauna of the Brixton Street Wetlands. Records of the collections of the Museum and survey information for the Perth Airport and Yule Brook Reserve can be used to predict the animals expected to be found at the Brixton Street Wetlands. However it should be kept in mind that both of these areas differ significantly from the Brixton Street Wetlands. Perth Airport and Yule Brook Reserve contain proportionally large areas of *Banksia* woodland associated with sand ridges and mixed shrublands (with similar composition to the understorey of the *Banksia* woodlands) on sandy flats. There are no sandy ridges or flats in the Brixton Street Wetlands. the most well drained areas are the comparatively slight rises where Marri woodland is present (see Flora). Also the Brixton Street Wetlands retain water for longer periods than the seasonally inundated areas in the Perth Airport and Yule Brook Reserve.

## Terrestrial Fauna

Records suggest that there will be a total of 66 terrestrial vertebrates in the vegetation associated with the wetlands.

## Native Mammals

The Quenda (*Isoodon obesulus*) is recorded from the Wetlands. The Quenda is:

- relatively abundant, nocturnal
- requires dense vegetation for shelter and nest material
- daytime shelter nests are built under dense shrubbery
- move seasonally, occupy low seasonally inundated areas in summer and move to higher ground in winter when these areas are inundated
- can move considerable distances from nest sites (in Lesmurdie, males can move >800 m. per night, females >295 m. per night)
- is an endangered species because of habitat reduction

No other native mammals, apart from bats, are likely to be present in the Reserve.

**Birds**

41 species are known from the Reserve. These are listed in the Bird Table. Features of the species expected to be found at the site are:

- most are non-resident and would occupy the area seasonally

- majority of the species are:

  (a) insectivorous and would feed in the air above the vegetation (birds of prey, swallow, martins)

  (b) insectivorous/nectivorous and feed from the vegetation

  (c) waterbirds

In addition, a number of other waterbirds and wading birds are likely to use the Reserve seasonally for feeding. Other species of migratory birds (such as cuckoos), birds of prey (such as songlarks) and species present on other parts of the coastal plain (such as honeyeaters) are likely to periodically visit the Reserve.

**Frogs** (5 species)

All of the frogs that are know to occur are winter/spring breeders that occupy temporary water. The Moaning Frog and Banjo Frog would be expected to aestivate in the Marri Woodland in summer.

*Ranidella insignifera*, a common tiny frog that breeds in winter ponds is common in the Reserve.

Crawling Frog (*Pseudophryne guentheri*) lays eggs on the damp margins of the water and lives under fallen vegetation when not active.

Banjo Frog *(Limnodynastes dorsalis*) lays its eggs in a floating mass attached to vegetation. This frog can move long distances from water.

Moaning Frog (*Heleioporus eyrei*) breeds in burrows in damp sand around the margins of the wetland and occupies dry land when feeding.

Quacking Frogs (*Crinia georgiana*). This frog is relatively common in the eastern part of Yule Brook Reserve but is uncommon in Brixton Street Wetlands. It breeds in the shallow margins of the wetland.

**Gecko** (1 species)

Spiny-tailed Gecko (*Diplodactylus spinigerus*) is known from Yule Brook reserve. It is an arboreal gecko that is easily destroyed by fire.

**Legless Lizards** (5 species)

A high diversity. This group is characteristically well represented in lowland sites. *Pletholax gracilis, Aprasia pulchella, A. repens, Lialis burtonis* and *Delma grayii* are all known from Yule Brook. It is likely that fires have impacted severely on these species.

**Dragons** (2 species)

*Tympanocryptis adelaidensis* and *Pogona minor* (Western Bearded Dragon) are both known from Yule Brook and would have been present in Brixton Street Wetlands before the fires.

**Skink Lizards**

Eight species are known from Yule Brook and probably also occur in Brixton Street Wetlands. The species are: Striped Skinks *Ctenotus fallens, C. lesueurii,* Fence Skink *Cryptoblepharus plagiocephalus*, Swamp Skink *Bassiana trilineata, Lerista elegans, Menetia greyii, Morethia obscura* and the Bobtail *Tiliqua rugosa.*

**Goannas** (2 species).

Rosenberg's Goanna (*Varanus rosenbergi*) and Gould's Goanna (*V. gouldii*) are both present.

**Snake** (1 species)

The Dugite (*Pseudonaja affinis*) is the only snake recorded in Brixton Street Wetlands.

**Conclusion**

Brixton Street Wetlands have a diverse vertebrate fauna that depends on different aspects of the vegetation and surface water to provide essential resources for shelter, food and breeding. Many of the species (especially birds) are present seasonally.

Fire is the greatest threat to the survival of many fauna species at Brixton Street. The severe recent fires have had a severe impact and many species will have to recolonize from the adjacent Yule Brook Reserve.

## FAUNA

**TABLE 1 Bird species know or likely to occur on Brixton Street Wetland**

| | |
|---|---|
| Little Eagle | *Aquila morphnoides* |
| Australian Kestrel | *Falco cenchroides* |
| Spotted Dove | *Streptopelia chinensis* |
| Laughing Dove | *Streptopelia senegalensis* |
| Ring-necked Parrot | *Platycercus zonarius* |
| Pallid Cuckoo | *Cuculus pallidus* |
| Rainbow Bee-eater | *Merops ornatus* |
| Sacred Kingfisher | *Halcyon sancta* |
| White-faced Heron | *Ardea novaehollandiae* |
| Little Pied Cormorant | *Phalacrocorax melanoleucos* |
| Black Duck | *Anas superciliosa* |
| Coot | *Fulica atra* |
| Wood Duck | *Chenonetta jubata* |
| Grey Teal | *Anas gibberifrons* |
| White Ibis | *Threskiornis aethiopicus* |
| Great Egret | *Egretta alba* |
| White-backed Swallow | *Cheramoeca leucosterna* |
| Welcome Swallow | *Hirundo neoxena* |
| Tree Martin | *Hirundo nigricans* |
| Richard's Pipit | *Anthus novaeseelandiae* |
| Black-faced Cuckoo-shrike | *Coracina novaehollandiae* |
| Rufous Whistler | *Pachycephala rufiventris* |
| Grey Fantail | *Rhipidura fuliginosa* |
| Willie Wagtail | *Rhipidura leucophrys* |
| Western Flyeater | *Gerygone fusca* |
| Splendid Fairy-wren | *Malurus splendens* |
| Mistletoebird | *Dicaeum hirundinaceum* |
| Striated Pardalote | *Pardalotus striatus* |
| Grey-breasted White-eye | *Zosterops lateralis* |
| Brown Honeyeater | *Lichmera indistincta* |
| Singing Honeyeater | *Meliphaga virescens* |
| White-cheeked Honeyeater | *Phylidonyris nigra* |
| Tawny-crowned Honeyeater | *Phylidonyris melanops* |
| Western Spinebill | *Acanthorhynchus superciliosus* |
| Red Wattlebird | *Anthochaera carunculata* |
| White-fronted Chat | *Epthianura albifrons* |
| Mudlark | *Grallina cyanoleuca* |
| Black-faced Woodswallow | *Artamus cinereus* |
| Grey Butcherbird | *Cracticus torquatus* |
| Magpie | *Cracticus tibicen* |
| Australian Raven | *Corvus coronoides* |

# *Education*

James Mumme

I believe that the Brixton Street Wetlands have some special features to offer to schools that are interested in involving their students in learning about the environment, in the environment and in acting for the environment.

If the community - residents, parents and interested professionals - can interest nearby schools in involving their students in study and action for the Wetlands, there will be great benefits for the environment , schools, the children and the community.

The challenge is how to interest and support teachers and schools in their first involvement in what to them can be scary adventures outside their comfortable patches. Once they do become involved, then I believe, given stability in staffing and support, teachers will build on their positive experiences year after year.

I think it is worth listing the benefits of involvement in the Wetlands as they can be used to persuade teachers and schools to take the next step.

## *Benefits*

### For Schools and Students

Many schools have placed in their mission statements or in their annual priorities things like '**Caring and the fulfillment of all individual's potential**'. Taking students outside the classroom multiplies the opportunities for achieving such goals **while** learning science and helping the environment.

The tone of the education as experienced by the students can also be changed. Students themselves appreciate changes to their routine and the variety of excursions. It can be more **fun**.

Such excursions also bring the **real world** into education in two senses. First it's a world of real things to be appreciated and understood as they are, not as described or pictured through the pen or camera of others (usually adults), but out there in their rawness, wetness, complexity, fragility and beauty. Second it's also a world of reality in that the artificiality of school activities where everything is an exercise and children are shielded from the world of real consequences is removed. If the seedlings are not planted properly, money and time will be wasted. The students are also able to meet people who live and work in the real world and are different to their teachers.

For students (and their teachers) there is the great **satisfaction of achieving** something of obvious worth: students like the sense of overcoming problems and of having a tangible effect in an area like the environment which most of them today think is important. I'd go so far as to say their are no other similar challenges facing us humans today, and so the sense of satisfaction for many students can be great.

For the schools there is the satisfaction of achieving a **public profile** - something that is becoming more important in these days of devolution - and of being seen to care about and be involved in their local communities. This is especially true for state schools which draw their students locally. Signage at the site, notes home and articles in the media all help principals and teachers to feel that their school is unique and worth putting effort into.

### Benefits to the Community

I believe there are many benefits to communities of involving children in environmental action: these include wider involvement of families, relatives and friends; possibilities for community activities with the focus on improving the local environment; the satisfaction of achieving something of local value; and feelings of pride and belonging.

**Benefits to the Environment**
Some of the immediate benefits are the possibility of more hands making **lighter work** of cleanups, weed control, tree planting and follow up, surveys of populations of flora and fauna, recording changes and the effects of changes, for example fires.

Longer term benefits include **greater community awareness** created through students undertaking community surveys and education through newsletters home, through preparation of displays for use locally, and through publicity for articles in the media. As well there would be gradually over the years a developing **sense of ownership and identification** as more and more students and families become involved in actions that had a visible effect on the Wetland.

Brixton Street in particular offers opportunities to see rare plants and animals and to teach lessons of the **value of biodiversity** and of the uniqueness of locally indigenous species and how they adapt to the local habitat. There are also evidences of the harmful impact of human activity on the environmental values of the Wetland.

Finally in practical terms for teachers, the Wetlands are eminently suitable: they are easily accessible, safe for even quite young students and compact in that the features are all contained within a ten minute walk of the entry.

### *What Sort of Projects are Possible*

Initial requirements are the willingness of teachers to undertake the project. It's important and fair to recognise that most projects require more time than just doing something traditional in class; that they require more expertise than most teachers feel they have; that few teachers are comfortable appearing ignorant before their students; that teachers are legally bound to be concerned about the safety of their students on excursions that involve bus travel and bush walks; that teachers are concerned about meeting requirements of syllabuses. As well in the current industrial situation , many teachers will be unwilling to undertake a project at all.

Therefore besides the usual environmental criteria, the sort of project that will attract teachers will be one that:
1. offers teachers background information and support in areas where s/he has no expertise, for example, botany.
2. makes it possible for the teacher to take students to the site with adequate supervision from adults.
3. offers activities that are suitable to groups of 2 or 8 for the whole class and that are on an appropriate level of difficulty - the teacher will be the best judge of this.
4. contains a variety of activities that students of different interests can warm to.
5. relates to syllabus statements. The National Curriculum's Student Outcome Statements, when implemented, should make it easier for teachers to undertake projects.
6. has something concrete and attractive to children, for example a warm and cuddly, or something intriguing.
7. can be completed in a term or else has several stages that can be undertaken separately from each other: it's important to prevent burn out.

### *Some Project Ideas Based on the Brixton Street Wetlands*

Each of the following projects could be developed into a project that could involve either a small group of students or a whole class. The whole set could conceivably involve a whole school which over several years could build a thorough picture of the Wetland, by making it the focus of science, social studies and English work where appropriate.

**Quenda** Using night video/stills to supplement daytime visits students can explore such questions as
how many Quenda, what ages/sizes

how many diggings, where are they
what vegetation is nearby, how do the Quenda use it
where are there no Quenda, why
is the population changing from year to year, why?

**Frogs** 'Frogwatch' is ready made for this: study can be done at particular times throughout the year with focus on eggs,
tadpoles, mature frogs, at present there are hardly any tadpoles or frogs, why what **reptiles** are there for example lizards?

**Ants** Students can study quadrats or one particular ant nest.

**Impact of Fire** Students can study quadrats or transects over time to discover what grows and how fast larger issues of the impact of fire on fauna, fire prevention, controlled burning.

**Rare Plants** Without being told of their rarity, students could do periodic studies of particular plants with drawings, photographs, measurements and descriptions of the plants and surroundings and insect life.
They could supplement this study by reading about such plants as Kingia, orchids, sedges.

**Birds** Students could choose local species, read about them and spend some time in the Wetland observing (RAOU has excellent materials).

**Issues** Such issues as fire, rubbish dumping, weeds, domestic cats and dogs, general awareness of the Wetland, can be dealt with through study in the Wetlands and through community surveys by letterbox dropping a form or by doorknocking and through displays of students' work.

**Communities** Students can examine some of the interactions between plants and animals, eg spiders and shrubs (including dead shrubs), birds and trees (the old dead trunks), birds and insects and ponds.

**Comparisons** Each of the above studies could also be based on more than one part of the Wetland, burnt and unburnt, low lying and higher, different soils.

### *Approaching Schools*

**Find out**

if they have an environment co-ordinator or an enthusiast,
if they have an environment policy,
what the school; priorities are,
whether they are implementing Student Outcome Statements.

# *Friends of Brixton Street*

**Regina Drummond**

## Why Brixton Street Wetlands are important to me

"A feeling of calm and being in a place away from the hustle and bustle..... natural sounds of frogs and birds."

Each time I go to the wetlands I experience the excitement of - **"This is here to stay!"**

In years to come the area will be even more valuable, there will be nothing but concrete all around **and the** Brixton Street Reserve.

Gosnells Council had a saying on their leaflets one year, when they went trough a 'Green period' which was excellent - "Think GLOBALLY act LOCALLY." Well, I can't save the rainforests but I can try to do my bit locally.

## Some memorable dates

January 1989 Already involved in Brixton Street through Joan Payne and the Waterbird Conservation Group.

June 1990 Waterbird Conservation Group took it upon themselves to notify Homeswest that they were going to look after Brixton Street, seeing they weren't by removing rubbish etc.

June/July 1991 Fenced a large section of Brixton Street.

September 1991 Probably 17th, found out Brixton Street would not be for housing.

18th August 1993 Inaugural meeting of the Friends of Brixton Street Wetlands

October 1993 Proposed closure of Brixton Street

December 1993 Launch of Yule Brook Nature Reserve proposal (prepared jointly by the Conservation Council and Friends of Brixton Street) by Vince Seventy

## The Friends Group

Brixton Street needed a friends group, separate from the Waterbird Conservation Group to concentrate on Brixton Street. Our first meeting was on 18th August 1993. Bob Dixon came and talked on establishing a Friends Group and provided excellent background and motivation to those present to then discuss the various aspects in detail. Such as:

- AREA of concern - boundaries, all agreed to concentrate on the larger area from Welshpool Road (Tomah Swamp) in the north, Brook Road to the west, Albany Hwy and the railway to the south and Wannaping Road/Boundary road to the east.
- Objectives

Overall-Establishing the the larger area (now referred to as the Yule Brook Nature Reserve) as a nature reserve to be managed by CALM.

Specific Objectives

1. Secure vesting of Lot 37 & 47 in the National Parks and Nature Conservation Authority to be managed by CALM.
2. Closure of Brixton Street between Alton Street and the railway and linking the two proposed reserves.

and some others as well.

The committee decided to meet regularly and to develop objectives and a clear focus for the group.

The Friends Fund was kicked off with the proceeds from the sale of a watercolour painting of Brixton Street kindly donated by wildlife artist Bryony Fremlin.

SO.....the group has been managing the area known as Brixton Street (bounded by Alton Street, Brixton Street and the railway) on a voluntary basis for many years. This involves organising on a regular basis - wildflower walks in spring, rubbish cleanups and weed removal. We also publicise the values of the Wetlands and the Friend's activities through displays in shopping centres, libraries and schools.

.....the group is a member of the Urban Bushland Council.

## 1995 and the Future

This year has turned out to be wonderful after a terrible start. In January there was a very bad fire which burnt out a goo third of Brixton Street.

THEN ....in April CALM put up a fence, cleared the rubbish and car bodies and put in place 3 new signs.

....on 22nd July the Friends held a workday with the Australian Conservation Volunteers Trust (organised with ECOPLAN)

....Today, 5th August.our workshop, Water and Wildlife held in conjunction with the Perth Branch of the Wildflower Society of WA

The Friends see their future role to ensure the long term preservation of the

- Southern Brown Bandicoot (Quenda) which is currently found in the area.
- claypans, flora and bird habitat.

That is to keep the area as natural as possible and still use it to find calm and peace.

## Conclusion

As Joan Payne said one day ".....the bandicoots, birds and plants will never know the war that has been waged here so that this could remain just as it is."

# Dieback Disease and Access

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## Introduction to Dieback Disease

Dieback disease, caused by *Phytophthora cinnamomi*, has destroyed thousands of hectares of shrubland, woodland and jarrah forest throughout south-western Australia. The disease is an exceptional example of an introduced pathogen with a wide host range causing great damage to a diverse but mainly susceptible set of plant communities. Surprisingly, it was not until the mid-1960's that the cause of dieback disease was confirmed by Frank Podger.

### Life Cycle

*Phytophthora* is a soil-borne fungus. It is pathogenic, requiring plant tissue as a food source. The life cycle of *P. cinnamomi* depends on moist conditions which favour survival, sporulation and dispersal. When conditions are warm and moist (generally in Autumn and Spring), large numbers of microscopic spore sacks are produced vegetatively in the soil or host tissue. Under wet soil conditions the sacks release mobile zoospores. Once released, the mobile zoospores swim over short distances through the moist soil or flowing water to infect host roots.

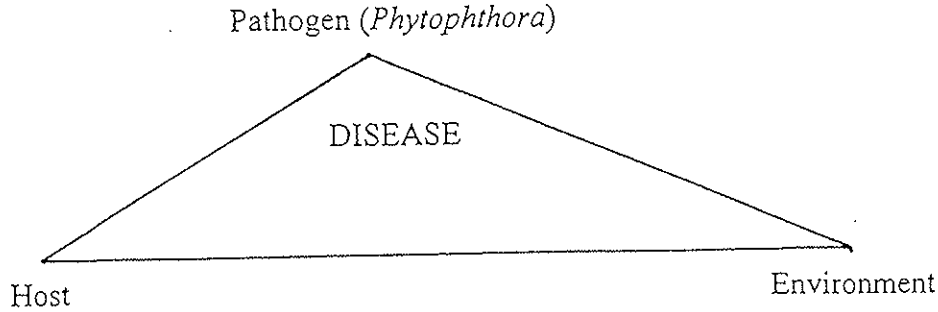
The fungus appears to infect the host through its fine roots, which are killed by it. Depending on the host species and environmental conditions, the fungus spreads through the larger roots. The host plant is killed when the main stem is girdled just above or below ground level.

### Susceptible Species

In 1980 at least 500 species had been recorded as hosts of *Phytophthora* in Australia. Jarrah is the only eucalypt species of the jarrah forest killed by *P. cinnamomi*. Many species of the families Proteaceae, Epacridaceae, Dilleniaceae, Xanthorrhoeceae and Papillionaceae that make up a large component of the understorey and shrub layer are commonly killed. Some understorey species, mainly grasses and sedges, are resistant. These and a other resistant species such as marri recolonise old dieback sites.

### Impact of the Disease

The impact of a disease is determined by a complex interaction between the pathogen (*Phytophthora*), the host and the environmental conditions. Obviously the pathogen is required to be present in large enough quantities on the site to infect the host species. The susceptibility of the host species and their numbers will be important. The environmental conditions will also have a major bearing on the disease impact on a site. For example, a wet swampy area full of Banksias will be highly impacted, while a free-draining hill top with wattles may have a low impact. Use the following triangle for determining disease impact and risk.



## DISEASE MANAGEMENT

Disease management is judged by the extent the management either prevents, delays or reduces the rate of disease development. It aims to protect the reserves conservation values. A well conceived disease management program integrates the use of all suitable methods. It must be based on knowledge of the pathogen and factors which impact on disease expression.

**1. What impact to the vegetation will occur once the fungus is introduced?**

After the fungus is introduced, many environmental factors and the number-distribution of susceptible species effect disease impact. The Brixton Street site, like most of the Swan Coastal Plain, is a potential high impact site (meaning that most of susceptible understorey and overstorey species will die). Therefore our major aim is to prevent the fungus from being introduced into the reserve or being spread further once introduced.

**2. Is dieback disease already present in the reserve? If so where?**

To determine the extent of the dieback disease on the reserve we must map its distribution. One way to locate the fungus is by sampling soil or dead plant tissue and "growing" the fungus in the laboratory. The other way is to map the distribution of dead indicator species in an area. We can only do this 3-5 years after a fire or other major disturbance. We know that the disease occurs on most reserves on the coastal plain, including the UWA reserve on Brickley Road.

To date CALM has not attempted to locate or map *Phytophthora* at Brixton Street. We will do this after the vegetation has recovered from the recent fire, in about 1997. Until then the area should be managed as though there is no dieback disease present.

**3. How could dieback disease be introduced or spread on the reserve?**

- Roads and tracks have introduce and spread dieback disease throughout Western Australia. The introduction of gravel or sand for roading from outside the reserve is a major source of infection. Once introduced the disease can be spread along the length of tracks through grading or plough, aswell as on vehicles using them.

- Muddy vehicles or machines can introduce the disease.

**4 3. Can the introduction or spread of dieback disease through the reserve be prevented?**

There are a number of dieback hygiene procedures which can be adopted at Brixton Street which are aimed at minimising the spread of infected soil. These are aimed at excluding vehicles and other activities which could move quantities of infected soils. They include:

- Control access by vehicles, horses, motorbikes and even walkers. The number of tracks should be kept to a minimum.

- Road construction and maintenance should not introduce new roading materials or should ensure that they dieback free. Track maintenance and construction should aim to have a firm surface where mud and pools of water are not formed.

- Wash down all vehicles and machines before they enter the reserve, so the soil clinging to them is removed.

- Stop access during wet periods when conditions are favourable for the spread and survival of the fungus. Confine activities to periods of least risk, when the soil is dry. Restrict vehicles and maintenance work to the summer months.

**5. Once the disease is established can we protect susceptible plants?**
Manipulation of understorey composition, stimulation of antagonistic microflora, modification of drainage and use of chemicals are some ways the development of *P. cinnamomi* can be reduced. However, these methods to manipulate the environment are still being developed and tested and are not yet widely applied.

## RECOMMENDATIONS (Management Guidelines)

1. Following fencing and recovery after fire, the Brixton Street Reserve system be assessed and mapped for dieback disease (in about 1997).

2. The current track network will be periodically reviewed. All unnecessary tracks will be closed, rehabilitated back to the natural profile and revegetated. Constructed no new tracks.

3. Grading and maintenance of tracks will take place under dry soil conditions. Tracks will be flat-graded to avoid earth heaps restricting water drainage from the track surface.

4. There will be no access by private vehicles, motorbikes or horses on to the reserve.

5. Allow management vehicle access only under dry soil conditions and severe restrictions.
- Vehicles being used for essential management actions will only be allowed on to the reserve under dry soil conditions.
- All vehicles will be clean of soil or mud before entering the reserve.
- Management vehicles are not to go off formed tracks at any time.
- Machines will not be used during fire suppression activities on the reserve without permission from CALM's Swan Regional duty officer.
- Drainage works by WAWA to be carried out in Summer under dry soil conditions.

6. Walk tracks are to be established only after a full dieback disease assessment has been made and appropriate hygiene measures established. Alternatives to earth walk tracks should be assessed.

7. Only after consultation with CALM and assessment of alternatives will clean, dieback-free soil material will be allowed on the reserve. This includes sand or gravel for tracks aswell as smaller quantities of soil associated with nursery grown plants.

8. The spraying of areas of vegetation with phosphorus acid may be used if required.

9. The local community, volunteers and Government staff require further education on dieback disease, including *Phytophthora* biology, disease expression, impact and management.

# Weeds

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## Introduction

Weed control in small conservation areas needs to be carefully targeted to achieve the maximum benefit from the resources available. These management guidlines divide weed control in the reserve into areas and species requiring immediate attention.

## Areas Requiring Attention

The vegetation map of the reserve shown here illustrates clearly the disturbed margins of the reserve dominated by bare ground and/or weeds. This area and the edges of the gravel road entering the reserve from the south requires immediate attention. The actions required are:

Control serious weeds to prevent them from spreading

Kill weeds on bulldozer spoil along Brixton Street, flatten dumps in summer onto firebreaks to prevent re-invasion

Control weeds on drain spoil dumps on Altona Road

Plant local trees and shrubs along Altona street verge and near train station to enhance rehabilitation.

## The Weeds

The weeds of Brixton Street comprise 64 species, all of which are from overseas. These can be divided into those requiring immediate and extensive control measures (serious weeds, table 1) and those weeds that could be targeted over time on "weeding" days to keep them in check (Table 2). Each table lists the areas that the weeds currently and potentially affect within the reserve..

There are 18 serious weeds (Table 1) currently recorded from the Brixton Street Wetlands that require immediate attention. These comprise 10 bulbous species, 1 annual grass and 7 perennial grasses. The bulbs and perennial grasses will compete with and potentially replace the rich native bulbous flora of the wetland. Several of the perennial grasses (Kikuyu and Buffalo Grass)will smother the native annual and perennial herbs as well. All grasses, including the annual Wild Oats increase the fire hazard. Fortunately most of these serious weeds are currently limited to the highly disturbed margins of the wetland and along several of the major tracks where chemical control should be safe, of low impact on the natives, and effective. There are also clearly documented methods of chemical control available for all these weeds. This information is available from Kings Park, Greening Western Australia, Dept. of Agriculture and APACE, and can be readily accessed from these sources

The 39 other weeds (Table 2) are mainly annual or perennial herbs that are ameneable to spot spraying and hand weeding to control them. Those species shown in bold should be removed as a priority on weeding days.

## Management

The most urgent need is to manage the disturbed areas so that these do not function as foci for weed invasion. Immediate action is required in the following areas:

1. Control serious weeds on disturbed areas (see Weed Table 1)

2. Remove soil dumps from fire breaks, flatten onto breaks, kill weeds.

3. Spray weeds on soil mounds removed from drains and tracks.

4. Plant Marri trees along Altona Street verges. Seed fast growing Acacia shrubs in area near train station.

## Weeds

### Table One Serious Weeds of Brixton Street

| Taxon | Area Affected | Potential Areas Affected |
|---|---|---|
| **Corms and Bulbs** | | |
| Babiana stricta (Baboon Flower) | Disturbed areas | All |
| Freesia hybrid | Disturbed areas | Marri |
| Hesperantha falcata | Vimminaria, Disturbed | All |
| Romulea rosea (Guildford Grass) | Widespread | All |
| Sparaxis bulbifera (Harlequin Flower) | Disturbed | All |
| Watsonia meriana (Watsonia) | Viminaria, Disturbed | Marri, Vim |
| Watsonia marginata (Watsonia) | Viminaria, Marri, Disturbed | ?All |
| Oxalis glabra (Fingerleaf Oxalis) | Disturbed areas | ?Marri |
| Oxalis pes-caprae (Soursob) | Disturbed areas | All |
| Oxalis purpurea | Disturbed areas | Marri, Vim |
| **Annuals** | | |
| Avena barbata (Wild Oats) | Disturbed areas | Marri, Vim |
| **Perennial Grasses** | | |
| Cynodon dactylon (Couch) | Disturbed areas | ?All |
| Ehrharta calycina (Perennial Veld Grass) | Disturbed areas | Marri |
| Eragrostis curvula (Love Grass) | Disturbed areas | Marri, Vim |
| Pennisetum clandestinum (Kikuyu) | Disturbed areas | ?All |
| Rhynchelytrum repens (Natal Red Top) | Disturbed areas | Marri |
| Stenotraphrum secundatum (Buffalo Grass) | Disturbed areas | ?All |
| Tribolium uniolae | Disturbed areas | Marri, Vim |

## Weeds

**Table 2 Weeds requiring Monitoring and Control When Practicable**

| Taxon | Area Affected | Potential |
|---|---|---|
| Cyperus tenellus (Tiny Flat Sedge) | All except claypans | All |
| Isolepis hystrix | Claypans | same |
| Juncus capitatus | Disturbed areas | ? |
| **Chasmanthe floribunda** | Disturbed areas | Marri, Vim |
| **Hexaglottis lewisae** | Disturbed areas | ?All |
| Aira caryophyllea (Hair Grass) | Widespread | Same |
| Arundo donax (Bamboo) | Disturbed | Marri, Vim |
| **Briza maxima** (Blowfly Grass) | Widespread | Same |
| **Briza minor** (Shivery Grass) | Widespread | Same |
| Ehrharta longiflora (Annual Veld Grass) | Viminaria, Marri, Disturbed | Same |
| Lagurus ovatus | Disturbed areas | Marri, Vim |
| Lolium tremulentum | Widespread | Same |
| **Paspalum dilatatum** | Claypans | Same |
| Vulpia myuros | Widespread | Same |
| **Arctotheca calendula**(Cape Weed) | Marri, Disturbed areas | Same |
| Conyza albida | Disturbed areas | ? |
| **Gazania linearis** | Disturbed areas | Marri |
| **Gladiolus caryophyllaceus** | Marri, Disturbed areas | Same |
| Hypochaeris glabra | Widespread | Same |
| Sonchus oleraceus | Disturbed areas | Same |
| Wahlenbergia capensis | Marri, Disturbed areas | Same |
| Crassula natans | Claypans | Same |
| Silene gallica | Marri, Disturbed areas | Same |
| Ornithopus compressus | Marri, Disturbed areas | Same |
| **Lupinus cosentinii** | Marri, Disturbed areas | Same |
| Robinia pseudacacia (Honey Locust) | Marri, Disturbed areas | Same |
| **Trifolium angustifolium** | Marri, Disturbed areas | Same |
| **Trifolium arvense** | Marri, Disturbed areas | Same |
| **Trifolium cernuum** | Marri, Disturbed areas | Same |
| **Trifolium dubium** | Marri, Disturbed areas | Same |
| **Vicia sativa** | Marri, Disturbed areas | Same |
| Centaurium erythraea | Widespread | Same |
| Monopsis simplex | Widespread | Same |
| Lythrum hyssopifolium | Claypans | Same |
| Anagallis arvensis | Marri, Disturbed areas | All |
| Anagallis minor | Claypans | Same |
| Echium plantagineum | Disturbed areas | Same |
| Solanum nigrum | Marri, Disturbed areas | Same |
| Parentucellia viscosa (Sticky Bartsia) | Widespread | Same |
| Ursinia anthemoides | Marri, Disturbed areas | Same |

# Part 2: Managing the Brixton Street Wetlands

## GUIDING PRINCIPLE FOR MANAGEMENT

That the community be able to share the peace, tranquility and the ongoing cycle of life in the Brixton Street Wetlands without putting this cycle at risk.

## MANAGEMENT GROUP AND IMPLEMENTATION

CALM and the Friends group are the appropriate management bodies. Gosnells City Council and other relevant individuals or groups should be invited to join the group.

A formal meeting of the management group should convene at least once per year to
- plan management for that year
- establish relevant lists of contacts for the year.
- assess the progress with the implementation of the guidelines
- take necessary actions to facilitate the implementation of the guidelines
- revise the guidelines as appropriate.

Regular informal contact should be maintained throughout the year.

Some of the guidelines have already been implemented, these are in italics.

## GUIDELINES

### 1. Notification of Individuals/Organisations of the Management Guidelines

The outcomes of the management workshop will be sent to individuals and organisations
- involved in the management of the Wetlands
- responsible for activities in the area surrounding the Wetlands that may impact on the Wetlands
- able to perform research on the priority research areas.

### 2. Water

Any developments in the area including drainage, roadworks, sewerage lines etc must consider the hydrology of the Brixton Street Wetlands and include measures to mitigate any possible effects of these activities on the Wetlands.

### 3. Flora

3.1 Restoration should focus on augmenting natural regeneration through
- weed control, the focus being on the serious weeds in Weeds Table 1 (page 42)
- removal of weed habitat created by soil mounds associated with tracks formation and soil dumping.

3.2 Revegetation of cleared areas using the rapidly growing native pioneer species listed according to habitat in Mangement Table 1 (page 48).

3.3 To maintain the distinctive local flora all propagation material must be:
- derived from locally collected seed/cuttings etc
- propagated in dieback free soil under dieback hygiene conditions

Areas proposed for clearing in adjacent areas could be used to source these requirements and plantings in adjacent areas.

3.4 No further clearing should occur and degraded areas should be restored to native vegetation.

**4. Fauna**

4.1 Maintain a variety of habitats to provide feeding, breeding and seasonal needs of fauna, in particular the Quenda.

4.2 Identify threats posed by
- taking of animals, including tadpoles
- barriers to animal movement eg roads
- feral animals

and develop actions to limit the effect of those threats identified.

**5. Education**

5.1 *A yearly public education programme be conducted to include*
- *walks, displays, talks*
- *management days* *FRIENDS*

5.2 Invite schools to be involved in management of the greater Yule Brook Nature Reserve area to lessen the impact on the fragile areas.

5.3 Establish programmes in those areas suitable for activities by school groups, including:
- growing local plants (see 3.2 and 10)
- planting out (see 10)
- water watch
- frog watch
- Quenda watch.

The appropriate specialists (see Background Information) be approached for help in preparing these materials.

**6. Signage**

*6.1 Signs identifying the Wetlands as a conservation area be erected.* *CALM*

6.2 An interpretive display should be established at the Altona Street entrance. The display should include information on the:
- natural values of the area, in particular the annual renewal of the flora
- impact of fire, dieback, weed invasion etc on the Wetlands
- all flora and fauna are protected, including tadpoles
- appropriate behaviour in the Wetlands

The appropriate specialists (see Background Information) be approached for help in preparing these materials.

**7. Local 'Wetlands Watch Group'**

7.1 The local members of the Friends group form the core of a group able to 'watch' the Wetlands on a daily basis.

7.2 A list of appropriate actions be prepared for the 'Wetlands Watch Group' by the Management Group which includes a list of contact people in CALM, Fire Brigade and City of Gosnells able to rectify management problems in need of official intervention.

**8.Fire**

7.1 Fire management should ensure that
- no structures are built in Wetlands that require protection
- the fire frequency is not less than 10 years
- any burning is based on small patch burns to maintain a variety of habitats and cover
- any fires are controlled quickly by rapid detection and suppression.

8.2 All authorities responsible for fire suppression should be identified. These groups together with the Friends group prepare fire management guidelines for the Wetlands. These guidelines should include reference to

- the 'Wetlands Watch Group'
- rapid detection
- fire suppression with minimal vegetation disturbance
- machines will not be used for fire suppression activities without the prior permission of CALM's Swan Regional duty officer
- weed control, especially post fire control, to reduce fuel loads.

8.3 A description of the Wetlands should be lodged with the Urban Bushland Council for inclusion in their register of sensitive bushland areas to be provided to the WA Fire Brigade.

**9. Access**

9.1 *The Wetlands be fenced with public access confined to walkers.* *CALM*

9.2 A raised walkway of fire resistant materials be built from the Altona Street entrance to allow minimal damage and all weather access.

9.3 No access by private vehicles, motorbikes or horses.

9.4 Management vehicles will have **access only under dry soil conditions** under the following restrictions

- all vehicles will be clean of mud before entering the area
- no vehicle will leave the tracks at any time
- vehicles will not be used for fire suppression activities without the prior permission of CALM's Swan Regional duty officer
- all individuals/authorities (for example contractors, WAWA, Westrail, City of Gosnells etc) who may want access to the area will be notified of these restrictions.

9.6 All dogs must be on a leash.

9.7 Tracks

- no new tracks will be constructed
- existing tracks will be periodically reviewed
- necessary tracks will be be flat graded to avoid earth heaps that restrict water movement and provide foci for weed invasion
- all unnecessary tracks will be closed, returned to natural profile and revegetated

**10. Dieback (and other diseases)**

The following measures will be practised to control the spread of dieback:

- no soil should be brought into the reserve unless it is established, after consultation with CALM, that it is dieback free
- until the extent and location of dieback in the area is known there should be no relocation of soil within the area
- establish foot 'dieback baths' at entrances
- management vehicles will only be permitted to access under dry soil conditions and if they are clean of soil
- all management vehicles must keep to formed tracks

## RESEARCH - A need for further information

The information presented at the workshop (see Section 1) clearly showed that the Brixton Street Wetlands

- have outstanding flora conservation values
- provide habitat for a variety of fauna
- are of local, regional and national significance

However there is a limited amount of information available on hydrology, vertebrates, invertebrates (aquatic and terrestrial) and the biology of the plants and animals of the Wetlands. While the Wetlands have survived in a mostly alien environment of agriculture for tens of years information on the these areas will be needed in the longer term to ensure the continued functioning of the Wetlands. This is of particular concern when housing is proposed for much of the area to the west, east and south.

While there is a need for ongoing research on all aspects of the Wetlands there is an urgent need for information on the hydrology, water quality and aquatic fauna. The water cycle at the Wetlands is fundamental to the functioning of the cycle of life. While it is considered that the Wetlands are surface water features dependant on rainfall for their annual renewal (Australian Groundwater Consultants in Hames Sharley Australia 1991) the relationship between the surface water and the ground water is not understood (C. Semeniuk pers. comm.).

As a consequence it is considered that research is most urgently needed on the following areas.

Priority 1: Dieback Survey
As soon as practical the area should be mapped for dieback. The extent of any dieback infection should be assessed and spraying infected vegetation with phosphoric acid be considered.

Priority 2: Hydrology
The hydrology of the area needs to be determined, specific attention should be directed at establishing the

- relationship between the ground water and surface water
- significance of the ironstone layer
- impact of adjacent urban development, including roads, drains, sewers, power lines and any other developments.
- measurement of water quality
- a monitoring regime

Priority 3: Aquatic Fauna
The aquatic fauna should be described and the water quality requirements identified. Local observations of the decline in frogs should be assessed and monitored.

Priority 4:Monitoring
Methods of monitoring the health of the Wetlands should be identified. Monitoring should refer to water quality, length of inundation, fire frequency and response of flora and fauna, weed species and frequency, floristic diversity etc.

Priority 5: Terrestrial Fauna
Ongoing studies of the terrestrial fauna should be described and the water quality requirements identified.

**Management Table 1:**
Naturally occurring plant species at Brixton Street suitable for revegetation

Key
# Species with local varients

Habitats
dry = "uplands" ie Marri Woodland and bare sandy areas (Altona Street verge), banks of the drain
damp = waterlogged areas
wet = innundated areas

| Family//species | Habitat | Propagation |
|---|---|---|
| Anthericaceae | | |
| Sowerbaea laxiflora | dry | division/seed |
| Tricoryne humilis | dry | division/seed |
| Asteraceae | | |
| Hyalosperma cotula | dry/damp/wet | seed |
| #Podolepis gracilis | damp/wet | seed |
| Haemodoraceae | | |
| Anigozanthos manglesii | dry | seed |
| Mimosaceae | | |
| #Acacia lasiocarpa | dry/damp | seed |
| #Acacia pulchella | dry | seed |
| #Acacia saligna | dry | seed |
| Myrtaceae | | |
| #Astartea aff. fascicularis | wet | seed |
| Baeckea camphorosmae | dry/damp | seed |
| Eucalyptus calophylla | dry | seed |
| Hypocalymma angustifolium | dry/damp | cuttings/seeed |
| Hypocalymma robustum | dry | cuttings/seeed |
| Melaleuca rhaphiophylla | wet | seed |
| Melaleuca viminea | wet | seed |
| Pericalymma ellipticum | damp/wet | seed |
| Papilionaceae | | |
| Kennedia prostrata | dry/damp | seed |
| Viminaria juncea | damp/wet | seed |
| Proteaceae | | |
| #Grevillea bipinnatifida | dry/damp | cuttings/seeed |
| #Hakea trifurcata | dry/damp | seed |
| #Hakea prostrata | dry/damp | seed |
| Hakea varia | damp/wet | seed |