FLORISTICS of

RESERVES and BUSHLAND AREAS

of the PERTH REGION (SYSTEM 6)

Parts V - IX

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The Wildflower Society of Western Australia has published these papers, parts of a continuing series, in the interest of the conservation of our unique flora. The Society considers it essential that decision makers and managers have available the necessary flora information before making irreversible land use decisions.

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FLORISTICS OF THREE BUSHLAND AREAS OF THE EASTERN SIDE OF THE SWAN COASTAL PLAIN

INTRODUCTION

The City of Perth is located on the Swan Coastal Plain and the western margin of the Darling Plateau. The biological diversity of the area has long been recognised but there are relatively few detailed flora studies of the bushland areas in the Perth Region. The System 6 Report (Department of Conservation and Environment, 1983) recognised the areas diversity and the possible conflicts with other land uses in the area and made a series of recommendations that attempted to conserve the variety of natural systems in the area. These recommendations were based on the information available at the time and the System 6 Report should be considered as the basis for a Reserve system, not the final outline of such a system.

Some very significant conservation areas are now recognised as having been omitted from the System 6 Report. For example the Brixton St Wetlands (Keighery and Keighery, 1991), not included in the Report, are now recognised to be of national significance and of outstanding flora conservation value. This area is located on the heavy soils of the eastern side of the Swan Coastal Plain, adjacent to the Plateau, which is the most floristicaly diverse section of the Plain and the most extensively cleared (Keighery and Trudgen, 1992 and Keighery and Keighery, 1993).

Within the metropolitan area most of the eastern side of the Plain can be divided into two geomorphological units (McArthur and Bettenay, 1960); the Ridge Hill Shelf, the foothills of the Darling Scarp, and the Pinjarra Plain. Nine areas (M 14, 15, 17, 53, 70, 69, 95, 83 & 88) in the System 6 Report were located on the eastern side of the Plain. All of these areas (except M70 which is mostly cleared and M88 which is scattered trees in pasture) were the subject of recommendations in Keighery and Trudgen (1992) as being important in conserving aspects of the floristic diversity of the eastern side of the Plain. A series of complementary areas, outside the System 6 Study, were also recognised by Keighery and Trudgen. Several other areas, not subject to specific recommendations, have been recognised since this study.

A detailed treatment of the flora is only available for three of the areas recommended to be reserved for the conservation of the flora of the eastern side of the Plain: M65 - Yule Brook Reserve (Speck and Baird, 1984) and the Brixton St Wetlands (Keighery and Keighery, 1991) and the Agricultural Protection Board Land, Forrestfield (Robinson and Mawson, 1993). However since 1990 the Wildflower Society through the Swan Coastal Plain Survey for conservation volunteers, co-ordinated by the authors, has been surveying bushland areas on the eastern side of the Plain. The outcome of these surveys include detailed flora treatments. The first three areas surveyed, Talbot Road Bushland, Brickwood Bushland and the Cardup Nature Reserve are the subject of these reports. One of the areas, Cardup Nature Reserve (M83) was a System 6 recommendation.

SURVEY METHOD

A series of $100m^2$ study sites were located in each of the plant communities identified by the co-ordinators using aerial photographs and limited field interpretation in each of the bushland areas. Groups of conservation volunteers, led by a botanist, recorded information in a set format on physical location, vegetation structure and density and the total flora at each of these study sites (Keighery 1993). The sites were sampled on at least two occasions by the volunteers and/or the co-ordinators. These sites are permanent sites and will be included in a detailed floristic survey of the Swan Coastal Plain, the GinGin to Busselton Bushland Survey. Opportunistic plant collections, that is

collections from outside the sites, were made during foot transects of the bushland areas at various times of the year. Further non-permanent sites were described as necessary during these foot transects. Identification of plant collections was made by the volunteers and the co-ordinators and verified at the W.A. Herbarium. Field herbaria have been prepared for each of the bushland areas. The results of the surveys have been compiled by the co-ordinators.

PART V: FLORISTICS OF THE TALBOT ROAD BUSHLAND, SHIRE OF SWAN.

INTRODUCTION

The Talbot Rd Bushland, the Talbot Rd Reserve and adjacent bushland (See Map 1T, p 19) encompasses approximately 90 hectares. Located in the Shire of Swan the area of bushland is bounded by Myles Rd to the west, Blanchard Rd, private property and O'Connor Rd to the south, Talbot Rd to the east and private property to the north. The northern portion between Myles and Talbot Rd is recognised by the Shire of Swan as an important bushland area and has been recommended for inclusion on the Register of the National Estate. This area was identified as Location 86 by Keighery and Trudgen (1992).

GEOMORPHOLOGY AND SOILS

The Ridge Hill Shelf of the Swan Coastal Plain is a strip of laterised low relief spurs along the base of the Darling Scarp between Bullsbrook and Harvey. This narrow dissected strip is from 1-3 km in width and slopes gently to the west to form the foothills of the Darling Scarp. The soils are predominantly derived from alluvium and colluvium derived from the Darling Plateau. In some areas residual laterite occurs on the surface. The soils are moderately well to well drained. These soils are mapped under various names in the available soils maps: namely, Foothills by Wells and Hesp (1989); Forrestfield by Churchward and McArthur (1979) and King and Wells (1990) and Guildford Formation by (Gozzard, 1986)

The bushland remnant contained in Talbot Rd Reserve and adjacent bushland, is located entirely on the Ridge Hill Shelf (McArthur and Bettenay, 1960). Although the area is excluded from the King and Wells map sheet, because it is public land, the soils that are predominant in the area and immediately adjacent are deep rapidly draining siliceous yellow brown sands (F1), well drained gravelly yellow or brown duplex soils with a sandy topsoil (F2), lateritic outcrop with shallow moderately well drained gravelly brownish or earthy sands (F6), poorly drained areas of bleached grey sand over an iron organic hardpan (F9) and in the drainage channel poorly drained gravelly yellow or brown duplex soils (F5). The Perth environmental geology map (Gozzard, 1986) maps similar soils and indicates that the colluvial sands (F1, King and Wells and S12, Gozzard) may be underlined to varying degrees by the soils with a greater percentage of silt (F2, F6 & F9, King and Wells and Ms3, Msg & Mgs1 Gozzard). Therefore, a great variety of soils are represented at Talbot Rd. These soils in turn support a great variety of plant communities. Consequently Talbot Rd bushland contains representatives of the characteristic upland plant communities of the northern Ridge Hill Shelf.

VEGETATION

A vegetation map (See Map 2T, p 19) has been prepared based on seventeen sites (Appendix 1T, p 22) located in each of the plant communities and foot transects of the

area. Thirteen of the sites are permanent sites and will be included in a detailed floristic survey of the Swan Coastal Plain, the GinGin to Busselton Bushland Survey.

Only the principal plant communities are mapped. These are:

- Wandoo (*Eucalyptus wandoo*) Open Woodland (Site 12), Marri (*Eucalyptus calophylla*) and Wandoo Woodland (Site 13) and Lateritic Heath (Site 1), on the lateritic areas with shallow moderately well drained gravelly brownish sands (F6).
- Marri Open Woodland (Site 4) to Woodland (Site 2) and Marri and Jarrah (*Eucalyptus marginata*) Woodland (Site 14 and Site 15), on well drained gravelly yellow or brown duplex soils with a sandy topsoil (F2).
- *Banksia* Open Low Woodland to Low Woodland (Sites 3, 10 &11) and a highly variable Sand Shrubland - *Adenanthos cygnorum* and *Allocasuarina humilis* Open Shrubland (Site 7) and *Hakea ruscifolia* Open Shrubland (Sites 8 & 9), on the rapidly draining siliceous yellow brown sands of varying depth (F1).
- Marri Woodland (Site 16), in the drainage channel on poorly drained gravelly yellow or brown duplex soils (F5) and *Hakea varia* and *H. trifurcata* Heath (Site 17, not mapped) on the adjacent clays.

Within the woodlands patches of shrubland or heath occur (Sites 5 & 6). These areas are too small to be mapped on this scale but indicate the complexity of the vegetation.

Vegetation maps place distinct boundaries between plant communities where a gradation from one community to the next is generally the actual situation. At Talbot Rd this gradation is marked due to the overlaying of the sandy soils and silty soils. For example the areas mapped on the sandy soils, *Banksia* Woodland and heaths/shrubland are all on soils with sand at the surface. However the floristic composition of these communities is highly variable containing species that are typical of both sandy (eg *Conospermum stoechadis*, *Stirlingia latifolia*, *Mesomelaena pseudostyia*) and heavier soils (*Lambertia multiflora*, *Verticordia densiflora*, *Tricostularia neesii*) indicating that the underlying silts are influencing the floristics. The interleaving of the other soils such as the clays and laterites as well as the sands has resulted in a comparable floristic complexity in the other communities.

This floristic complexity is expressed in the dense shrub, herb and sedge strata. These strata occur in all plant communities and when the density of the dominant tree species, generally Marri, *Banksia attenuata* and/or *Banksia menziesii*, Marri and Jarrah and less commonly Wandoo is low the vegetation is mapped as shrubland or heath. This floristically rich understorey is characteristic of the plant communities of the eastern side of the Swan Coastal Plain.

Vegetation Condition

Most plant communities are in Very Good to Good Condition (Appendix 1, p 22) with all strata in the communities intact and only a few species of common non-aggressive weed species present. Such weeds are **Ursinia anthemoides*, **Hypochaeris glabra* and **Romulea rosea*. The plant communities of the Ridge Hill Shelf, particularly those on lateritic soils, contain dense shrub and herb strata that apparently allow few opportunities for weed propagules to become established unless there is substantial soil disturbance. There are areas where such disturbance occurs. This is generally localised and is associated with:

- gravel mines in the two lateritic areas (area of Site 1 and Sites 13 & 14) where there are substantial areas of exposed compacted laterite, weeds are of a variety of species, associated with dumped rubbish and patches of regenerating heath.
- clearing adjacent to the Water Authority enclosure (area of Site 17) where there is some regeneration but the herb, grass and sedge strata are composed predominantly of exotics these being **Ehrharta calycina*, **Sparaxis bulbifera* and **Homeria flaccida*.

- numerous tracks and fire breaks creating channels for the invasion of **Ehrharta calycina*.
- drainage lines from the water reserve, roads and urban areas causing erosion and weed invasion, particularly **Eragrostis curvula* .

There is significant weed invasion associated with the outer boundaries of the bushland. The sandier soils are most affected by this edge affect the weeds invading further into the these soils than the lateritic soils. **Ehrharta calycina* is the most significant weed of the sandy soils.

FLORA

Talbot Rd Reserve and the adjacent bushland contain a diverse flora of over 384 taxa (see Appendix 2, p31). Of these 366 are natives and 18 exotics. The Anthericaceae (25 taxa), Asteraceae (15 taxa), Cyperaceae (23 taxa), Fabaceae (24 taxa), Haemodoraceae (15 taxa), Myrtaceae (26 taxa), Orchidaceae (19 taxa), Poaceae (14 taxa), Proteaceae (38 taxa), Restionaceae (10 taxa) and the Stylidiaceae (12 taxa) are the most species diverse families. These groups represent nearly two-thirds of the taxa present and are the principal components of the dense shrub, herb and sedge strata characteristic of the plant communities of the eastern side of the Swan Coastal Plain (Keighery and Trudgen, 1992). The shrub flora is particularly rich in species of Fabaceae, Proteaceae and Myrtaceae as is expected in the south-west of WA but is relatively poor in the Epacridaceae (14 taxa) and Mimosaceae (11 taxa). The Mimosacaeae and Epacridaceae are more poorly represented on the adjacent Pinjarra Pain with greater, but still low, representation on the Ridge Hill Shelf.

Significant Flora

One hundred and five taxa are considered of special significance, these are detailed in Appendix 3, p59.

The flora on the Ridge Hill Shelf has close affinities with the Plateau as was described by Keighery and Trudgen (1992). Over 25% of the flora of this area is common with the Plateau. A number of species not previously recorded on the Swan Coastal Plain but found on the Plateau are found in the area. These are *Aristida contorta*, *Stylidium affine*, *Chamaescilla versicolor, Grevillea endlicheriana*, *Grevillea glabrata* ssp. *glabrata*, *Hakea myrtoides*, *Synaphea pinnata* and *Xanthorrhoea acanthostachya*

Seven Priority taxa (Atkins, 1992); *Thysanotus glaucus*, *Gonocarpus pithyoides*, *Lambertia multiflora* var 'darlingensis' ms, *Hakea myrtoides*, *Isopogon drummondii*, *Synaphea acutiloba* and *Synaphea pinnata* are recorded from the area. The population of *Hakea myrtoides*, *Synaphea acutiloba* and *Synaphea pinnata* are restricted in numbers, having populations of less than 30 individuals. Numbers of *Thysanotus glaucus* are difficult to determine as it occurs as scattered individuals in the *Banksia* Woodland. The remaining taxa occur in larger populations all in excess of 100 individuals. In the Perth Region *Isopogon drummondii* is confined to the eastern side of the Swan Coastal Plain between Midland and Forrestfield and this is one of the few occurrences on a reserve in the Region.

Several taxa are recorded for the first time in the Perth Region (Marchant et al., 1987); a grass, *Aristida contorta* and a sedge, *Cyathochaeta clandestina*. *Cyathochaeta clandestina* has since been recognised at several other sites in the south the study area where it had previously been recorded as *Cyathochaeta avenacea* (Keighery and Trudgen, 1992) and at the Forrestfield Complex of the Agricultural Protection Board (Robinson and Mawson, 1993). *Aristida contorta* has also been recorded at several other sites on the eastern side of the Plain.

The population of *Conospermum incurvum* (Plumed Smokebush)is the only known record of this species within a reserve in the Perth Region.

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Greg has had a long interest in the Talbot Rd Reserve after it was drawn to his attention by John McComb. Greg's work on the Reserve has run over nearly 10 years and has recently been complimented by the inclusion of the Reserve in the Swan Coastal Plain Survey. The first Swan Coastal Plain Survey session with volunteers was held in this Reserve in 1990. Thanks to Ellen, Neil C., Peter, Bob, Barbara B., Maureen, Geoff, Mary, Jan, Neil G., Kate, Keran, Barbara E., Rodney, Rae, Diane, Gary, Karen, Margaret, Pauline , Margaret E., Diedre, Sue, Sylvia, Stan, Lorine, Helen, Keld and Rosemary. Thanks to Bill Muir who prepared the vegetation map. The Shire of Swan gave permission to undertake this survey at Talbot Road.

PART V1: FLORISTICS of the BRICKWOOD BUSHLAND, SHIRE OF SERPENTINE-JARRAHDALE

INTRODUCTION

The Brickwood Bushland approximately 43 hectares is one of the largest areas of remnant bushland on the eastern side of the Plain. Located in Shire of Serpentine - Jarrahdale, the area is the bushland bounded by Mead St, Gordon Way, Soldiers Rd, private property and Warrington Rd (see Map 1B, p 20). The bushland is dissected diagonally by Turner Rd. The eastern portion is vested as the Brickwood Reserve for the conservation of flora and the western portion is a reserve for other purposes. This area was identified as Location 10 by Keighery and Trudgen (1992).

GEOMORPHOLOGY AND SOILS

The Brickwood Bushland is within several kilometres of the Scarp. Most of the area is low lying and waterlogged in winter with sandy loam over clay soils. A well drained low sandy dune crosses the eastern section of the area. A very shallow valley runs east-west through the northern triangle of the Brickwood Reserve. Water naturally collects in the valley and would have formed a series of deeper ponds over a more widely waterlogged area in the past. However the increased run-off from the road is directed into the area and a gully has formed on the western side of the eastern block that runs into the western block. Van Gool (1990) maps Bassendean Sands of aeolian origin on the sandy rise (B1 - grey sands over intensely coloured yellow sand). South of the rise is alluvium of the Pinjarra Plain (P1e - sand to sandy loam over gravelly clay) and to the north of the rise, colluvium of the Ridge Hill Shelf (F5 - acidic yellow duplex soils and sandy alluvium). Gozzard (1986) maps a reduced area of colluvium (eastern margins; Csg - gravelly sandy clays) and alluvium (western two thirds; Cs- sandy clay) in the Reserve. The rise is mapped as Bassendean Sand (S8).

VEGETATION

A vegetation map (see Map 2B, p 20) has been prepared based on nine sites (Appendix 1B, p 26) located in each of the plant communities and foot transects of the area. Eight of

the sites are permanent sites and will be included in a detailed floristic survey of the Swan Coastal Plain, the GinGin to Busselton Bushland Survey.

Only the principal plant communities are mapped. These are:

- *Banksia* Woodland (Site 2) on the Bassendean Sand ridge.
- Marri (*Eucalyptus calophylla*) and Jarrah (*Eucalyptus marginata*) Open Woodland (Site 9) to the eastern boundary and extending into the margins of the ridge with a sandy topsoil over sandy clays.
- Marri Open Woodland with scattered *Kingia* and Wetland Mosaic (Sites 1, 3, 4, 5, 7 & 8) on the poorly drained, seasonally inundated, sandy clays.
- *Melaleuca* and *Viminaria* Scrub (Site 6) in the poorly defined drainage channel.

Within the areas mapped as Marri Woodlands the density of the Marri is variable as is the composition of the shrubland, herbland and sedgeland understorey. On the slightly raised areas where the soil is poorly drained but not inundated the density is higher but on the slightly lower areas that are seasonally inundated to varying depths density of Marri is very low. These lower lying areas should be mapped as a mosaic of *Pericalymma* Heath, mixed Low Shrubland to Heathland, Herblands and Sedgelands but the pattern is so complex that this has not been done and these are placed under the general vegetation unit of Wetland Mosaic. This term was used by Keighery and Trudgen (1992) for mapping such communities. While the individual units in these communities are not mapped it is important to recognise this complex of communities as it is typical of the seasonally inundated Pinjarra Plain.

The adjacent vegetation along the railway line is similar to that included in Brickwood. This area is located on the Ridge Hill Shelf and although not surveyed in detail would be a significant addition to the Reserve as it is reported (Keighery and Trudgen, 1992) to contain some additional significant species not found in the Brickwood Bushland. These are *Melaleuca uncinata*, *Tribonanthes brachypetala* and *Hakea erinacea* .

Vegetation Condition

Most plant communities are in Very Good to Good Condition (Appendix 1B, p 26). This assessment is based on the condition of the shrub, herb and sedge strata as the tree and tall shrub strata appear to be significantly impacted by frequent fires. Indications of this are that most of the large Marri are dead or their crowns stagged, ash beds where the soil has been sterilised scattered through the area, remnants of large *Viminaria* shrubs, and the dense stands of species associated with hot fires, for example *Hakea trifurcata* and *Acacia saligna*. The good regeneration of the Marri and *Viminaria* will eventually re-establish these strata if frequent fires are excluded. *Banksia* trees in the *Banksia* Woodland have apparently been able to regenerate after these fires and maintain their canopy. Loss of *Banksia* trees is probably associated with dieback as there are many deaths of susceptible species indicating the presence of dieback on the ridge.

In most communities there are non-aggressive weed species. Such weeds are **Vulpia* species, **Romulea rosea*, **Briza minor*, **Briza maxima*, **Hypochaeris glabra* and **Ursinia anthemoides*. The dense shrub and sedge strata of these communities and the seasonal inundation apparently allow few opportunities for weed propagules to become established. However where the shrub and sedge strata are disturbed there is significant weed invasion. The areas effected are:

- tracks and fire breaks creating channels for the invasion of **Eragrostis curvula.*
- the drainage line from the east carrying run off from roads which is causing erosion , flooding and nutrient enrichment resulting in substantial weed invasion into the *Melaleuca* Scrub. Many aggressive weed species are established and spreading in this area, replacing the herb and sedge strata. The most significant weed species are:

*Eragrostis curvula, *Aster subulatus, *Lotus angustissimus, *Watsonia bulbillifera and *Watsonia meriana.
- scattered ash beds where the normally non-aggressive weed *Briza maxima forms dense patches.

There is also significant weed invasion, associated with the outer boundaries of the bushland and the areas of development in the bushland. *Eragrostis curvula is the most significant weed of the boundaries.

The adjacent vegetation along the railway line is similar to that included in Brickwood and in Good to Poor Condition. Tracks and weed invasion are evident with some very degraded areas associated with the tracks.

FLORA

Brickwood Bushland contain a diverse flora of over 333 taxa (Appendix 2B, p 41). Of these 309 are natives and 24 exotics. The Anthericaceae (18 taxa), Cyperaceae (33 taxa), Fabaceae (19 taxa), Dasypogonaceae (10 taxa), Droseraceae (12 taxa), Haemodoraceae (15 taxa), Myrtaceae (20 taxa), Poaceae (9 taxa), Proteaceae (31 taxa), Restionaceae (10 taxa) and the Stylidiaceae (12 taxa) are the most species diverse families. These groups represent sixty percent of the taxa present and are the principal components of the dense shrub, herb and sedge strata characteristic of the plant communities of the eastern side of the Swan Coastal Plain (Keighery and Trudgen, 1992). The shrub flora is particularly rich in species of Proteaceae with the Fabaceae and Myrtaceae also well represented as is expected in the south-west of WA but is relatively poor in the Epacridaceae (3 taxa) and Mimosaceae (8 taxa). The Mimosaceae and Epacridaceae are consistently poorly represented on the Pinjarra Pain. The large numbers of Cyperaceae and Restionaceae reflect the area's wetland characteristics.

Significant Flora

Ninety two taxa are considered of special significance, these are detailed in Appendix 3, p59.

The flora on the Ridge Hill Shelf and Pinjarra Plain has close affinities with the Plateau as was described by Keighery and Trudgen (1992). Over 21% (66 taxa) of the flora of this area is common with the Plateau. *Darwinia thymoides* is recorded off the Plateau for the first time.

Five Priority taxa (Atkins, 1992) were found: *Daviesia physodes*, *Gonocarpus pithyoides*, *Verticordia lindleyi* ssp *lindleyi*, *Lambertia multiflora* var 'darlingensis'ms and *Stylidium utricularioides*.

Trichocline sp GJK 6382 is one of the two known populations, the other being at Brixton St Wetlands (Keighery and Keighery, 1991). This taxa is much smaller than *Trichocline spathulata* and flowers in late summer and will probably be described as a distinct species.

The population of *Johnsonia* sp GJK 5249 is one of the three known populations, at Brickwood, Cardup and Lowlands. The population at Serpentine from which the original collection was made is now extinct. This taxa will probably be described as a sub-species of *Johnsonia pubescens* and is confined to sands of the eastern side of the Plain in the Byford area.

A small grove of *Eucalyptus lane-poolei* occurs in Gordon Way, between the Aged Persons Home and the sporting grounds. This is a remnant of a larger area now cleared for housing and is one of the few patches of bushland containing *Eucalyptus lane-poolei* on the Swan Coastal Plain.

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PART VII: FLORISTICS OF THE CARDUP NATURE RESERVE, SHIRE OF SERPENTINE -JARRAHDALE.

INTRODUCTION

Cardup Nature Reserve is located in the Shire of Serpentine - Jarrahdale (see Map 1C, p 20). It is an area of approx 75 hectares located to the south of Cardup Siding Rd and bounded on three sides by private property. Keighery and Trudgen (1992) designated the area as Location 11. The Reserve was established as the result of a System 6 Report recommendation, M83 (Department of Conservation and Environment, 1983), to conserve the flora of the alluvial soils of the Swan Coastal Plain. It was considered the 'largest area of its type available for reservation on the Coastal Plain' (p 270), containing a 'low open forest '.....'with an upper storey of jarrah, woody pear, slender banksia and bull banksia' and a 'quite diverse' understorey including '*Astroloma stomarrhena*, *Gompholobium knightianum* and *Pronaya elegans* '.

GEOMORPHOLOGY AND SOILS

Cardup Nature Reserve is within several kilometres of the Scarp. The western margin is low lying and waterlogged in winter with sandy clay soils. East of this narrow band are well drained low sandy dunes which make up most of the Reserve. A shallow valley runs east-west through the centre of the Reserve. Water collects in the valley but does not persist and has not been observed to form a creek. Van Gool (1990) maps Bassendean Sands of aeolian origin on the sandy rises (B1a - grey sands over intensely coloured yellow sand) and in the valley (B2 - grey sands over pale yellow sands or a weak hardpan). To the west is alluvium of the Pinjarra Plain (P1d - shallow pale sand to sandy loam over clay, moderately susceptible to salinity) and to the east colluvium of the Ridge Hill Shelf (F2b - gravelly acidic yellow duplex). Only small intrusions of these soils are mapped as being in the Reserve. Gozzard (1986) maps a greater area of colluvium (eastern margins and valley; Csg - gravelly sandy clays) and alluvium (western margin; Cs- sandy clay)in the Reserve. The rises are mapped as Bassendean Sands (S8).

VEGETATION

A vegetation map (see Map 2C, p 21) has been prepared based on thirteen sites (Appendix 1C, p 28) located in each of the plant communities and foot transects of the area. All of

the sites are permanent sites and will be included in a detailed floristic survey of the Swan Coastal Plain, the GinGin to Busselton Bushland Survey.

Only the principal plant communities are mapped. These are:

- Jarrah (*Eucalyptus marginata*) Woodland (Sites 1 & 3 and valley Site 4) and Banksia Woodland (Sites 2, 5, 6, 7, &11) on the grey Bassendean Sands.
- Jarrah Woodland (no site) on the well drained sandy clays (colluvial)to the east.
- Marri Woodland (Sites 14 & 15) and Marri and Jarrah Woodland (Sites 8 & 9) on the poorly drained sandy clays (alluvial), to the west
- *Melaleuca preissiana* Low Woodland (Site 10), on the very poorly drained clayey sand.

On aerial photographs the boundaries between these woodlands are difficult to determine as the density and height of the different dominant species are similar and the communities change gradually, probably due to the interleaving of the different soils.

The floristic composition of each of these communities reflects the soils. The *Banksia* Woodland contains the typical species *Conospermum stoechadis*, *Eremaea pauciflora*, *Stirlingia latifolia*, *Mesomelaena pseudostyia*, as does the Jarrah Woodland on the sands as well as several taxa more commonly found on the Plateau such as *Conostylis setosa* and *Mesomelaena tetragona*. The Jarrah Woodland on the sandy clays contains many species typical of the flora of the Scarp and the eastern side of the Plain; for example *Lambertia multiflora*, *Grevillea quercifolia*, *Grevillea wilsonii* and *Grevillea bipinnatifida*; as does the Marri Woodland for example, *Grevillea bipinnatifida*, *Hakea cyclocarpa* and *Gompholobium marginatum*.

Vegetation Condition

Most of the Reserve is in Very Good Condition (Appendix 1C, p28) with all strata in the communities intact and only a few species of common non-aggressive weed species present. Such weeds are **Ursinia anthemoides*, **Hypochaeris glabra* and **Romulea rosea*. Generally the dense shrub and herb strata allow few opportunities for weed propagules to become established unless there has been significant disturbance. Significant disturbance has occurred :

-in the *Banksia* Woodlands on the western margins, probably from past grazing, where **Ehrharta calycina* and **Ehrharta longiflora* are forming a grassland (Poor Condition).

- in several areas in the Reserve where dieback has had a significant impact on the tree strata.

Several weed species presently in low numbers have the potential to become a problem, especially in the presence of dieback. These are **Eragrostis curvula* , **Homeria flaccida* and **Acacia longifolia*.

FLORA

Cardup Nature Reserve contains a diverse flora of over 322 taxa, (Appendix 2C, p 50). Of these 294 are natives and 28 exotics. The Anthericaceae (17 taxa), Asteraceae (15 taxa), Cyperaceae (17 taxa), Dasypogonaceae (13 taxa), Fabaceae (28 taxa), Haemodoraceae (12 taxa), Myrtaceae (17 taxa), Orchidaceae (19 taxa), Poaceae (14 taxa), Proteaceae (28 taxa), Restionaceae (10 taxa) and the Stylidiaceae (9 taxa) are the most species diverse families. These groups represent nearly two-thirds of the taxa present and are the principal components of the dense shrub, herb and sedge strata of the plant communities of the Reserve. This dense shrub, herb and sedge strata was found to be characteristic of the plant communities of the eastern side of the Swan Coastal Plain (Keighery and Trudgen, 1992) and the Bassendean Sands on the eastern side of the Plain. The shrub flora is rich in species of Fabaceae, Proteaceae and Myrtaceae as is expected in the south-west of WA but is relatively poor in the Epacridaceae (7 taxa) and Mimosaceae

(8 taxa). The Mimosaceae and Epacridaceae are more poorly represented on the Pinjarra Plain with greater, but still low, representation on the Ridge Hill Shelf (Talbot Rd) and indications are now that there is a low percentage of these families on the entire Swan Coastal Plain (GinGin to Busselton Bushland Survey, observation) .

Significant Flora

Fifty eight taxa are of special significance; these are detailed in Appendix 3, p59.

A number of species not recorded in Marchant et al. (1987) as occurring on the Swan Coastal Plain but found on the Plateau are found in this Reserve. These are *Aristida contorta, Conostylis setosa* and *Hakea cyclocarpa* . *Aristida contorta*, was also found at Talbot Rd. Sixteen percent (48 taxa) of the flora of the Reserve are shared with the Plateau.

Four Priority taxa (Atkins, 1992), *Eryngium pinnatifidum* ssp 'palustre' ms, *Gonocarpus pithyoides, Lambertia multiflora* var 'darlingensis' ms, and *Daviesia physodes* are recorded from the area. The population of *Lambertia multiflora* var 'darlingensis' ms is small being confined to the Ridge Hill Shelf Jarrah Woodland. The other two taxa are relatively widely distributed on the sandy soils in the Reserve.

Of particular interest is *Johnsonia* sp. GJK 5249. This taxon is closely related to *Johnsonia pubescens* and will probably be described as a subspecies of *J. pubescens*. *Johnsonia* sp. GJK 5249 is known from Cardup, Brickwood and Lowlands, all Bassendean Sands on the eastern side of the Plain (see Part VI, this study). The typical *Johnsonia pubescens* also occurs at Cardup and is here at the southern limit of its distribution.

Dasypogon bromeliifolius and *D. obliquifolius* both occur in the reserve and were recorded growing in the same *Banksia* Woodland sites (Sites 5 & 6). This is the most southern record for *D. obliquifolius*. The co-occurrence of these two species is not uncommon on the eastern side of the Plain (Keighery and Trudgen, 1992).

ACKNOWLEDGEMENTS

Several Swan Coastal Plain Survey field sessions were held in this Reserve over 1991. Thanks to Mary, Anne, Dorothy, Barbara E., Diana C., Alice, Elaine, Stan, Mike, Kate, Joy, Frank, Jennifer, Ellen, Neil C., Neil G., David G., Sylvia, Rhonda, David J., Rodney, Rae, Pauline, Margaret E., Diedre, Bob, Barbara B,.Lorine, Helen, Keld and Margaret. The Department of Conservation and Land Management gave permission to undertake this survey in the Reserve.

GENERAL DISCUSSION

The vegetation of the the eastern side of Swan Coastal Plain is 97% cleared of vegetation (CALM, 1990). The Wheatbelt, considered to be 93% cleared (Beard ,1990), has been the subject of intensive study, in the past 15 years but the eastern side of the Swan Coastal Plain has received comparably scant attention, even though Beard noted in the same publication that there was "..no virgin vegetation left " on the eastern side of the Swan Coastal Plain.

Plant Communities of the Eastern Side of the Plain

The paucity of vegetation on the eastern side of the Plain has led to some speculation (Speck, 1958; Smith, 1974; Hallam, 1975; Seddon, 1972, Beard, 1979a & 1979b and

Heddle et al., 1980) about the vegetation that existed in the area prior to European settlement.

Beard (1979a & 1979b) and Heddle et al. (1980) have produced the small scale (1:250 000) vegetation maps of the study area based on studies of the remaining patches of vegetation and soil maps. The most recent study by Keighery and Trudgen (1992) described a series of plant communities, related to topography, that were considered characteristic of the eastern side of the Plain in the region that is the subject of this study. These are on the

(i) Pinjarra Plain:
Slightly elevated plain
- well drained sandy rises of Bassendean Sands ; Jarrah Woodland generally occurring with Marri, *Allocasuarina fraseriana* and *Banksia* species (*B. attenuata*, *B. menziesii* and *B. grandis*) in various combinations and densities.
- poorly drained loamy rises and flats; predominantly *Eucaluptus calophylla* (Marri) Woodland to Open Forest with more restricted *Casuarina obesa* Woodland to Open Forest, *Eucalyptus calophylla* and *Eucalyptus wandoo* (Wandoo) Woodland to Open Forest.

Seasonally inundated flats- ephemeral wetlands with a complex mosaic of shrublands, heaths, sedgelands and herblands.

Riverine - *Eucalyptus rudis* (Flooded Gum) Woodland to Forest.

(ii) Ridge Hill Shelf:
- on the higher slopes of the Ridge Hill Shelf; Marri and Jarrah Open Forest to Open Woodland.
- on the well drained heavier gravelly soils; Marri-Jarrah-Wandoo Open Forest to Open Woodland.
- in the drainage lines on the upper and lower slopes; *Eucalyptus rudis* (Flooded Gum)and *Melaleuca rhaphiophylla* Open Forest to Woodland or Marri, Flooded Gum and Jarrah Open Forest.
- on the lower slopes the well drained sandy rises are dominated by, Jarrah, *Allocasuarina* and *Banksia* Woodland.

The characteristic understorey of the Woodland communities of the eastern side of the Plain was a dense combination of shrubs, herbs and sedges in varying combinations. On the Ridge Hill Shelf this understorey is very similar both structurally and floristicaly to the understorey of similar woodlands on the Darling Plateau containing many species characteristic of the Darling Plateau in the Perth Region. This relationship between the shrublands, herblands and sedgelands of the Plateau and the Ridge Hill Shelf is also shown in the communities of the Pinjarra Plain but the Plateau element is lower. At times, on both the Ridge Hill Shelf and the Pinjarra Plain, the understorey forms a distinct community with the trees scattered or completely absent.

Previous descriptions of the vegetation of the Ridge Hill Shelf (Speck, 1956; Smith, 1974; Seddon 1972, Beard, 1979 and Heddle, et al. 1980) described the same communities as being characteristic of these soils but gave less detail on the understorey and its relationship with the flora of the Scarp.

Similarly previous descriptions of the vegetation of the Pinjarra Plain (Speck 1956, Smith 1974, Seddon 1972, Beard 1979 and Heddle et al. 1980) recognised similar communities but were in disagreement about the extent of *Eucaluptus calophylla* (Marri) Woodland to Open Forest, some considering that this was not the major community, the other woodlands as being more common (Heddle et al. 1980). All studies underestimated the extent of the ephemeral wetlands. This confusion was probably caused by the small fragmented nature of the remnant vegetation.

The diversity of plant communities and flora on the eastern side of the Plain is well illustrated by the flora of these three bushland areas. Although all three are in the same relative position to the Scarp, are at similar altitude and relatively close together (Cardup and Brickwood being within several kilometres of each other and Talbot Rd 40 kms to the north) the three areas contain very different suites of plant communities. These communities can be compared with those described as characteristic of the eastern side of the Plain.

Talbot Rd Bushland

The Talbot Rd Bushland contains plant communities comparable with those considered characteristic of the Ridge Hill Shelf; Wandoo Open Woodland, Marri and Wandoo Woodland, Marri Woodland, Marri and Jarrah Woodland and *Banksia* Low Woodland. However there are some significant additional communities:

(i) The drainage line is vegetated with Marri Woodland. Keighery and Trudgen (1992) found similarly vegetated drainage lines on the Pinjarra Plain and suggested that Marri Woodland may have been more common on drainage lines on the eastern side of the Plain before clearing . The present day predominance of *Eucalyptus rudis* is the result of its ability to recolonise readily.

(ii) Jarrah is uncommon, Marri Woodland and Wandoo Woodland dominating.

(iii) The heath or shrubland over open herbland and/or open sedgeland occur in mapable areas.

(iv) small pockets of *Harperia lateriflora* Sedgeland, a community identified by Keighery and Keighery (1992) as being apparently rare.

Brickwood Bushland

The plant communities characteristic of the Pinjarra Plain, Marri Open Woodland with scattered *Kingia* , the Wetland Mosaic and *Melaleuca* and *Viminaria* Scrub are the most widespread in the Bushland. The Brickwood Bushland also contains small areas of Marri and Jarrah Open Woodland, a plant community considered characteristic of the Ridge Hill Shelf, and *Banksia* Woodland, a plant community considered characteristic of the Bassendean Sands. A small pocket of *Harperia lateriflora* Sedgeland and the *Eucalyptus lane-poolei* Woodland are also significant, both being identified by Keighery and Keighery (1992) as being apparently rare.

Cardup Nature Reserve

Cardup is located on the eastern side of the Plain, however the soils are predominantly Bassendean Sands. As a result Cardup contains an interesting combination plant communities:

(i) Bassendean Sands - Jarrah Woodland and *Banksia* Woodland
(ii) Ridge Hill Shelf - Jarrah Woodland
(iii) Pinjarra Plain. - Marri Woodland

However there are some atypical communities recorded for the Pinjarra Plain: the *Melaleuca preissiana* Low Woodland and Marri and Jarrah Woodland. Keighery and Trudgen (1992) did not describe these communities on the the Pinjarra Plain. However it is considered that the proximity of the Bassendean Sand ridge to the alluvial soils has resulted in the occurrence of these communities, more generally associated with the Pinjarra Plain/Bassendean Sand interface, so far to the east. Floristicaly these communities have closer affinities with the typical wetland and woodland communities of the Pinjarra Plain, for example the presence of *Kingia* in the Marri and Jarrah Woodland.

Flora of the Eastern Side of the Plain

Although useful, comparisons of plant communities on a structural basis, are less informative than a floristic comparison of bushland areas in discerning patterns and relationships. Keighery and Keighery (1991) in a detailed floristic study of the Brixton St Wetlands identified some distinctive features of the flora of the eastern side of the Plain that contribute to the diversity of this flora. That is

- the close relationship with the flora of the heavy soils of the Scarp and the heavy soils of the Pinjarra Plain.
- the presence of a significant number of taxa endemic to the eastern side of the Swan Coastal Plain.
- the flora of the area is incompletely studied, as indicated by the occurrence of many poorly known taxa.

These patterns have been supported and further elucidated by Keighery and Trudgen (1992) who also described other features of the flora of the eastern side of the Plain that contribute to the diversity of the area's flora. These patterns of floral diversity relate to the various combinations of aeolian sands, colluvial sands, sandy alluvial deposits and heavy alluvial deposits at depth that have contributed to the formation of a unique understories. These understories contain taxa that are

- typical of the adjacent Bassendean Sand communities.
- normally found in areas removed from the eastern side of the Plain, the sandplains to the north and the coastal sands.

Consequently the flora of the three bushland areas contain taxa that illustrate these five patterns (Appendix 3, p59 and flora treatments for each bushland area). Some examples of these patterns are:

Sandy Taxa

- from the sandplains to the north: *Calytrix aurea* (Talbot & Brickwood - Darling Scarp and north to Eneabba), *Isopogon drummondii* (Talbot-Jurien Bay), *Dasypogon obliquiifolius* (Talbot & Cardup- north to Eneabba) and *Astroloma stomarrhena* (Cardup-Perth to Eneabba).
- from the *Banksia* Woodlands of the Bassendean Sands: *Bossiaea eriocarpa*, *Eremaea pauciflora*, *Petrophile linearis*, *Patersonia occidentalis*, and *Lyginia barbata*
- from the coastal sands and limestones: *Mesomelaena pseudostygia* , *Melaleuca acerosa* and *Hakea lissocarpha*.

Heavy Soil Taxa

- from the Plateau: *Stylidium affine*, *Lambertia multiflora*, *Calytrix aurea* (Darling Scarp and north to Eneabba),*Jacksonia restioides*, *Dryandra armata*, *Hakea undulata*, *Hakea stenocarpa*, *Cyathochaeta avenacea*, *Mesomelaena tetragona* and *Persoonia elliptica*.
- -eastern endemics: *Eryngium pinnatifidum* ssp 'palustre' ms (Cardup), *Vertcordia lindleyii* ssp *lindleyi* (Brickwood).
- poorly known taxa: *Johnsonia* sp GJK 5249 (Cardup & Brickwood), *Trichocline* sp GJK 6382 (Brickwood), *Wurmbea dioica* 'Swamp Form' and *Podolepis gracilis* 'Swamp White' (Brickwood).

The three areas are compared floristicaly in Table 1.

Table 1 A Comparison of the Native Flora of Talbot Rd, Cardup and Brickwood.

Bushland Area	Total No Taxa	Shared by All	Shared	% Shared Plateau
Talbot Rd	366	38% (139)	C 51% (187); B 46% (172)	25% (90)
Cardup	294	47% (139)	T 64% (187); B 60% (179)	16% (48)
Brickwood	309	46% (139)	T 57% (172); C 60% (179)	22% (67)

A comparison of the percentages of flora each bushland area has in common with the Plateau illustrates the closer relationship between the floras of the Plateau and the Ridge Hill Shelf (Talbot Rd) than that between the floras of the Plateau and the Pinjarra Plain (Brickwood). However the flora of the Pinjarra Plain has a closer relationship with the

flora of the Plateau than do those areas on the eastern side of the Plain with a high proportion of sandy well drained soils (Cardup).

The comparison of shared taxa shows that the greatest percentage one area has in common with another is 64% (Cardup in common with Talbot) but can be as low as 46% (Talbot and Brickwood). This is a high level of dissimilarity for three geographically similar areas. These differences relate to the

(i) predominance of aeolian sands at Cardup, with such typical sandy species as *Astroloma stomarrhena*, *Hypocalymma robustum*, *Daviesia nudiflora*, *Petrophile macrostachya*, *Persoonia saccata* and *Thysanotus sparteus*, all of these except *Astroloma stomarrhena* are also found on the similar sandy soils at Brickwood.

(ii) absence of laterite from Cardup and well developed laterite at Brickwood, taxa associated with lateritic soils being absent. For example *Eucalyptus wandoo*, *Tribonanthes brachypetala*, *Stypandra grandiflora* and *Synaphea acutiloba* are only present at Talbot Rd.

(iii) intrusion of low lying alluvial soils of the Pinjarra Plain to a small extent at Cardup and a great degree at Brickwood where such species as *Leptocarpus co-angustatus*, *Drosera gigantea*, *Melaleuca viminea* and *Pericalymma ellipticum* occur.

(iv) the larger area of low lying seasonally inundated soils at Brickwood supporting taxa characteristic of the Pinjarra Plain, that is, taxa shared with the heavy soils of the Plateau, endemic taxa and poorly known taxa. For example *Stylidium utricularioides*, *Centrolepis humillima*, *Hakea ceratophylla*, *Melaleuca lateriflora*, *Wurmbea dioica* 'Swamp Form' and *Drosera rosulata*. Only a few of these taxa occur at Cardup.

(v) the presence of a different suites of taxa from the Plateau intruding onto the Plain. For example at

- Cardup only; *Conostylis setosa*, *Grevillea quercifolia*, *Hakea cyclocarpa* and *Bossiaea ornata*.
- Brickwood only; *Mesomelaena gracilceps*, *Darwinia thymoides*, and *Petrophile seminuda* (all other Plateau taxa at Brickwood not shared by Talbot or Cardup are dependant on seasonally inundated soils).
- Talbot only; *Xanthosia candida*, *Xanthosia ciliata*, *Leucopogon gracillimus*, *Jacksonia alata*, *Jacksonia condensata*, *Trichocline spathulata*, *Hibbertia commutata*, *Anigozanthos bicolor* and many others.

Only one of the areas, Cardup Nature Reserve, was a proposed reserve in the System 6 Report. But this comparison clearly shows that the diversity landform and soils in the three areas is reflected in the diversity of plant communities and flora. This diversity is characteristic of the eastern side of the Swan Coastal Plain and, as the remaining vegetation is so restricted all three areas should be considered complimentary conservation areas. Talbot Rd Bushland contains the largest area of the flora of the Ridge Hill Shelf while Cardup and Brickwood contain smaller more southern elements of the Ridge Hill Shelf, the eastern Bassendean Sands and the Pinjarra Plain. Brickwood contains the largest area of Marri Woodland with scattered *Kingia* in the metropolitan area and there is only one other area of comparable size within the System 6 area, C53 just north of Waroona. The once apparently widespread Marri Woodland with scattered *Kingia* or *Kingia* Shrubland and Marri Woodlands to Forest (Keighery and Trudgen, 1992) present at Brickwood and Cardup, were identified by Keighery and Keighery (1992) as being apparently rare.

Talbot being the largest area of Ridge Hill Shelf vegetation can be compared with the Bushmead Riffle Range, another area presented as being representative of the Ridge Hill Shelf. Bushmead is an area of much debate and some controversy as it is Commonwealth land and much is proposed for housing development (Anon, 1992, Dames and Moore, 1990, Halpern, Glick and Maunsell, 1991 and 1992). A different suite of soils and consequently plant communities are present at Bushmead. Soils are generally sandier with areas of aeolian sands (S8 & S10) and colluvial sand (S12). There are small areas

of heavier colluvium (Mgs2 & Mgs1), granite and laterite. Consequently Banksia Woodlands and Jarrah-Marri Woodlands predominate with *E. rudis* Woodland along the creekline. Marri is apparently less common and Jarrah more common at Bushmead than at Talbot Rd and the areas of species rich shrubland, widespread at Talbot Rd are not found at Bushmead. Both areas have some Wandoo Woodland but the floristics of Bushmead indicate that the Wandoo Woodland at Bushmead is more closely related to that of the Plateau.

As a detailed flora list is available for both areas a comparison of the flora of these two areas can be made. Several points must be noted before this comparison is made

- the report on Bushmead indicates that 70 species are introduced, however the table of flora in the report (Ecologia,1991) has 87 species of naturalized plants listed and only native species are used in the comparison
- 24 species are not identified below genus and cannot be used in the comparison.

This leaves a total of 264 species which were compared to Talbot Rd (Table 1).

Table 2: A Comparison of the Native Flora of Talbot Rd and Bushmead

Bushland Area	Total Taxa	Shared Taxa
Talbot Rd	366	44% (162)
Bushmead	264	61% (162)
Combined Total taxa not shared	306	

Of these taxa 162 were shared with Talbot Rd, a total of 61% (Table 2). This is again a high level of dissimilarity for two geographically and in this case, geomorphically similar areas. There appear to be three main reasons for these differences. Bushmead has a creekline dominated by *Eucalyptus rudis*, this area contains species such as *Acacia alata*, *Euchilopsis linearis*, *Juncus kraussii*, *Juncus pallidus*, *Lepidosperma effusum*, *Melaleuca preissiana*, *Melaleuca rhaphiophylla* and *Trymalium ledifolium*. The outcropping of granite and the resultant granitic soils allow some of the distinctive Plateau species to occur at Bushmead, eg: *Billardiera bicolor*, *Bossiaea ornata*, *Hakea petiolaris*, *Hovea pungens*, *Mirbelia ramulosa*, *Nemcia cuneata*, *Persoonia sulcata* and *Xanthorrhoea gracilis*. Finally Bushmead has a mantle of Bassendean and colluvial sands, which posses a distinctive range of species characteristic of these sandy soils, for example *Alexgeorgea nitens*, *Astroloma stomarrhena*, *Astroloma xerophyllum*, *Blancoa canescens*, *Daviesia preissii*, *Daviesia nudiflora*, *Petrophile macrostachya* and *Synaphea spinulosa*. As noted by Ecologia (1991) a more detailed study of the floristics of the Bushmead site is clearly warranted. However current floristic data clearly show the two areas are complementary conservation areas and should not be viewed as alternative Ridge Hill Shelf reserves.

A recent study of the Agricultural Protection Board Land at Forrestfield (Robinson and Mawson, 1993) further illustrates these relationships. Although a detailed comparison will not be made it is of interest to note that this area contains many taxa that illustrate the patterns discussed previously some of which were not recorded in the three bushland areas in this study. For example

Sandy Soil Taxa

- from the sandplains to the north: *Haemodorum loratum*, *Olax scalariformis*, *Xanthorrhoea drummondii* and *Stenanthemum humile* (all Forrestfield only).
- from the *Banksia* Woodlands of the Bassendean Sands: *Bossiaea eriocarpa*, *Eremaea pauciflora*, *Petrophile linearis*, *Patersonia occidentalis*, and *Lyginia barbata*.
- from the coastal sands and limestones: *Mesomelaena pseudostygia* , *Melaleuca acerosa* and *Hakea lissocarpha*.

Heavy Soil Taxa

- from the Plateau: *Conothamnus trinervis* (Forrestfield only).
- eastern endemics: *Conspermum undulatum* (Forrestfield only).

- poorly known taxa: *Dryandra* sp 22 and *Dryandra* aff *vestita* (Forrestfield only) *Xanthorrhoea drummondii* and *Olax scalariformis* were in this study recorded for the first time in the Perth Region.

CONCLUSION

The three bushland areas contain examples of most of the communities considered characteristic of the eastern side of the Swan Coastal Plain and some significant variations on these. Floristicaly all areas illustrate the high level of diversity found on the eastern side of the Plain, the greatest diversity being associated with the Ridge Hill Shelf and the lowest with large areas of Bassendean Sand. However the diversity on the eastern side of the Plain in both communities and flora is so great and the area of vegetation remaining so small that all areas are significant conservation areas and they are complementary conservation areas. Indications from other studies are that similar patterns of diversity occur and all areas of vegetation in comparable condition are significant conservation areas and should also be viewed as complementary conservation areas.

Specific conclusions can be made for each area:

Talbot Road Bushland

The Talbot Rd Reserve and the adjacent bushland is one of the few remaining areas of bushland encompassing many of the varying soil types of the Ridge Hill Shelf and thus the plant communities and flora of the Ridge Hill Shelf. There is no comparable area known to the authors and the area is considered to be of outstanding flora conservation value.

The Swan Council has designated Talbot Rd Reserve (A 2395) as a flora reserve and the Reserve is classified by the National Trust (WA) and has been nominated for listing on Register the National Estate (Heritage Commission). The detailed treatment of the flora and vegetation of the Reserve in this report supports these decisions. This study also supports the enlargement of the Reserve to include the bushland associated with the cemetery. This area contains three communities, the Marri Woodland of the creekline, Jarrah/Marri Woodland and the Wandoo Woodland, not represented in the Reserve. The addition of this area would also enlarge the areas of some of the other communities, particularly the species rich shrublands.

Brickwood Bushland

The Brickwood Bushland is one of the few remaining areas of bushland encompassing the Ridge Hill Shelf and a comparatively large area of Pinjarra Plain. There is no comparable area known to the authors and the area is considered to be of outstanding flora conservation value.

The Shire of Serpentine - Jarrahdale has recognised the value of some of this bushland area in the Brickwood Reserve for the protection of flora. This study supports this action and indicates that the values of the Reserve would be enhanced if it was enlarged to increase the adjacent area of bushland included in this study and indicates that the remnant vegetation on the railway line should also be included.

Cardup Nature Reserve

While not preserving a large area of the vegetation for which its reservation was recommended, the Pinjarra Plain, the Reserve does encompass elements of the flora of the eastern side of the Plain not encountered elsewhere and considering the paucity of remnant vegetation on the eastern side of the Plain and the condition of this bushland it is of very high conservation value and its vesting as an "A" class Nature Reserve is supported.

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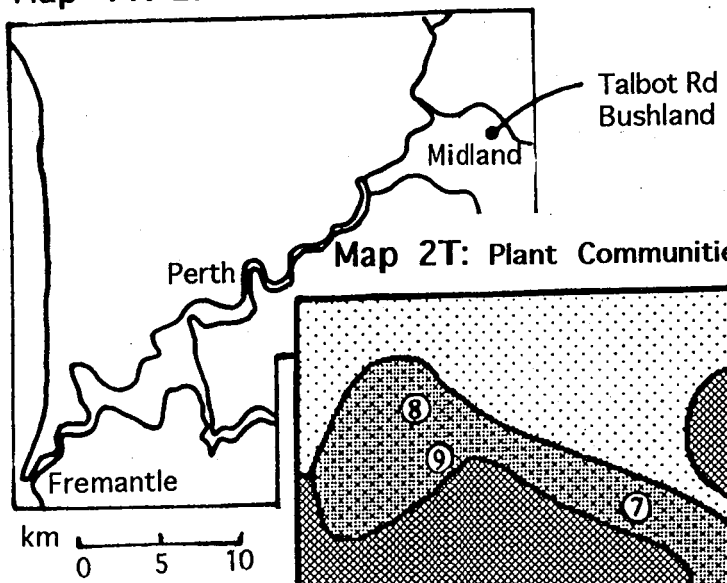
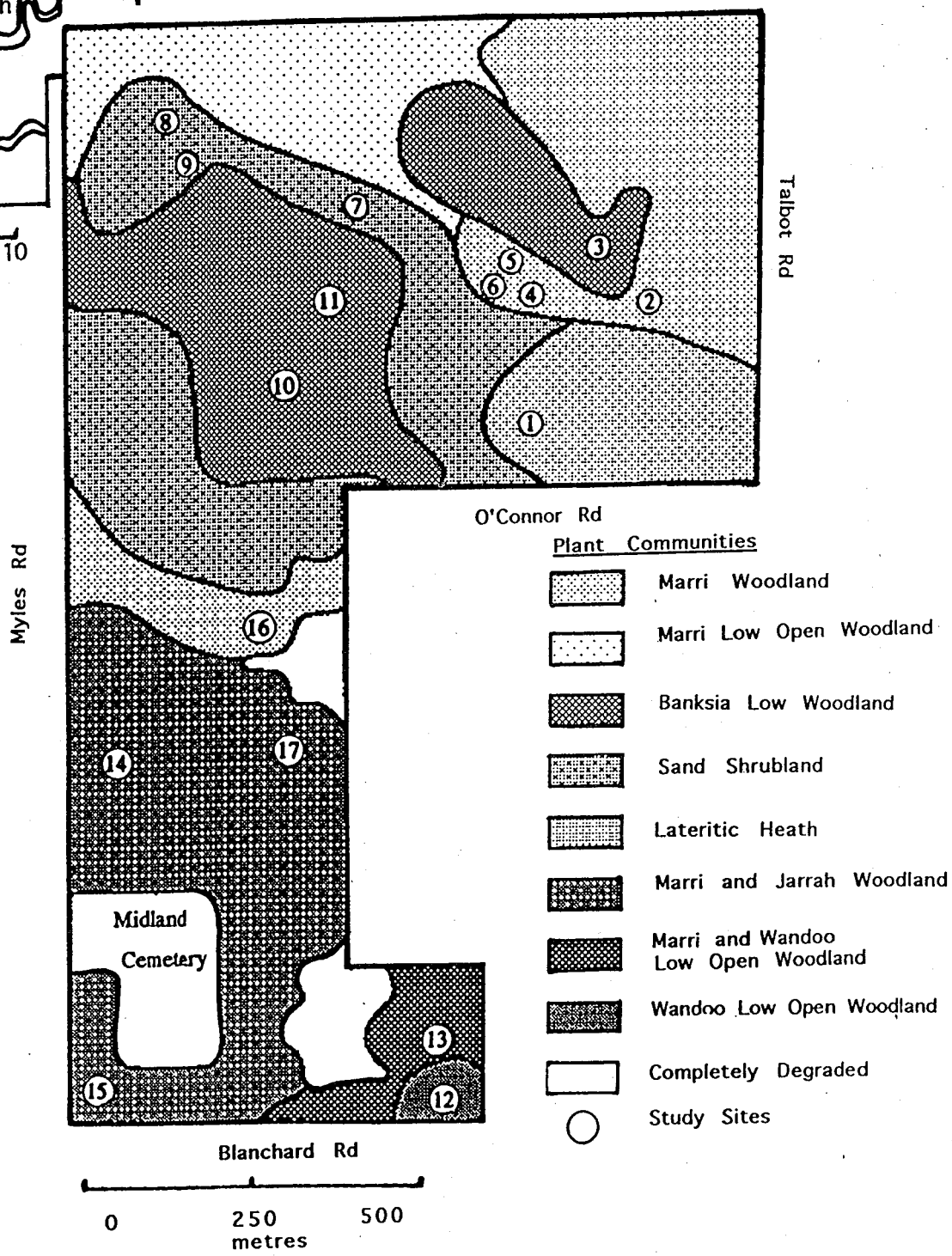
Map 1T: Location of the Talbot Road Bushland

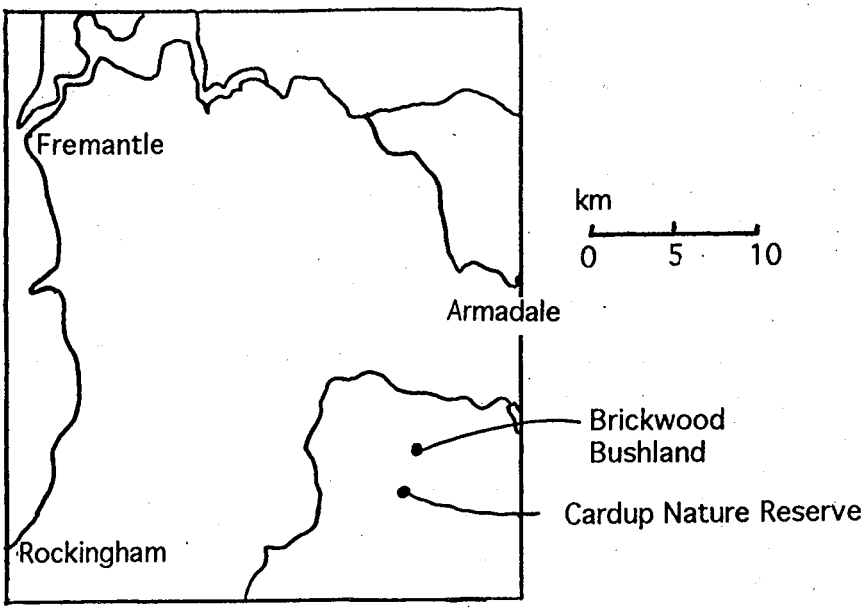


Map 2T: Plant Communities of the Talbot Road Bushland

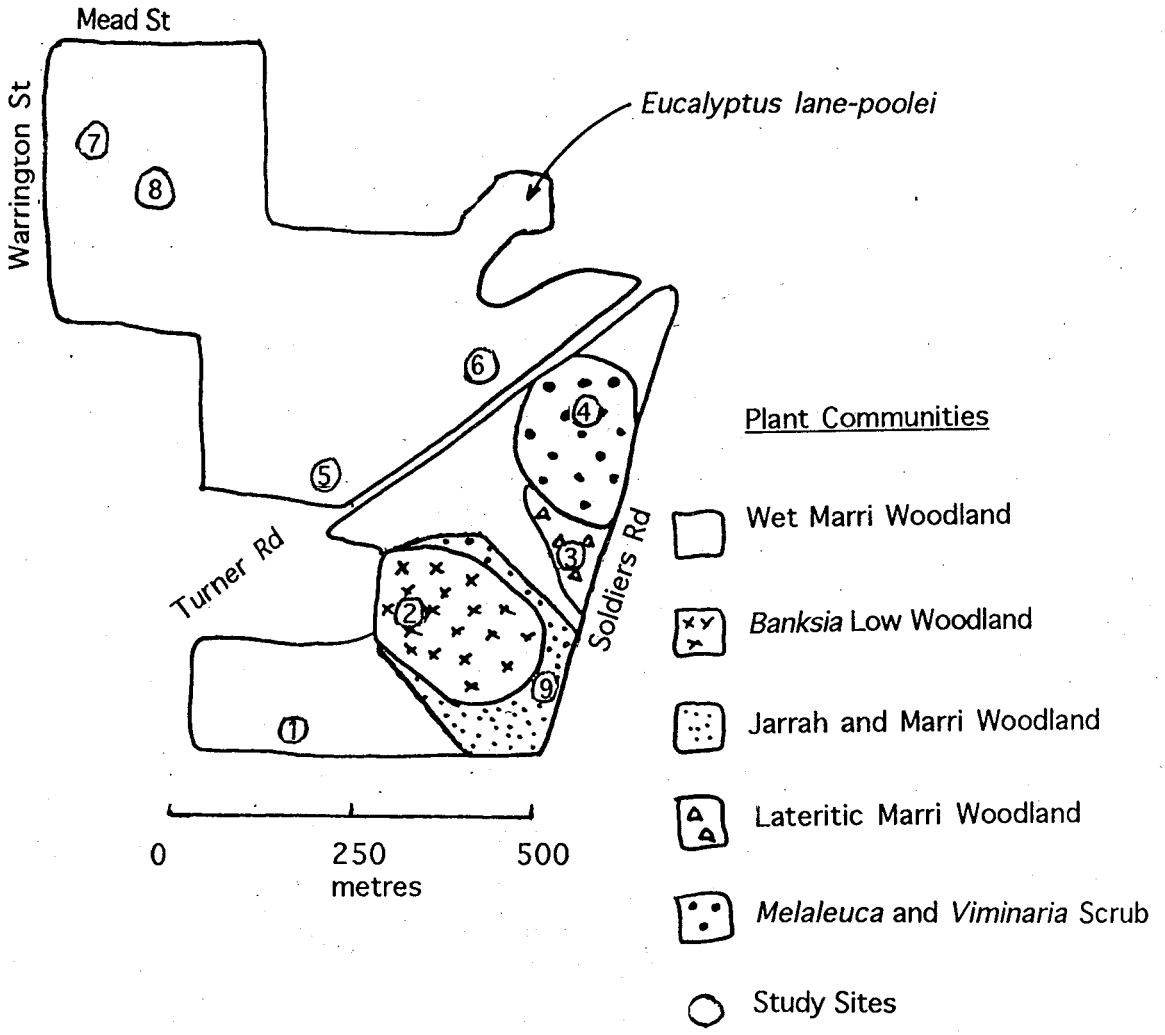


Map 1B and 1C:

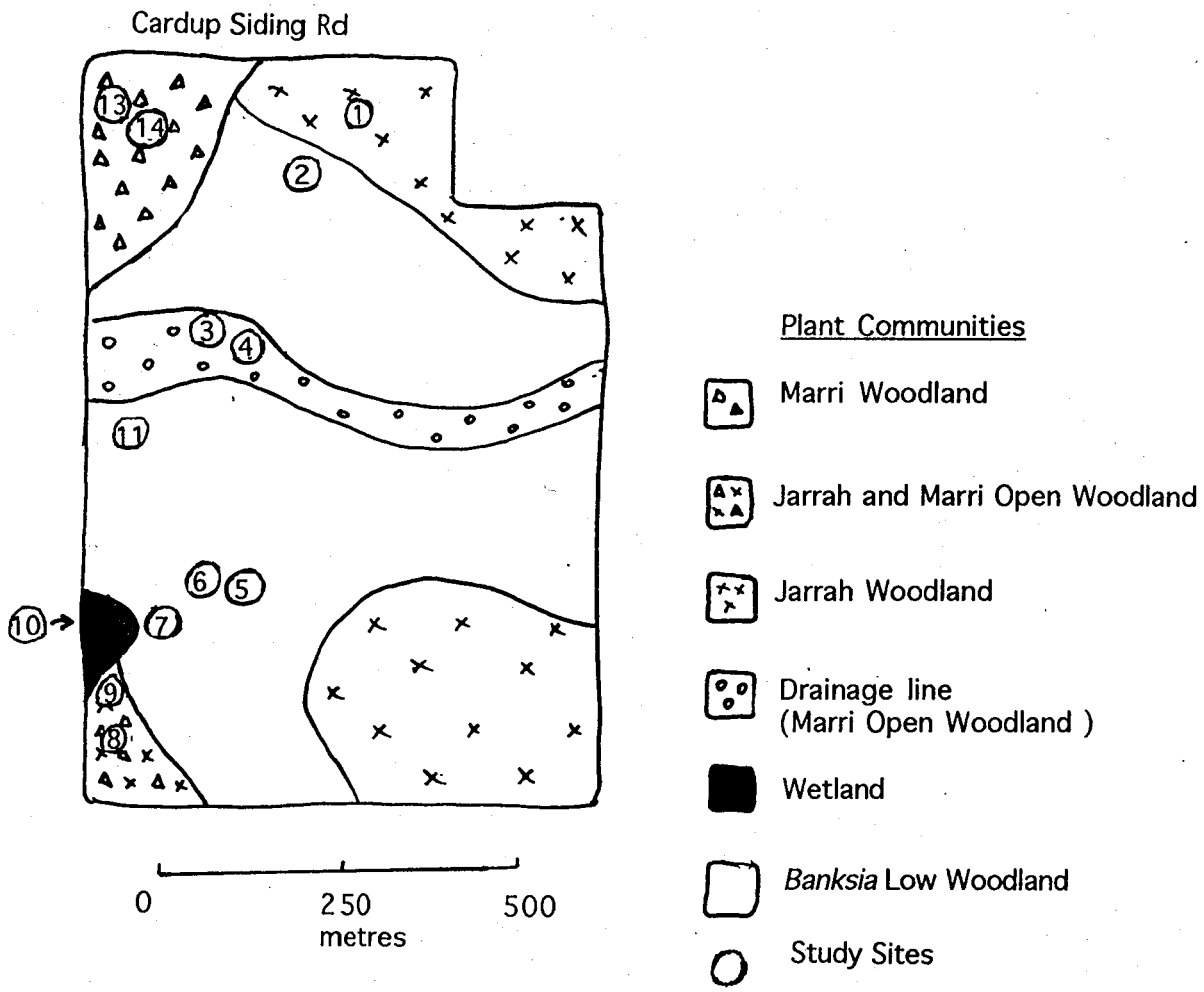
Location of the Brickwood Bushland and Cardup Nature Reserve



Map 2B : Plant Communities of the Brickwood Bushland



Map 2C: Plant Communities of the Cardup Nature Reserve



APPENDIX 1: Vegetation Site Descriptions

Appendix 1T: Vegetation Site Descriptions for the Talbot Rd Bushland
Aerial Photo: MSD 1989 Run 14 5035
A general mapping unit is given for each site, the detailed vegetation descriptions are based on Aplin (1979) and condition ratings are based on a scale developed by Trudgen (1990).

Site 1 - Lateritic Heath.
***Hakea trifurcata, Hakea undulata, Allocasuarina humilis* and *Beaufortia purpurea* Open Heath over *Hibbertia hypericoides, Jacksonia condensata, Hypolcalymma angustifolium* and *Melaleuca scabra* Low Open Heath over *Neurachne aleopecuroidea* Open Grassland, *Borya scirpoidea* and *Stylidium* species Herbland and Open Sedgeland.**
CONDITION Rating Good to Very Good
Comments: The general area of Mixed Lateritic Heath has been disturbed and there is an old gravel mine at the top of the rise. The north western slope is in good condition with small patches of weeds associated with tracks, off road vehicle use, rubbish dumping and soil disturbance. The southern boundary of this section of the Reserve is now fenced which discourages the dumping of garden refuse and is limiting the access by offroad vehicles.
Soil: pale brown sandy loam over laterite, ?F6 (King and Wells, 1990)
Litter 2-10% Bare Ground 2-10%
Drainage: moderate to poor Aspect: gentle, west

Site 2 - Marri Woodland
Marri Woodland over *Acacia pulchella, Xanthorrhoea preissii* and *Kingia australis* Open Shrubland over *Hibbertia hypericoides, Gompholobium aristatum* and *Dryandra nivea* Low Shrubland over *Anigozanthos mangelesii* Open Herbland and Open Sedgeland.
Comments
This site is of particular significance as this is the most northerly population of *Kingia* found on the Swan Coastal Plain. South of this Location *Kingia* 's presence on the Swan Coastal Plain can be used as an indicator of Ridge Hill Shelf and Pinjarra Plain vegetation.
CONDITION Rating Very Good
Soil: grey sand, ?F1 (King and Wells, 1990)
Litter 30-70% Bare Ground <2%
Drainage: moderate Aspect: gentle, west

Site 3 - *Banksia* Low Woodland
***Banksia menziesii* Low Open Woodland over *Adenanthos cygnorum* High Open Shrubland over *Calytrix angulata* and *Conospermum stoechadis* Low Shrubland over Open Herbland and *Mesomelaena pseudostygia* Open Sedgeland.**
CONDITION Rating Good
Comments: The presence of many dead *Banksia* indicates the presence of dieback but there are several large mature *Conospermum stoechadis* bushes present that make this conclusion uncertain.
Soil: grey white sand, ?F1 (King and Wells, 1990)
Litter 30-70% Bare Ground 5-10%
Drainage: well Aspect: gentle, W

Site 4 - Marri Open Low Woodland
Marri Open Low Woodland over *Hakea trifurcata, Xanthorrhoea preissii* and *Jacksonia sternbergiana* High Shrubland over *Dryandra nivea* Low Shrubland over *Conostylis aculeata* Open Herbland and *Harperia lateriflora* Sedgeland.

CONDITION	Rating	Very Good	
Soil:	grey sandy clay over clay, F? (King and Wells, 1990)		
Litter	2-10%	Bare Ground	0%
Drainage:	moderate to poor	Aspect:	gentle, north.

Site 5 - Sand Shrubland
***Adenanthos cygnorum* High Shrubland over *Allocasuarina humilis* Open Shrubland over *Calytrix angulata, Vertcordia densiflora* and *Hibbertia hypericoides* Low Open Heath over *Mesomelaena pseudostygia, Lyginia barbata* and *Restio* 'sinuosus' ms Open Sedgeland.**

CONDITION	Rating	Very Good	
Soil:	grey-white sand over grey sand, ?F1 (King and Wells, 1990)		
Litter	5%	Bare Ground	5%
Drainage:	well	Aspect:	gentle, NE.

Site 6 - Sand Shrubland
***Jacksonia sternbergiana* and *Adenanthos cygnorum* High Shrubland over *Allocasuarina humilis* and *Hakea ruscifolia* Open Shrubland over *Dryandra nivea* Low Shrubland over *Mesomelaena pseudostygia, M. tetragona* and *Restio* 'sinuosus' ms Open Sedgeland..**

CONDITION	Rating	Very Good	
Soil:	cream sand over yellow sand, ?F1 (King and Wells, 1990)		
Litter	20%	Bare Ground	3%
Drainage:	well	Aspect:	gentle, NE.

Site 7 - Sand Shrubland
***Adenanthos cygnorum* and *Allocasuarina humilis* Open Shrubland over *Eremaea pauciflora, Leucopogon conostephioides* and *Calytrix angulata* Low Shrubland over *Neurachne alopecuroidea* and *Amphipogon turbinatus* Open Grassland, Open Herbland and *Lyginia barbata* Open Sedgeland.**

CONDITION	Rating	Very Good	
Soil:	light grey sand over grey sand, ?F1 (King and Wells, 1990)		
Litter	2-10%	Bare Ground	2-10%
Drainage:	well	Aspect:	gentle, N.

Site 8 - Sand Shrubland
***Hakea ruscifolia* Open Shrubland over *Allocasuarina humilis, Lambertia multiflora, Xanthorrhoea preissii* and *Dryandra nivea* Low Open Heath over *Loxocarya cinerea* Open Sedgeland.**

CONDITION	Rating	Very Good	

Comments:The only known occurrence of this type of shrubland on the Coastal Plain.A major food source for Honeyeaters.

Soil:	grey sand over sandy clay, ?F1 (King and Wells, 1990)		
Litter	<5%	Bare Ground	5-10%
Drainage:	well	Aspect:	gentle, N

Site 9 - Sand Shrubland
***Hakea ruscifolia* Open Shrubland over *Allocasuarina humilis*, *Lambertia multiflora*, *Xanthorrhoea preissii*, *Dryandra nivea* and *Bossiaea eriocarpa* Low Open Heath over Open Herbland and Open Sedgeland.**

CONDITION	Rating	Very Good	
Soil:	grey sand over sandy clay, ?F1 (King and Wells, 1990)		
Litter	<5%	Bare Ground	5-10%
Drainage:	well	Aspect:	gentle, N

Site 10 - *Banksia* Low Woodland
***Banksia attenuata* and *B.menziesii* Low Woodland over *Allocasuarina humilis*, *Isopogon drummondii*, *Conospermum stoechadis* and *Stirlingia latifolia* Open Heath over *Dasypogon bromeliifolius* Open Herbland, *Tricostularia neesii*, *Cyathochaeta avenacea* and *Loxocarya cinerea* Sedgeland.**

CONDITION	Rating	Very Good	
Comments	The presence of dead and dying Banksia in the area indicates the presence of dieback.		
Soil:	grey sand over grey sand, ?F1 (King and Wells, 1990)		
Litter	<2%	Bare Ground	<2%
Drainage:	well	Aspect:	flat.

Site 11 - *Banksia* Open Low Woodland
***Banksia attenuata* and *B.menziesii* Open Low Woodland over *Allocasuarina humilis*, *Persoonia saccata*, *Conospermum stoechadis* and *Jacksonia densiflora* Low Shrubland over *Amphipogon turbinatus* Open Grassland, Open Herbland and *Tricostularia neesii* and *Mesomelaena pseudostygia* Open Sedgeland.**

CONDITION	Rating	Very Good	
Comments	The presence of dead and dying *Banksia* in the area indicates the presence of dieback.		
Soil:	white sand over grey sand, ?F1 (King and Wells, 1990)		
Litter	20%	Bare Ground	8%
Drainage:	well	Aspect:	gentle, NE.

Site 12 - Wandoo Open Low Woodland.
Wandoo Open Low Woodland.over *Acacia pulchella*, *Hakea lissocarpha* , *Hypolcalymma angustifolium* and *Hakea erinacea* Low Shrubland over *Neurachne alopecuroidea* and *Stipa pycnostachya* Open Grassland, *Borya sphaerocephala*, *Trichocline spathulata* and *Xanthosia candida* Herbland and *Mesomelaena tetragona* Open Sedgeland.

CONDITION	Rating	Good to Very Good	
Comments:	The overall area of Wandoo Open Woodland has been disturbed and there is an old gravel mine at the top of the rise the southern slope is in good condition with small patches of weeds associated with tracks, rubbish dumping and soil disturbance. The boundary is fenced which discourages the dumping of garden refuse.		
Soil:	red loam over quartzite, ?F6 (King and Wells, 1990)		
Litter	50%	Bare Ground	20%
Drainage:	moderate to poor	Aspect:	gentle to steep slope, south

Site 13 - Marri and Wandoo Low Open Woodland.
Marri and Wandoo Low Open Woodland over *Hakea trifurcata* High Open Shrubland over *Hakea lissocarpha* and *Nemcia spathulata* Low Shrubland over *Neurachne aleopecuroidea* Grassland, Open Herbland and Open Sedgeland.

CONDITION	Rating	Good	
Comments:	see above		
Soil:	red loam over laterite, ?F6 (King and Wells, 1990)		
Litter	70%	Bare Ground	30%
Drainage:	moderate	Aspect:	gentle to steep, south

Site 14 - Marri Woodland.
Marri Woodland over *Banksia* Low Woodland over Low Shrubland

CONDITION	Rating	Good	
Comments:	minimal survey.		
Soil:	cream sand, ?F1 (King and Wells, 1990)		
Drainage:	good	Aspect:	gentle, S

Site 15 - Jarrah Woodland.
Jarrah Woodland over Low Shrubland

CONDITION	Rating	Poor	
Comments:	This small area of Jarrah Woodland was confined to the south western corner of the cemetery land and is subject to substantial disturbance associated with too frequent fires, rubbish dumping and soil disturbance. This community was not sampled in the detailed survey.		
Soil:	yellow sand, ?F1 (King and Wells, 1990)		
Drainage:	good	Aspect:	gentle, N

Site 16 - Marri Open Woodland .
Marri Open Woodland over mixed Low Open Heath over Open Herbland and *Mesomelaena tetragona* Open Sedgeland.

CONDITION	
Rating	Very Good
Comments	The site is on the banks of a creek that enters the bushland as a drain and leaves the bushland as a drain.

Soil:	loamy sand, ?SW (King and Wells, 1990)		
Drainage:	moderate	Aspect:	bank creek

Site 17- Clay Heath (area too small to map)
***Hakea varia* and *Hakea trifurcata* Closed Heath to High Open Shrubland over **Sparaxis* and **Homeria* Open Herbland.**

CONDITION	Rating	Very Poor	
Comments:	The area has been cleared and regeneration is occurring.		
Soil:	brown grey loamy clay over clay, ?F5 (King and Wells, 1990)		
Drainage:	poor	Aspect:	gentle, W.

Appendix 1B: Vegetation Site Descriptions for the Brickwood Bushland

Aerial Photo: MSD 1991 Run 13 5167
A general mapping unit is given for each site, the detailed vegetation descriptions are based on Aplin (1979) and condition ratings are based on a scale developed by Trudgen (1990).

Site 1 - Marri Woodland with scattered *Kingia*.
Marri Open Woodland over *Xanthorrhoea preissii* and *Kingia* Open Shrubland over mixed Low Shrubland over *Borya scirpoidea and Stylidium dichotomum* Open Herbland and *Cyathochaeta avenacea* and *Mesomelaena tetragona* Open Sedgeland.
Adjacent area has *Pericalymma ellipticum* Low Open Heath to Closed Heath.

CONDITION	Rating	Very Good	
Soil:	grey sandy loam over clay, P1e, Van Gool (1990)or Cs, Gozzard (1986)		
Litter	<2%	Bare Ground	0%
Drainage:	poor,waterlogged	Aspect:	flat

Site 2: *Banksia* Woodland.
***Banksia attenuata* and *B. menziesii* Open Woodland over *Hakea ruscifolia*, and *Conospermum stoechadis* Shrubland over *Allocasuarina humilis*, *Hibbertia hypericoides*, *Eremaea* aff. *brevifolia* and *Baeckea camphorosmae* Low Shrubland over *Amphipogon turbinatus* Open Grassland and *Mesomelaena pseudostygia* Sedgeland.**

CONDITION	Rating	Very Good to Good	
Soil:	grey sand over ?yellow sand: B1, Van Gool (1990)or S8 Gozzard (1986)		
Litter	2%	Bare Ground	2%
Drainage:	good	Aspect:	flat, ridge top

Site 3:Marri Woodland with scattered *Kingia* (laterite).
Marri Open Woodland over *Viminaria juncea* Open Shrubland over *Kingia australis* and *Xanthorrhoea preissii* Shrubland over *Kunzea micrantha*, *Calytrix aurea*, *Gompholobium aristatum* and *Pericalymma ellipticum* Low Shrubland over *Borya scirpoidea* Open Herbland and *Mesomelaena tetragona*, *Cyathochaeta avenacea* and *Loxocarya fasciculata* Sedgeland.

Adjacent areas have extensive patches of *Pericalymma ellipticum*, *Gompholobium aristatum*, and *Stirlingia latifolia* Low Shrubland to Closed Heath over Open Sedgeland with scattered *Viminaria juncea* and *Kingia australis*.

CONDITION	Rating	Very Good	
Soil:	gravelly sandy clays over gravelly clay: F5, Van Gool(1990) or Csg, Gozzard (1986)		
Litter	5%	Bare Ground	5%
Drainage:	very poor	Aspect:	gentle slope, NW

Site 4: *Melaleuca* and *Viminaria juncea* Scrub.
***Melaleuca viminea*, *M. lateriflora* and *Viminaria juncea* Open Scrub over Open Bunch Grassland over Open Herbland and *Chorizandra enodis*, *Leptocarpus co-angustatus* and *Baumea* Closed Sedgeland**
Adjacent areas have patches of Herbland and Sedgeland.

CONDITION	Rating	Good	
Comments:	There is significant invasion by **Watsonia* in this site. The Wetland area is the most disturbed community in the Brickwood Bushland.		
Soil:	grey sandy loam over clay: F5, Van Gool (1990) or Cs, Gozzard (1986)		
Litter	5%	Bare Ground	0%
Drainage:	very poor, free water to 50 cm	Aspect:	flat

Site 5: *Pericalymma ellipticum* Heath.
***Pericalymma ellipticum* Closed Heath with scattered *Viminaria juncea* over *Leptocarpus co-angustatus*, *Cyathochaeta avenacea* and *Mesomelaena tetragona* Open Sedgeland.**

CONDITION	Rating	Very Good	
Soil:	grey sandy loam over clay: F5, Van Gool (1990) or Cs, Gozzard (1986)		
Litter	<2%	Bare Ground	0%
Drainage:	very poor, free water to 3 cm	Aspect:	flat

Site 6: **Marri Woodland with scattered *Kingia*.**
Marri Woodland over *Hakea trifurcata* Open Scrub scattered *Kingia* over *Stirlingia latifolia* Shrubland over mixed Low Shrubland over Open Herbland and *Mesomelaena tetragona*, *Cyathochaeta avenacea* and *Tricostularia neesii* Open Sedgeland.

CONDITION	Rating	Very Good	
Soil:	grey sandy loam over clay: F5, Van Gool (1990) or Cs, Gozzard (1986)		
Litter	10-20%	Bare Ground	0%
Drainage:	very poor	Aspect:	flat

Site 7: **Marri Woodland with scattered *Kingia*.**
Marri Open Woodland with scattered *Kingia* over *Allocasuarina humilis*, *Eremaea* aff. *brevifolia* and *Eriostemon spicatus* Open Heath over mixed Open Herbland and *Mesomelaena tetragona*, *Cyathochaeta avenacea* and *Hypolaena exsulca* Sedgeland.

CONDITION	Rating	Very Good	
Soil:	grey sandy loam over clay: F5, Van Gool (1990) or Cs, Gozzard (1986)		
Litter	10-20%	Bare Ground	0%
Drainage:	very poor	Aspect:	flat

Site 8: **Marri Woodland with scattered *Kingia*.**
Marri Open Woodland over *Jacksonia sternbergiana* High Shrubland with scattered *Kingia* over over mixed Shrubland over *Hakea prostrata* Low Shrubland over mixed Open Herbland and *Mesomelaena tetragona*, *Cyathochaeta avenacea* and *Hypolaena exsulca* Sedgeland.

CONDITION	Rating	Very Good	
Soil:	grey sandy loam over clay: F5, Van Gool (1990) or Cs, Gozzard (1986)		
Litter	2 -10%	Bare Ground	<2%
Drainage:	very poor	Aspect:	flat

Site 9: **Marri and Jarrah Open Woodland.**
Marri and Jarrah Open Woodland with scattered *Kingia* and *Xanthorrhoea* over *Jacksonia sternbergiana* Open Shrubland over mixed Low Shrubland over mixed Open Herbland and mixed Sedgeland.

CONDITION	Rating	Very Good to Good	
Comments: Stumps indicate that Jarrah has been extensively cut in this area of the Bushland.			
Soil:	grey sandy loam over clay: F5, Van Gool (1990) or Csg, Gozzard (1986)		
Litter	50%	Bare Ground	<2%
Drainage:	good	Aspect:	gentle, N

Appendix 1C: Vegetation Site Descriptions for the Cardup Nature Reserve

Aerial Photo: MSD 1991 Run 13 5167
A general mapping unit is given for each site, the detailed vegetation descriptions are based on Aplin (1979) and condition ratings are based on a scale developed by Trudgen (1990).

Site 1: **Jarrah Woodland.**
Jarrah (*Eucalyptus marginata*) Woodland over scattered *Xylomelum occidentale*, *Kingia* and *Xanthorrhoea* over *Jacksonia sternbergiana* and *Hakea ruscifolia* Shrubland over *Hibbertia hypericoides*, *Eriostemon spicatus* and *Bossiaea eriocarpa* Low Open Heath over *Dasypogon bromeliifolius*, mixed Open Herbland and *Mesomelaena pseudostygia* Open Sedgeland to Sedgeland.
CONDITION Rating Very Good
Soil: gray sand over yellow sand: B 1a, Van Gool (1990) or S8, Gozzard (1986)
Litter 40% Bare Ground 10%
Drainage: well Aspect: gentle slope, SW

Site 2: ***Banksia* Low Woodland.**
***Banksia attenuata*, *B. grandis* and *B. menziesii* Low Open Woodland with scattered emergent *Eucalyptus marginata* over *Allocasuarina humilis* and *Hakea ruscifolia* Shrubland over *Daviesia physodes*, *Stirlingia latifolia* , *Eremaea pauciflora* and *Bossiaea eriocarpa* Low Open Heath over *Mesomelaena pseudostygia* Open Sedgeland to Sedgeland.**
CONDITION Rating Very Good
Soil: gray sand over yellow sand: B 1a, Van Gool (1990) or S8, Gozzard (1986)
Litter 25% Bare Ground 20%
Drainage: well Aspect: gentle slope, SW

Site 3: **Drainage Line**
***Adenanthos meisneri*, *Hibbertia hypericoides*, *Stirlingia latifolia*, *Xanthorrhoea preissii* and *Eremaea pauciflora* Low Open Heath with scattered *Eucalyptus marginata* over *Lyginia barbata*, *Hypolaena exsulca*, *Mesomelaena pseudostygia* and *M. tetragona* Open Sedgeland to Sedgeland.**
CONDITION Rating Good
Comments Reduced canopy indicates the presence of dieback and possibly too frequent fires.
Soil: gray sand over dark gray sand: B 2, Van Gool (1990) or Cs, Gozzard (1986)
Litter 2-10% Bare Ground 30-50%
Drainage: well Aspect: gentle slope, SW

Site 4: **Drainage Line.**
***Jacksonia sternbergiana* and *Xanthorrhoea preissii* Shrubland over *Eremaea pauciflora* and *Stirlingia latifolia* Low Open Shrubland over mixed Open Herbland and *Hypolaena exsulca* Open Sedgeland.**
CONDITION Rating Poor
Soil: gray sand over yellow sand: B 2, Van Gool (1990) or Cs, Gozzard (1986)
Litter 25% Bare Ground 2-10%
Drainage: moderate Aspect: very gentle slope, W

Site 5: **mapped within the *Banksia* Low Woodland to Forest.**
***Xylomelum occidentale* Open Woodland over *Allocasuarina humilis*, *Hakea ruscifolia*, *Eremaea pauciflora* and *Hibbertia hypericoides* Low Open Heath over *Dasypogon obliquifolius* and *D. bromeliifolius* Open Herbland and *Mesomelaena pseudostygia* Open Sedgeland.**

CONDITION Rating Very Good
Soil: gray sand over yellow sand: B 1a, Van Gool (1990) or S8, Gozzard (1986)
Litter 5% Bare Ground 15%
Drainage: well Aspect: gentle slope, NE

Site 6: ***Banksia*** **Low Woodland to Forest.**
Banksia attenuata, B. menziesii **and** ***Xylomelum occidentale*** **Low Open Forest over** ***Allocasuarina humilis, Eremaea pauciflora*** **and** ***Hibbertia hypericoides*** **Shrubland over** ***Mesomelaena pseudostygia*** **Closed Sedgeland**
CONDITION Rating Very Good
Soil: gray sand over yellow sand: B 1a, Van Gool (1990) or S8, Gozzard (1986)
Litter 25% Bare Ground 2%
Drainage: well Aspect: gentle slope, NW

Site 7: ***Banksia*** **Low Woodland to Forest**
Banksia attenuata, B. menziesii **and** ***Xylomelum occidentale*** **Low Open Forest over** ***Allocasuarina humilis, Stirlingia latifolia*** **and** ***Hibbertia hypericoides*** **Shrubland over*** ***Ehrharta calycina*** **Open Grassland, mixed Open Herbland and** ***Loxocarya flexuosa*** **Closed Sedgeland**
CONDITION Rating Good
Soil: gray sand over yellow sand: B 1a, Van Gool (1990) or S8, Gozzard (1986)
Litter 70-100% Bare Ground 0%
Drainage: well Aspect: gentle slope, W

Sites 8 & 9 are mapped in the area of Jarrah and Marri Woodland.

Site 8:
Eucalyptus marginata **Open Woodland over** ***Kingia australis*** **and** ***Xanthorrhoea preissii*** **Shrubland over** ***Daviesia physodes, Adenanthos meisneri*** **and** ***Hibbertia*** **species Low Shrubland over** ***Lyginia barbata, Hypolaena exsulca*** **and** ***Mesomelaena tetragona*** **Sedgeland to Closed Sedgeland.**
CONDITION Rating Good
Comments Large dead Jarrah trees and other deaths indicates the presence of dieback and possibly too frequent fires.
Soil: gray sand over cream sand: B 1a/P1a, Van Gool (1990) or S8/Cs, Gozzard (1986)
Litter 2-10% Bare Ground 2-10%
Drainage: poor Aspect: flat

Site 9
Eucalyptus marginata, Banksia menziesii **and** ***Xylomelum occidentale*** **Low Open Woodland with scattered** ***Kingia australis*** **over** ***Stirlingia latifolia, Eremaea pauciflora*** **and** ***Adenanthos meisneri*** **Open Heath over mixed Low Shrubland over** ***Phlebocarya ciliata*** **Open Herbland and over** ***Hypolaena exsulca*** **and** ***Mesomelaena tetragona*** **Open Sedgeland.**
CONDITION Rating Good
Comments Large dead Jarrah trees and other deaths indicates the presence of dieback and possibly too frequent fires.
Soil: gray sand over sandy clay: B 1a/P6, Van Gool (1990) or S8/Cs, Gozzard (1986)
Litter 25% Bare Ground 2%
Drainage: well Aspect: gentle slope, NW

Site 10: Wetland.
***Eucalyptus calophylla* and *Melaleuca preissiana* Woodland to Forest over *Stylidium repens* Open Herbland and *Lepyrodia muirii* and *Hypolaena exsulca* Open Sedgeland.**
CONDITION Rating Good to Poor
Comments: The area appears o have been cleared and grazed before fencing for the Nature Reserve. Regeneration is progressing well but the species diversity is reduced.
Soil: gray sand over gray sandy clay: P1d, Van Gool (1990) or Cs, Gozzard (1986)
Litter 30-50% Bare Ground 2-10%
Drainage: Poor, free water to 25 cm Aspect: gentle to centre wetland

Site 11: Banksia Low Woodland
***Banksia menziesii* Low Open Woodland *Scholtzia involucrata* and *Dryandra nivea* Low Open Shrubland over **Ehrharta calycina* Closed Grassland and *Lyginia barbata* and *Mesomelaena pseudostygia* Open Sedgeland.**
CONDITION Rating Very Poor
Comments: Heavily invaded by **Ehrharta calycina* , probably as a result of past grazing and fires and possibly impact of dieback.
Soil: cream sand over gray sand: B 1a, Van Gool (1990) or S8, Gozzard (1986)
Litter 2-10% Bare Ground <2%
Drainage: well Aspect: gentle slope, W

Site 14 : Marri Woodland with scattered *Kingia*
Marri Open Woodland with scattered *Kingia* over *Xanthorrhoea* and *Sphaerolobium vimineum* Low Shrubland over mixed Sedgeland
CONDITION Rating Very Good
Soil: gray sandy clay over clay: P1d, Van Gool (1990) or Cs, Gozzard (1986)
Litter 50% Bare Ground <2%
Drainage: very poor, waterlogged Aspect: gentle slope, W

Site 15: Marri Woodland with scattered *Kingia*
Marri Open Woodland with scattered *Kingia* over *Xanthorrhoea, Hibbertia hypericoides* and *Baeckea camphorosmae* Low Shrubland over *Mesomelaena tetragona* and *Hypolaena exsulca* Sedgeland
CONDITION Rating Very Good
Soil: gray sandy clay over clay: P1d, Van Gool (1990) or Cs, Gozzard (1986)
Litter 10-20% Bare Ground 10-20%
Drainage: very poor, waterlogged Aspect: gentle slope, W

APPENDIX 2: Flora

Appendix 2T: Flora of the Talbot Rd Bushland

Records from quadrat data and opportunistic collecting, 1989-92. Families in alphabetical order and according to Marchant et al., (1987) unless indicated.

Key
opportunistic record
* non-native taxa

Plant Communities (see Map 2T, p 19)
wW Wandoo Low Open Woodland (Site 12)
wm W Marri&Wandoo Low Open Woodland (Site 13)
mj W Marri and Jarrah Woodland (Sites 14, 15 & 17)
m W Marri Woodland (Sites 2 & 4)
b W Banksia Low Woodland (Sites 3, 10 & 11)
s S Sand Shrubland (Sites 7, 8 & 9)
l H Lateritic heath (Site 1)

Taxon	wW	wmW	mjW	mW	bW	sS	lH
Gymnosperms							
Zamiaceae							
#Macrozamia riedlei							
Angiosperms							
Aizoaceae							
#Macarthuria australis					+		
Amaranthaceae							
#Ptilotus declinatus			+				
#Ptilotus drummondii				+			
Ptilotus manglesii				+			
Ptilotus stirlingii		+		+			
Anthericaceae							
Arnocrinum preissii					+	+	
Arthropodium capillipes	+			+			
Arthropodium preissii	+	+					
Borya scirpoidea							+
Borya sphaerocephala	+	+		+		+	
Caesia micrantha	+	+		+			+
Chamaescilla corymbosa				+	+	+	+
Chamaescilla versicolor	+	+		+			+
Johnsonia pubescens				+	+	+	
Laxmannia grandiflora				+			+
Laxmannia ramosa	+			+	+	+	
Laxmannia sessiliflora			+	+	+	+	
Laxmannia squarrosa	+	+		+		+	
Sowerbaea laxiflora				+			
#Stypandra grandiflora				+			
Thysanotus arenarius				+			+
Thysanotus dichotomus				+			
Thysanotus glaucus					+		

Flora of the Talbot Rd Bushland (cont.)

Taxon	wW	wmW	mjW	mW	bW	sS	lH
#Thysanotus manglesianus				+	+		+
#Thysanotus multiflorus				+			
Thysanotus patersonii		+		+		+	
Thysanotus thyrsoides	+	+					
Thysanotus triandrus					+		
Tricoryne elatior				+		+	
Tricoryne humilis							+
Apiaceae							
Actinotus leucocephalus	+			+			
Eryngium pinnatifidum	+	+					
Homalosciadium homalocarpum	+	+		+			
Hydrocotyle diantha				+			
Hydrocotyle pilifera		+					
#Platysace juncea				+			
Trachymene pilosa	+			+	+	+	
Xanthosia candida	+	+		+			+
Xanthosia ciliata							+
Xanthosia huegelii			+	+		+	
Asteraceae							
Brachycome iberidifolia				+			
Craspedia pleiocephala	+						
*Hypochaeris glabra	+	+		+		+	
Hyalospermum cotula				+		+	+
Lagenifera huegelii	+	+					
Olearia elaeophila				+	+	+	
#Olearia paucidentata				+			
Pithocarpa pulchella	+			+			
Podolepis gracilis				+	+	+	+
Podolepis lessonii				+			
Podotheca angustifolia						+	
Quinetia urvillei			+		+	+	
#Siloxeris humifusus				+	+		
*Sonchus oleraceus						+	
Trichocline spathulata	+	+		+			
*Ursinia anthemoides	+		+	+	+	+	
Waitzia citrina					+		
Waitzia paniculata					+		
Brassicaceae							
#Stenopetalum gracile			+				
Campanulaceae							
*Wahlenbergia capensis					+		
Wahlenbergia preissii					+		
Caryophyllaceae							
#*Cerastium glomeratum				+			
#*Silene gallica				+			
#*Spergula arvensis				+			

Flora of the Talbot Rd Bushland (cont.)

Taxon	wW	wmW	mjW	mW	bW	sS	lH
Casuarinaceae							
#Allocasuarina fraseriana			+				
Allocasuarina humilis			+		+		
Centrolepidaceae							
Aphelia cyperoides				+			
Centrolepis aristata			+	+		+	
#Centrolepis drummondiana			+		+		
#Centrolepis inconspicua				+	+		
Colchicaceae							
Burchardia multiflora			+	+		+	+
Burchardia umbellata	+	+		+	+	+	+
Crassulaceae							
#Crassula colorata				+			
#Crassula pedicellata					+		
Cyperaceae							
Caustis dioica				+		+	
Cyathochaeta avenacea	+	+		+	+		
Cyathochaeta clandestina					+		
Isolepis marginata				+	+	+	+
Lepidosperma angustatum	+	+		+			
#Lepidosperma ?gladiatum				+			
Lepidosperma leptostachyum					+		
#Lepidosperma scabrum					+		
Lepidosperma ?tenue	+	+		+	+		+
Mesomelaena pseudostygia				+	+	+	
Mesomelaena tetragona	+			+		+	
Schoenus bifidus				+		+	+
Schoenus brevisetis			+				
Schoenus caespititius					+	+	
#Schoenus clandestinus					+		
Schoenus curvifolius					+	+	
#Schoenus gramatophyllus				+			
Schoenus nanus							+
Schoenus subflavus				+		+	+
#Schoenus subbulbosus					+		
Schoenus unispiculatus	+			+			
Tetraria octandra				+	+	+	
Tricostularia neesii					+	+	
Dasypogonaceae							
Calectasia cyanea				+		+	
Dasypogon bromeliifolius				+	+	+	
#Dasypogon obliquifolius			+				
Kingia australis			+	+		+	
Lomandra caespitosa				+	+	+	
Lomandra hermaphrodita				+	+	+	
Lomandra odora				+		+	
Lomandra preissii	+			+		+	
Lomandra sericea						+	
Lomandra spartea	+			+			

Flora of the Talbot Rd Bushland (cont.)

Taxon	wW	wmW	mjW	mW	bW	sS	lH
Dilleniaceae							
Hibbertia acerosa	+					+	
Hibbertia aurea				+	+		
#Hibbertia commutata				+			
Hibbertia huegelii				+	+	+	
Hibbertia hypericoides	+			+	+	+	+
#Hibbertia racemosa					+		
Hibbertia subvaginata					+		
Droseraceae							
Drosera erythrorhiza	+	+	+				+
Drosera glanduligera				+	+	+	
Drosera macrantha 'robust' 1p58		+		+		+	+
Drosera menziesii ssp menziesii				+			
Drosera menziesii ssp penicillaris	+	+	+		+	+	+
Drosera palacea					+	+	
#Drosera pallida				+			
Drosera platystigma	+						
Drosera pycnoblasta					+	+	
Drosera stolonifera			+	+	+	+	
Epacridaceae							
Andersonia lehmanniana				+	+		
#Astroloma macrocalyx					+		
#Astroloma pallidum				+			
Conostephium pendulum				+	+	+	
Conostephium preissii					+	+	
Leucopogon conostephioides				+	+	+	
Leucopogon polymorphus		+					+
Leucopogon propinquus					+		
Leucopogon sprengelioides				+	+	+	
#Leucopogon gracillimus							
#Leucopogon cymbiformis							
Lysinema ciliatum				+	+	+	
#Styphelia tenuiflora			+				+
Euphorbiaceae							
Monotaxis grandiflora					+		
#Poranthera microphylla				+			
Fabaceae (Papilionaceae)							
Bossiaea eriocarpa				+	+	+	
Chorizema dicksonii	+			+			+
*Cytissus prolifera		+					
Daviesia decurrens				+			
Daviesia horrida	+						
Daviesia podophylla				+		+	
Daviesia triflora					+	+	
#Dillywinia ?cinerascens				+			+
Gompholobium aristatum				+		+	
Gompholobium confertum				+		+	
Gompholobium marginatum				+			+
Gompholobium tomentosum					+	+	

Flora of the Talbot Rd Bushland (cont.) Taxon	wW	wmW	mjW	mW	bW	sS	lH
#Hovea trisperma				+		+	
Isotropis cuneifolia					+	+	
Jacksonia alata				+			+
Jacksonia condensata				+			+
#Jacksonia decumbens					+		
Jacksonia densiflora					+	+	
Jacksonia sternbergiana				+			+
#Kennedia prostrata					+	+	
Nemcia capitata						+	
Nemcia spathulata	+						
Pultenaea ericifolia	+	+					+
Templetonia biloba				+		+	
*Trifolium campestre	+	+					
*Trifolium angustifolium	+	+					
#Viminaria juncea				+			
Fumariaceae							
#*Fumaria capreolata	+						
Gentianaceae							
#Mitrasacme paradoxa				+	+		
#*Centaurium erythraea				+			
Goodeniaceae							
Goodenia caerulea	+	+		+			+
#Goodenia pulchella	+			+			
Goodenia micrantha				+			
Lechenaultia biloba		+		+		+	
#Lechenaultia expansa					+		
Scaevola canescens					+	+	
#Scaevola glanduligera				+			
Scaevola repens				+	+	+	
Haemodoraceae							
#Anigozanthos bicolor	+			+			
#Anigozanthos humilis					+	+	
Anigozanthos manglesii				+	+	+	
Conostylis aculeata				+	+	+	
Conostylis aurea					+	+	
Conostylis caricina		+		+	+		+
Conostylis setigera					+		
#Haemodorum brevisepalum					+		
Haemodorum laxum				+	+	+	
#Haemodorum paniculatum							
Haemodorum spicatum				+	+	+	
Phlebocarya ciliata					+	+	
Phlebocarya filifolia					+	+	
Tribonanthes brachypetala	+	+					
Tribonanthes longipetala				+			
Haloragaceae							
#Glishrocaryon aureum				+			
Gonocarpus pithyoides		+		+			

Flora of the Talbot Rd Bushland (cont.)

Taxon	wW	wmW	mjW	mW	bW	sS	lH
Hypoxidaceae							
Hypoxis occidentalis	+			+			+
Iridaceae							
*Hesperantha falcata	+	+		+			
*Gladiolus caryophyllaceus	+	+	+	+	+	+	+
#Orthrosanthos laxus				+			
Patersonia juncea	+						+
Patersonia occidentalis				+	+	+	
*Romulea rosea	+	+		+			+
*Sparaxis bulbifera				+			
Juncaceae							
#*Juncus bufonius							
Juncaginaceae							
#Triglochin centrocarpa				+			
Lamiaceae							
Hemiandra linearis					+	+	
#Hemiandra ?pungens					+		
Lauraceae							
#Cassytha aurea			+				
Cassytha pubescens	+	+					
Cassytha racemosa			+				+
Lobeliaceae							
#Lobelia heterophylla	+						
Lobelia tenuior					+		
Loranthaceae							
#Ameyema miquelii	+						
Nuytsia floribunda						+	
Loganiaceae							
#Logania campanulata					+		
#Logania vaginalis				+			
Mimosaceae							
Acacia auronitens				+	+	+	
Acacia ericifolia			+				+
#Acacia extensa				+			
Acacia huegelii			+		+	+	
#*Acacia longifolia				+			
#Acacia obovata			+				
Acacia lasiocarpa	+						
Acacia pulchella	+	+		+		+	
Acacia sessilis			+	+	+		
#Acacia teretifolia			+				
Acacia willdenowiana				+	+	+	

Flora of the Talbot Rd Bushland (cont.)

Taxon	wW	wmW	mjW	mW	bW	sS	lH
Myrtaceae							
Baeckea camphorosmae	+				+		+
#Baeckea crispiflora				+			
Beaufortia purpurea				+			+
Calothamnus sanguineus				+			+
#Calothamnus hirsutus				+			
#Calothamnus torulosus							+
Calytrix angulata					+	+	
#Calytrix aurea						+	
#Calytrix flavescens					+	+	
Eremaea pauciflora					+	+	
Eremaea aff brevifolia D.Coates MI175				+	+		
Eucalyptus calophylla		+	+	+			
Eucalyptus marginata			+				
#Eucalyptus todtiana						+	
Eucalyptus wandoo	+	+					+
Hypocalymma angustifolium	+			+			+
Kunzea recurva				+	+	+	
#*Leptospermum laevigatum				+			
#Leptospermum erubescens				+			
#Melaleuca acerosa				+			
Melaleuca scabra	+	+		+	+	+	+
Melaleuca trichophylla					+	+	
Scholtzia involucrata 'erect'					+		
Scholtzia involucrata 'prostrate'						+	
Verticordia densiflora						+	
Verticordia pennigera							+
Orobanchaceae							
#Orobanche minor					+	+	
Orchidaceae							
Caladenia deformis				+			
Caladenia discoidea					+		
Caladenia filamentosa						+	
Caladenia gemmata							+
Caladenia huegelii				+			
Caladenia longicauda	+						
Caladenia sericea				+		+	
Diuris longifolia	+						
Eriochilus dilatatus			+	+	+		
Leporella fimbriata				+	+	+	+
Lyperanthus nigricans				+	+	+	
Lyperanthus serratus	+						
*Monadenia bracteata			+	+	+		
Prasophyllum fimbriata	+	+					
Pterostylis barbata	+						
Pterostylis recurva				+			+
Pterostylis vittata				+		+	
Thelymitra canaliculata				+			+
Thelymitra crinita	+	+		+			+

Flora of the Talbot Rd Bushland (cont.)

Taxon	wW	wmW	mjW	mW	bW	sS	lH
Oxalidaceae							
#*Oxalis pes-caprae	+						
#Oxalis perennans	+						
Philydraceae							
#Philydrella pygmaea							+
Phormicaceae							
Agrostocrinum scabrum				+			
Pittosporaceae							
Pronaya fraseri						+	
#Sollya heterophylla			+				
Poaceae							
#Aristida contorta					+		
*Aira caryophyllea				+		+	
Amphipogon turbinatus				+	+	+	+
*Avena barbata	+						+
*Briza maxima	+	+		+	+	+	+
*Briza minor				+			
#*Bromus diandrus							+
Danthonia caespitosa				+	+	+	+
Danthonia pilosa	+						
*Ehrharta calycina			+	+	+		
*Eragrostis curvula					+		
#Eragrostis elongata	+						
#Microlaena stipoides				+			
Neurachne alopecuroidea	+	+			+	+	
*Pentaschistis airoides						+	+
Poa drummondiana	+			+		+	
*Rhyncheletrum repens							
#Stipa elegantissima				+			
#Stipa campylachne				+			
Stipa compressa					+		
Stipa pycnostachya	+	+		+	+	+	+
#Stipa semibarbata				+			
Polygalaceae							
Comesperma calymega				+		+	
Portulacaceae							
#Calandrinia corrigioloides				+	+	+	
#Calandrinia granulifera					+		
#Calandrinia liniflora				+	+	+	
Proteaceae							
Adenanthos cygnorum					+	+	
Banksia attenuata					+		
Banksia grandis					+	+	
Banksia menziesii					+		
Conospermum acerosum					+		
#Conospermum huegelii				+			

Flora of the Talbot Rd Bushland (cont.)

Taxon	wW	wmW	mjW	mW	bW	sS	lH
#Conospermum incurvum						+	
Conospermum stoechadis					+	+	
Dryandra armata	+			+			
Dryandra nivea			+	+	+	+	+
#Dryandra sessilis			+	+			
Grevillea bipinnatifida				+			
#Grevillea endlicheriana				+			
#Grevillea glabrata				+			
#Hakea auriculata				+			
Hakea candolleana							+
Hakea erinacea				+			+
Hakea incrassata				+			+
Hakea lissocarpha	+	+					
Hakea myrtoides	+						
Hakea prostrata				+	+	+	+
Hakea ruscifolia			+	+	+	+	
#Hakea stenocarpa				+			
Hakea trifurcata				+		+	+
Hakea undulata				+			+
#Isopogon asper				+			
Isopogon drummondii					+	+	
#Isopogon dubius					+		
#Isopogon scabra				+			
Lambertia multiflora var. 'darlingensis' ms			+			+	
Persoonia saccata			+		+	+	
#Petrophile biloba				+			
Petrophile linearis				+	+	+	
#Petrophile striata				+			
Stirlingia latifolia			+		+	+	
Synaphea acutiloba	+			+			+
#Synaphea pinnata	+						
#Xylomelum occidentale			+				
Restionaceae							
Harperia lateriflora				+			+
Hypolaena exsulca				+	+	+	
Lepidobolus chaetocephalus				+	+		+
#Lepyrodia macra				+			
Loxocarya cinerea	+	+		+	+	+	
Loxocarya fasciculata	+			+	+	+	
Loxocarya flexuosa						+	
Lyginia barbata				+	+	+	+
Restio 'sinuosus' ms						+	
Restio sphacelatus						+	
Rhamnaceae							
Cryptandra arbutiflora	+		+				
#Cryptandra glabriflora			+	+	+		
Cryptandra pungens				+			
#Cryptandra spinescens							
Spyridium tridentatum				+		+	

Flora of the Talbot Rd Bushland (cont.)

Taxon	wW	wmW	mjW	mW	bW	sS	lH
Rubiaceae							
Opercularia vaginata	+	+		+			+
Rutaceae							
Boronia ramosa					+	+	
Eriostemon spicatus				+	+	+	
Stackhousiaceae							
#Stackhousia pubescens				+			
Tripterococcus brunonis	+			+			
Sterculiaceae							
#Thomasia foliosa			+				
#Thomasia grandiflora			+				
Stylidiaceae							
#Levenhookia pusilla					+		+
Levenhookia stipitata					+		
Stylidium affine	+						
Stylidium breviscapum				+			+
Stylidium brunonianum	+	+		+	+	+	
Stylidium bulbiferum	+	+					+
#Stylidium calcaratum				+	+	+	
Stylidium dichotomum				+			+
#Stylidium maitlandianum			+				
Stylidium petiolare							+
Stylidium piliferum					+	+	
Stylidium repens			+		+	+	+
Thymelaeaceae							
Pimelea imbricata var. piligera		+		+			+
Pimelea rosea			+	+			
Tremandraceae							
#Tetratheca nuda				+			
Violaceae							
Hybanthus calycinus			+		+	+	
Xanthorrhoeaceae							
Xanthorrhoea preissii	+	+		+		+	
#Xanthorrhoea acanthostachya						+	

Appendix 2B: Flora of the Brickwood Bushland

Records from quadrat data and opportunistic collecting, 1989-93. Families in alphabetical order and according to Marchant et al., (1987) unless indicated.

Key
opportunistic record
* non-native taxa

Plant Communities (see Map 2B, p20)
Wet *Melaleuca* and *Viminaria* Scrub(Site 4)
b W *Banksia* Low Woodland (Site 2)
m W Marri Woodland
wet Wet Marri Woodland (Site 1, 6, 7 & 8)
lat Lateritic Marri Woodland (Site 3)
jm W Jarrah and Marri Woodland (Site 9)
p H *Pericalymma* Heath (Site 5)

Taxon	Wet	bW	mW wet	mW lat	jmW	pH
Lycopsida (Fern Allies)						
Lycopodiaceae						
Phylloglossum drummondii	+					
Selaginellaceae						
Selaginella gracillima	+					
Isoetaceae						
Isoetes australis	+					
Gymnosperms						
Zamiaceae						
#Macrozamia riedlei		+			+	
Angiosperms						
Amaranthaceae						
#Ptilotus manglesii			+			
Anthericaceae						
Arnocrinum preissii		+				
Borya scirpoidea			+	+	+	
#Borya shaerocephala	+					
Caesia micrantha	+			+	+	
Caesia occidentalis			+			
Chamaescilla corymbosa		+	+	+		
Johnsonia sp GJK 5249		+	+		+	
Laxmannia sessiliflora		+	+		+	
Sowerbaea laxiflora		+				
Thysanotus manglesianus			+		+	
Thysanotus multiflorus			+			
Thysanotus patersonii		+	+	+	+	
Thysanotus sparteus			+	+	+	
Thysanotus thyrsoides			+			
Thysanotus triandrus		+	+		+	

Flora of the Brickwood Bushland (cont.) Taxon	Wet	bW	mW wet	mW lat	jmW	pH
Tricoryne elatior		+	+	+	+	
Tricoryne humilis		+	+			
#Tricoryne tenella			+			
Apiaceae						
Hydrocotyle alata			+			
Hydrocotyle diantha				+		
Hydrocotyle pilifera				+		
#Schoenolaena juncea	+					
Trachymene pilosa		+		+		
Xanthosia huegelii		+	+	+	+	+
Asteraceae						
*Aster subulatus	+					
#*Dittrichia graveolens	+					
Hyalospermum cotula		+	+	+		
*Hypochaeris glabra	+	+	+	+	+	+
#Podolepis gracilis'Swamp White'[1]	+			+		
#Podotheca angustifolia					+	
Quinetia urvillei		+	+			
Senecio quadridentatus	+					+
Siloxeris humifusus	+					
Sonchus hydrophilus[2]	+					
*Sonchus oleraceus	+					
#Trichocline sp GJK 6382	+					
*Ursinia anthemoides	+		+			
#Waitzia paniculata		+				
Caesalpiniaceae						
Labichea punctata		+			+	
Campanulaceae						
Wahlenbergia preissii				+		
Casuarinaceae						
Allocasuarina humilis			+		+	
Allocasuarina microstachya			+			
Centrolepidaceae						
Aphelia cyperoides	+		+	+		
#Centrolepis alepyroides	+		+			
#Centrolepis aristata			+			
#Centrolepis drummondiana		+				
#Centrolepis glabra	+					
#Centrolepis humillima	+		+			
Colchicaceae						
Burchardia multiflora	+		+			
Burchardia umbellata		+			+	
Wurmbea dioica						+
Wurmbea dioica 'Swamp Form'[3]	+					

Flora of the Brickwood Bushland (cont.) Taxon	Wet	bW		mW wet	mW lat	jmW	pH
Crassulaceae							
Crassula colorata		+					
Cyperaceae							
Baumea acuta	+						
Baumea juncea	+						
Baumea preissii	+						
Chorizandra enodis	+						
Cyathochaeta avenacea				+	+		+
#Cyathochaeta clandestina						+	
*Cyperus tenellus	+						
#Isolepis cernua	+						
Isolepis marginata	+			+			
Isolepis oldfieldiana	+						
Lepidosperma angustatum				+	+		+
Lepidosperma aff. angustatum		+					
#Lepidosperma leptostachyum		+					
Lepidosperma ?tenue					+		
#Mesomelaena graciliceps		+				+	
Mesomelaena pseudostygia		+			+		
Mesomelaena tetragona				+	+		+
#Schoenus asperocarpus				+			
Schoenus brevisetis		+		+	+		
#Schoenus bifidus	+						
Schoenus clandestinus					+		
#Schoenus curvifolius				+		+	
Schoenus nanus				+			
#Schoenus odontocarpus			+				+
#Schoenus rigens					+		
#Schoenus rodwayanus				+			
Schoenus subbulbosus		+				+	
Schoenus subflavus		+		+			
#Schoenus tenellus	+						
Schoenus unispiculatus	+				+		+
Schoenus sp				+			
Tetraria octandra		+		+			+
Tricostularia neesii		+		+		+	
Dasypogonaceae							
Calectasia cyanea		+					
Calectasia grandiflora					+		
Dasypogon bromeliifolius		+		+	+		
Kingia australis		+		+	+	+	
Lomandra britttanii				+		+	
#Lomandra caespitosa		+				+	
Lomandra hermaphrodita				+	+	+	
Lomandra odora				+			
Lomandra preissii				+		+	
Lomandra purpurea					+		
Dilleniaceae							
Hibbertia acerosa		+		+		+	

Flora of the Brickwood Bushland (cont.) Taxon	Wet	bW		mW wet	mW lat	jmW	pH
Hibbertia huegelii		+					
Hibbertia hypericoides		+				+	
#Hibbertia stellaris	+			+			
#Hibbertia vaginata		+					
Droseraceae							
Drosera erythrorhiza		+		+			
#Drosera glanduligera				+			
Drosera gigantea				+			
Drosera heterophylla				+			
Drosera menziesii ssp menziesii				+	+		
Drosera menziesii ssp penicillaris					+		
#Drosera nitidula	+						
Drosera palacea ssp palacea		+					
Drosera pallida				+			
Drosera rosulata				+	+		
Drosera stolonifera		+		+			
Drosera subhirtella ssp subhirtella			+				
Epacridaceae							
Astroloma pallidum				+			
Conostephium pendulum		+				+	
Lysinema ciliatum		+					
Euphorbiaceae							
Poranthera microphylla		+					
Stachystemon vermicularis		+					
Fabaceae (Papilionaceae)							
#Aotus gracillima	+						
#Aotus procumbens				+			
Bossiaea eriocarpa		+					
Daviesia decurrens				+			
#Daviesia nudiflora		+					
Daviesia physodes				+			
#Daviesia preissii					+		
Gompholobium confertum				+		+	
Gompholobium aristatum		+		+	+		
Gompholobium marginatum		+		+			
#Gompholobium polymorphum						+	
Gompholobium tomentosum		+				+	
#Hovea trisperma		+				+	
#Jacksonia ?sericea						+	
#Jacksonia furcellata		+		+			
Jacksonia sternbergiana		+		+		+	+
#Kennedia prostrata		+		+	+		
*Lotus angustissimus	+						
Nemcia capitata				+	+		
Nemcia reticulata				+			
*Ornithopus compressus	+			+			
#Sphaerolobium vimineum					+		
Viminaria juncea	+				+		

Flora of the Brickwood Bushland (cont.)

Taxon	Wet	bW	mW wet	mW lat	jmW	pH
Gentianaceae						
#Centaurium erythraea	+					
Goodeniaceae						
Dampiera alata	+					+
Dampiera linearis		+	+	+	+	+
Goodenia caerulea			+	+		
Goodenia pulchella						
Lechenaultia biloba			+			
Lechenaultia expansa			+			
Scaevola glandulifera			+			
Scaevola lanceolata			+			
Velleia trinervis		+		+		
Haemodoraceae						
Anigozanthos manglesii			+			
Anigozanthos viridis			+			
Conostylis aculeata			+			
#Conostylis caricina			+			
Conostylis juncea		+			+	
Conostylis setigera			+	+		
Haemodorum discolor			+			
Haemodorum laxum		+	+	+		
#Haemodorum simplex			+			
#Haemodorum sparsiflorum			+			
Haemodorum spicatum			+			
#Phlebocarya ciliata		+				
Phlebocarya filifolia		+			+	
Tribonanthes australis	+		+			
#Tribonanthes longipetala			+			
Haloragaceae						
#Gonocarpus pithyoides				+		
Hypoxidaceae						
Hypoxis occidentalis	+		+			
Iridaceae						
#Patersonia juncea		+	+			
Patersonia occidentalis			+	+		+
Patersonia occidentalis 'Swamp Form'[4]			+			
*Romulea rosea			+			
*Watsonia bulbillifera	+		+			
*Watsonia meriana	+					
Juncaceae						
Juncus bufonius	+		+			
#*Juncus capitatus	+					
Juncus holoschoenus	+					

Flora of the Brickwood Bushland (cont.) Taxon	Wet	bW	mW wet	mW lat	jmW	pH
Lauraceae						
#Cassytha flava	+		+			
Cassytha glabella			+			+
#Cassytha racemosa				+		
Lentibulariaceae						
#Polypompholyx multifida	+					
#Utricularia inaequalis	+					
Lobeliaceae						
#Isotoma hypocrateriformis					+	
Lobelia tenuior		+				
#*Monopsis simplex	+					
Loranthaceae						
Nuytsia floribunda			+	+		
*Lythraceae						
#*Lythrum hyssopifolia	+					
Mimosaceae						
Acacia drewiana			+			
#Acacia huegelii		+			+	
Acacia lasiocarpa			+			
#Acacia pulchella			+			
#Acacia saligna			+			
Acacia sessilis			+			
Acacia stenoptera					+	
#Acacia teretifolia					+	
Myrtaceae						
Baeckea camphorosmae		+				+
Calytrix angulata		+			+	
#Calytrix aurea				+		
Darwinia thymoides			+			
Eremaea aff brevifolia D.Coates MI175		+		+	+	
Eucalyptus calophylla			+	+	+	
#Eucalyptus lane-poolei			+			
#Eucalyptus marginata			+		+	
Hypocalymma robustum		+				
Kunzea micrantha	+		+	+		
Kunzea recurva			+			+
Melaleuca lateriflora	+					
Melaleuca preissiana			+			
Melaleuca viminea	+					
Pericalymma ellipticum			+	+		+
Verticordia densiflora			+			
#Verticordia lindleyi ssp lindleyi			+			
Verticordia pennigera			+			
Vertcordia plumosa			+			
#Verticordia serrata	+				+	

Flora of the Brickwood Bushland (cont.)

Taxon	Wet	bW	mW wet	mW lat	jmW	pH
Onagraceae						
#Epilobium billardierianum	+					
Orchidaceae						
#Caladenia sp	+		+			
#Diuris laxiflora			+			
Eriochilus dilatatus			+			
Leporella fimbriata		+				
Lyperanthus nigricans		+				
#Lyperanthus serratus					+	
#Microtis media		+			+	
#*Monadenia bracteata			+			
Prasophyllum drummondii	+					
Prasophyllum ?elatum		+	+			
Thelymitra crinita			+			
Philydraceae						
#Philydrella drummondii	+					
Philydrella pygmaea	+		+	+		
Phormicaceae						
#Agrostocrinum scabrum			+			
Pittosporaceae						
#Pronaya fraseri					+	
Poaceae						
#Agrostis avenacea			+		+	
Agrostis pleibia	+		+			
#*Aira caryophyllea	+				+	
Amphipogon debilis			+	+		
Amphipogon turbinatus		+				
*Briza maxima			+			+
*Briza minor	+		+	+		
Danthonia occidentalis			+			
Danthonia ?pilosa			+			
#*Ehrharta calycina		+	+			
*Eragrostis curvula	+		+	+		
Neurachne alopecuroidea			+	+		
#*Paspalum dilatatum	+					
*Pennisetum clandestinum	+					
*Pentachistis airoides			+			
#*Phleum pratense	+					
Polypogon tenellus	+					
#Stipa compressa			+			
Stipa ?semibarbata			+		+	
*Vulpia bromoides			+			
*Vulpia myuros			+			+
Polygalaceae						
Comesperma calymega		+				
#Comesperma virgatum		+	+			

Flora of the Brickwood Bushland (cont.) Taxon	Wet	bW	mW wet	mW lat	jmW	pH
Primulaceae						
*#Anagallis arvensis	+	+				
Proteaceae						
#Adenanthos meisneri		+			+	
Banksia attenuata		+				
Banksia menziesii		+				
Conospermum stoechadis		+				
#Dryandra bipinnatifida			+			
Dryandra nivea		+	+	+		
#Dryandra sessilis					+	
Grevillea bipinnatifida			+			
Grevillea pilulifera			+			
#Grevillea quercifolia					+	
#Grevillea wilsonii					+	
#Hakea auriculata			+			
Hakea ceratophylla			+	+		+
Hakea incrassata			+			
#Hakea lissocarpha					+	
Hakea prostrata		+	+			
Hakea ruscifolia		+				
#Hakea stenocarpa					+	
Hakea sulcata						+
Hakea trifurcata			+			
#Hakea undulata					+	
Hakea varia						+
Isopogon asper			+			
#Lambertia multiflora var. 'darlingensis' ms						+
#Persoonia saccata					+	
#Petrophile linearis		+			+	
Petrophile media var. juncifolia			+			
#Petrophile striata					+	
Petrophile seminuda			+			
Stirlingia latifolia			+	+	+	
Synaphea petiolaris			+	+		+
#Xylomelum occidentale		+			+	
Restionaceae						
#Harperia lateriflora			+			
Hypolaena exsulca			+	+	+	+
#Leptocarpus aristatus			+			
Leptocarpus co-angustatus	+					+
Lepyrodia macra			+	+		
#Loxocarya cinerea			+			
Loxocarya fasciculata			+	+		+
Loxocarya flexuosa			+		+	
Lyginia barbata			+			
Restio leptocarpoides	+					
#Restio 'sinuosus' ms		+			+	
Rubiaceae						
#Opercularia vaginata					+	

Flora of the Brickwood Bushland (cont.) Taxon	Wet	bW	mW wet	mW lat	jmW	pH
Rutaceae						
Eriostemon spicatus			+	+		+
Schrophulariacea						
#Grattiola peruviana	+					
Stackhousiaceae						
#Stackhousia huegelii			+			
Tripterococcus brunonis				+	+	
Stylidiaceae						
Levenhookia pusilla		+	+	+	+	+
Levenhookia stipitata		+	+		+	
Stylidium brunonianum		+	+			
#Stylidium bulbiferum			+			
Stylidium dichotomum			+	+		
Stylidium ecorne						
Stylidium mimeticum			+	+		
Stylidium petiolare				+		
Stylidium piliferum		+				
Stylidium pulchellum	+			+		
#Stylidium repens		+	+		+	
#Stylidium utricularioides	+		+			
Thymelaeaceae						
#Pimelea imbricata var major			+			
Tremandraceae						
#Tetratheca hirsuta			+			
Xanthorrhoeaceae						
Xanthorrhoea preissii		+	+	+		

1 A robust form found on the inundated Pinjarra Plain.
2 G.J.Keighery has determined *Sonchus* aff. *asper* as *Sonchus hydrophilus.*
3 A large form of *Wurmbea dioica*, also found at Brixton St (Keighery and Keighery, 1991)
4 A fine and more floriferous form of *Patersonia occidentalis.*

Appendix 2C: Flora of Cardup Nature Reserve

Records from quadrat data and opportunistic collecting, 1989-93. Families in alphabetical order and names after Marchant et al. (1987) unless indicated.

Key
opportunistic record
* weed

Plant Communities (see Map 2C, p 21)
Wet Wetland (Site 10)
D r Drainage line (Site 4)
b W *Banksia* Low Woodland(Sites, 2, 5, 6,7 & 11)
m W Marri Woodland (Sites 14 & 15)
mj W Jarrah/Marri Woodland (Sites 8 & 9)
j W Jarrah Woodland (Sites 1 & 3)
T r Tracks

Taxon	Wet	Dr	bW	mW	mjW	jW	Tr
Gymnosperms							
Zamiaceae							
#Macrozamia riedlei							
Angiosperms							
Aizoaceae							
#Macarthuria australis					+		
Amaranthaceae							
#Ptilotus declinatus			+				
#Ptilotus drummondii				+			
Ptilotus manglesii				+			
#Ptilotus stirlingii				+			
Anthericaceae							
Agrostocrinum scabrum			+				
Arnocrinum preissii			+				
#Arthropodium capillipes	+			+			
#Borya sphaerocephala				+			
Caesia micrantha				+	+		
Chamaescilla corymbosa		+	+	+	+	+	
Johnsonia pubescens				+			
Johnsonia sp. GJK 5249			+			+	
Laxmannia sessiliflora						+	
Laxmannia squarrosa			+				
Sowerbaea laxiflora				+	+	+	
Thysanotus manglesianus			+			+	
Thysanotus multiflorus				+			
Thysanotus patersonii			+			+	
Thysanotus sparteus			+				
Thysanotus thyrsoides			+	+		+	
Thysanotus triandrus			+	+		+	
Tricoryne elatior				+	+	+	

Flora of Cardup Nature Reserve (cont.)

Taxon	Wet	Dr	bW	mW	mjW	jW	Tr
Apiaceae							
Eryngium pinnatifidum ssp 'palustre' ms					+		
Homalosciadium homalocarpum			+	+			
#Hydrocotyle alata				+			
#Hydrocotyle pilifera						+	
Pentapeltis peltigera						+	
#Platysace juncea				+			
Trachymene pilosa			+		+	+	
Xanthosia huegelii			+	+		+	
Asteraceae							
#*Arctotheca calendula							+
Asteridia pulverulenta			+				
*Hypochaeris glabra	+	+	+	+	+		
#Hyalospermum cotula				+		+	
Lagenifera huegelii					+	+	
#Millotia myosotidifolia			+				
#Olearia elaeophila			+				
#Olearia paucidentata						+	
Podolepis gracilis					+		
#Pseudognaphalium luteoalbum	+						
Quinetia urvillei	+		+			+	
Pithocarpa sp			+				
Siloxeris ?filifolius							
Siloxeris humifusus	+						
*Sonchus oleraceus					+		
*Ursinia anthemoides	+	+	+	+	+	+	
*Vellereophyton dealbatum	+						
#Waitzia paniculata			+				
Waitzia suaveolens			+			+	
Caesalpiniaceae							
Labichea punctata			+		+	+	
Campanulaceae							
Wahlenbergia preissii			+	+			
Caryophyllaceae							
*Silene gallica		+					
Casuarinaceae							
#Casuarina obesa	+				+		
Allocasuarina humilis			+	+		+	
Allocasuarina thuyoides			+				
Centrolepidaceae							
Centrolepis aristata	+						
#Centrolepis drummondiana			+		+		
Colchicaceae							
#Burchardia multiflora				+			
Burchardia umbellata			+	+	+	+	
#Wurmbea dioica				+			

Flora of Cardup Nature Reserve (cont.)

Taxon	Wet	Dr	bW	mW	mjW	jW	Tr
Crassulaceae							
Crassula colorata	+	+	+		+		
Crassula decumbens	+			+			
Crassula peduncularis			+			+	
Cyperaceae							
Cyathochaeta avenacea			+	+	+		
#*Cyperus tenellus				+			
Isolepis cernua	+						
Isolepis oldfieldiana	+						
Lepidosperma angustatum			+	+	+	+	
#Lepidosperma leptostachyum					+		
Lepidosperma ?tenue			+	+			
Mesomelaena pseudostygia			+	+		+	
Mesomelaena tetragona			+	+	+	+	
Schoenus brevisetis			+		+		
Schoenus caespititius			+			+	
Schoenus clandestinus					+		
#Schoenus curvifolius			+				
Schoenus subbulbosus			+			+	
Schoenus subflavus			+		+	+	
Tetraria octandra			+	+	+	+	
#Tricostularia neesii			+				
Dasypogonaceae							
Calectasia cyanea			+			+	
Dasypogon bromeliifolius		+	+	+	+	+	
Dasypogon obliquifolius			+		+		
Kingia australis				+	+		
#Lomandra britttanii						+	
Lomandra caespitosa			+		+	+	
Lomandra hermaphrodita			+		+	+	
Lomandra nigricans			+		+	+	
Lomandra odora					+		
Lomandra preissii			+		+	+	
Lomandra purpurea				+			
Lomandra sericea			+		+		
#Lomandra suaveolens							
Dilleniaceae							
#Hibbertia acerosa			+		+		
Hibbertia huegelii			+		+	+	
Hibbertia hypericoides	+		+	+		+	
Hibbertia vaginata			+		+	+	
Droseraceae							
Drosera erythrorhiza			+	+	+	+	
Drosera gigantea	+			+			
Drosera glanduligera	+		+	+	+	+	
Drosera palacea ssp palacea	+		+			+	
Drosera macrantha			+		+	+	
Drosera macrantha 'robust'[1]				+			
Drosera menziesii ssp penicillaris						+	

Flora of Cardup Nature Reserve (cont.)

Taxon	Wet	Dr	bW	mW	mjW	jW	Tr
#Drosera palaceaa			+		+	+	
Drosera stolonifera			+	+	+	+	
Epacridaceae							
Andersonia lehmanniana ssp lehmanniana				+		+	
Astroloma pallidum			+			+	
Astroloma stomarrhena			+				
Conostephium pendulum			+			+	
Conostephium preissii			+				
Lysinema ciliatum			+				
Styphelia tenuiflora			+			+	
Euphorbiaceae							
Monotaxis grandiflora						+	
#Poranthera huegelii						+	
Poranthera microphylla						+	
Stachystemon vermicularis			+			+	
Fabaceae (Papilionaceae)							
Aotus procumbens	+						
Bossiaea eriocarpa			+		+	+	
Bossiaea ornata			+	+		+	
Daviesia decurrens			+	+			
Daviesia physodes			+		+	+	
Daviesia triflora			+		+		
#Daviesia nudiflora					+		
Gompholobium confertum			+			+	
Gompholobium knightianum						+	
Gompholobium marginatum				+			
#Gompholobium preissii						+	
#Gompholobium polymorphum						+	
Gompholobium tomentosum		+	+		+	+	
#Hovea chorizemifolia					+		
Hovea trisperma			+	+	+		
#Isotropis cuneifolia					+		
Jacksonia sternbergiana		+			+	+	
#Kennedia coccinea					+		
Kennedia prostrata			+		+		
#*Lupinus angustifolius							+
Nemcia reticulata					+		
*Ornithopus compressus	+		+				
Sphaerolobium vimineum				+		+	
Templetonia biloba				+		+	
*Trifolium arvense		+					
#*Trifolium dubium							
Geraniaceae							
*Erodium botrys		+					
Gentianaceae							
#*Cicendia filiformis	+						

Flora of Cardup Nature Reserve (cont.) Taxon	Wet	Dr	bW	mW	mjW	jW	Tr
Goodeniaceae							
Dampiera linearis				+	+		
#Goodenia caerulea						+	
Lechenaultia biloba			+	+		+	
Scaevola phlebopetala				+			
Scaevola repens						+	
Haemodoraceae							
Anigozanthos humilis			+				
Anigozanthos manglesii				+		+	
Anigozanthos humilis X manglesii			+			+	
Conostylis aculeata			+	+		+	
Conostylis aurea			+				
Conostylis juncea			+	+	+	+	
Conostylis setigera			+		+		
Conostylis setosa			+			+	
Haemodorum laxum			+		+	+	
#Haemodorum paniculatum			+			+	
Haemodorum sparsiflorum			+				
Haemodorum spicatum			+			+	
Phlebocarya ciliata					+		
Phlebocarya filifolia			+		+	+	
Haloragaceae							
#Gonocarpus pithyoides			+			+	
Hypoxidaceae							
#Hypoxis occidentalis				+			
Iridaceae							
#*Homeria flaccida			+				+
Patersonia juncea	+		+	+		+	
Patersonia occidentalis			+				
*Romulea rosea	+	+	+	+			
Juncaceae							
#*Juncus bufonius	+						
#Juncus capitatus	+						
Juncus pallidus	+						
#Juncus polyanthemus	+						
Juncaginaceae							
#Triglochin centrocarpum	+						
Lauraceae							
Cassytha flava				+			
Cassytha glabella						+	
Cassytha racemosa				+			
Lentibulariaceae							
#Polypompholyx multifida				+			

Flora of Cardup Nature Reserve (cont.)

Taxon	Wet	Dr	bW	mW	mjW	jW	Tr
Lobeliaceae							
Isotoma hypocrateriformis				+		+	
#Lobelia tenuior						+	
Loranthaceae							
Nuytsia floribunda					+		
Loganiaceae							
#Mitrasacme paradoxa	+						
Logania serpyllifolia			+				
Mimosaceae							
#Acacia barbinervis			+			+	
#Acacia drewiana					+		
#Acacia huegelii			+				
#*Acacia longifolia							+
#Acacia pulchella						+	
#Acacia saligna				+			
Acacia sessilis			+			+	
Acacia stenoptera				+		+	
Acacia willdenowiana			+	+	+	+	
Myrtaceae							
Baeckea camphorosmae		+	+	+		+	
Calytrix angulata			+				
#Calytrix flavescens		+	+			+	
Eremaea pauciflora			+		+	+	
Eremaea aff brevifolia D.Coates MI175			+				
Eucalyptus calophylla	+	+	+	+	+		
Eucalyptus marginata			+	+	+	+	
Hypocalymma angustifolium				+			
Hypocalymma robustum			+		+	+	
#Kunzea micrantha				+			
#Kunzea recurva				+			
Melaleuca acerosa			+				
Melaleuca preissiana	+						
Melaleuca thymoides					+		
#Melaleuca viminea	+						
#Pericalymma ellipticum				+			
Scholtzia involucrata 'prostrate'			+		+	+	
Orobanchaceae							
#Orobanche minor				+			
Orchidaceae							
#Caladenia deformis						+	
Caladenia discoidea			+				
Caladenia flava			+	+		+	
#Caladenia marginata						+	
Caladenia reptans			+			+	
Diuris aff. longifolia				+	+		
#Diuris magnifica D.Jones				+			
#Drakea glyptodon			+				

Flora of Cardup Nature Reserve (cont.) Taxon	Wet	Dr	bW	mW	mjW	jW	Tr
#Elythranthera brunonis						+	
Eriochilus dilatatus			+			+	
Leporella fimbriata			+	+	+	+	
Lyperanthus nigricans	+		+	+		+	
#Lyperanthus serratus				+			
#Microtis media						+	
*Monadenia bracteata	+	+	+	+	+	+	
Prasophyllum parviflorum				+			
#Pterostylis recurva						+	
Pterostylis vittata			+	+		+	
Thelymitra crinita				+		+	
Thelymitra sp						+	
Phormicaceae							
Agrostocrinum scabrum					+	+	
Pittosporaceae							
Pronaya fraseri			+	+		+	
Poaceae							
#*Aira cupaniana						+	
#Aristida contorta						+	
Amphipogon turbinatus				+	+	+	+
*Avena barbata							
*Briza maxima		+	+	+			+
*Briza minor				+			+
#Bromus diandrus							
#Danthonia ?occidentalis			+			+	+
*Ehrharta calycina		+	+				
*Ehrharta longiflora		+	+	+			
*Eragrostis curvula					+		
Eragrostis elongata	+						
Neurachne alopecuroidea				+		+	
#*Pentachistis thunbergii							+
#Poa drummondiana			+		+		
Poa sp	+						
#Stipa elegantissima				+			
#Stipa compressa			+		+		
Stipa ?pycnostachya				+		+	
#Stipa aff. trichophylla	+						
#*Vulpia myuros			+				+
Polygalaceae							
#Comesperma calymega			+				
Comesperma virgatum			+				
Primulaceae							
*Anagallis arvensis	+		+				
Proteaceae							
Adenanthos meisneri					+	+	
Banksia attenuata			+		+	+	
Banksia grandis			+				

Flora of Cardup Nature Reserve (cont.)

Taxon	Wet	Dr	bW	mW	mjW	jW	Tr
Banksia menziesii			+		+	+	
#Conospermum stoechadis			+			+	
#Dryandra bipinnatifida						+	
Dryandra nivea		+	+	+	+	+	
#Dryandra sessilis						+	
Grevillea bipinnatifida				+			
Grevillea pilulifera			+	+		+	
#Grevillea quercifolia						+	
#Grevillea wilsonii						+	
Hakea cyclocarpa				+		+	
Hakea lissocarpha						+	
#Hakea prostrata				+			
Hakea ruscifolia			+			+	
#Hakea stenocarpa			+			+	
#Hakea trifurcata						+	
#Isopogon asper				+			
#Lambertia multiflora var. darlingensis ms						+	
#Persoonia elliptica						+	
#Persoonia saccata						+	
Petrophile linearis			+		+	+	
Petrophile macrostachya			+				
Petrophile striata			+				
Stirlingia latifolia		+	+	+	+	+	
#Synaphea petiolaris						+	
Xylomelum occidentale			+		+	+	
Restionaceae							
Hypolaena exsulca		+	+	+	+	+	
Lepidobolus chaetocephalus						+	
#Leptocarpus co-angustatus	+						
Lepyrodia macra/muirii	+						
#Loxocarya cinerea			+				
Loxocarya fasciculata		+	+	+	+	+	
Loxocarya flexuosa			+			+	
Lyginia barbata			+	+	+	+	
Restio leptocarpoides	+						
#Restio 'sinuosus' ms			+			+	
Rubiaceae							
#Opercularia vaginata						+	
Rutaceae							
#Boronia spathulata				+		+	
Eriostemon spicatus			+	+		+	
Schrophulariacea							
*Dischisma capitatum		+					
Stackhousiaceae							
Stackhousia pubescens			+	+			
Tripterococcus brunonis			+			+	

Flora of Cardup Nature Reserve (cont.) Taxon	Wet	Dr	bW	mW	mjW	jW	Tr
Stylidiaceae							
Levenhookia pusilla				+		+	
Stylidium brunonianum			+		+	+	
#Stylidium bulbiferum				+			
Stylidium calcaratum			+	+		+	
Stylidium dichotomum				+			
#Stylidium junceum						+	
Stylidium piliferum			+			+	
Stylidium repens			+	+			
#Stylidium schoenoides			+				
Thymelaeaceae							
Pimelea imbricata var piligera				+			
Pimelea suaveolens			+				
Pimelea sulphurea						+	
Tremandraceae							
#Tetratheca hirsuta			+				
#Tetratheca setigera						+	
Violaceae							
#Hybanthus calycinus						+	
Xanthorrhoeaceae							
Xanthorrhoea preissii	+	+	+	+	+	+	

1 A robust form of *Drosera macrantha* confined to the Swan Coastal Plain (A. Lowrie, pers. comm.)

Appendix 3: Significant Flora of the Three Bushland Areas

Key

Column 1 Taxa in family, listed alphabetically. Names and distributions follow Marchant et al. unless noted.

Column 2 T: Talbot Rd Bushland
B: Brickwood Bushland
C: Cardup Nature Reserve

Column 3 East: Taxa endemic to the eastern side of the Plain
*RH: Taxa confined to the the Ridge Hill Shelf in the Perth Region
Plateau: Taxa on the eastern side of the Plain and the Darling Plateau in the Perth Region.
RH: Ridge Hill Shelf and the Darling Plateau in the Perth Region.
JF: Taxa confined to the Jarrah Forest
Symbols underlined in column 3 indicate that these taxa have occasional occurrences on the western side of the Swan Coastal Plain.

Column 4 Conservation Code, Priority Code. Atkins, 28/10/1992.
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 5 Significant Record
SR: Southern most record
NR: Northern most occurrence
PR: New record for the Perth Region
SCP: New record on the Swan Coastal Plain

Taxon	Bushland Area	East& other	Priority	Significant Record
Amaranthaceae				
Ptilotus declinatus	T C	Plateau		
Ptilotus manglesii	T B C	Plateau		
Anthericaceae				
Arthropodium preissii	T	Plateau		
Borya scirpoidea	T B	Other		
Borya sphaerocephala	T B C	Plateau		
Caesia occidentalis	B	Other		
Chamaescilla versicolor	T	RH		SCP
Johnsonia GJK 5249	B C	East		New taxa
Laxmannia grandiflora	T	RH		
Thysanotus dichotomus	T	Plateau		
Thysanotus glaucus	T	Plateau	4	
Tricoryne humilis	T B	Plateau		
Apiaceae				
Actinotus leucocephalus	T	Plateau		

Taxon	Bushland Area	East& other	Priority	Significant Record
Eryngium pinnatifidum ssp 'palustre' ms	C	East	1	
Pentapeltis peltigera	C	Plateau/JF		
Platysace juncea	C	Plateau		
Schoenoleana juncea	B	Plateau		
Xanthosia candida	T	RH		
Xanthosia ciliata	T	RH/JF		
Asteraceae				
Olearia paucidentata	T C	RH		
Podolepis gracilis 'Swamp White'	B	?East		New taxa
Trichocline spathulata	T	Plateau		
Trichocline sp GJK 6382	B	East		New Taxa
Sonchus hydrophilus	B			
Casuarinaceae				
Allocasuarina microstachya	B	Other, second record in the PR		
Allocasuarina thuyoides	C	Other, second record in the PR		
Centrolepidaceae				
Centrolepis alepyoides	B	Plateau		
Centrolepis humillima	B	Plateau		
Colchicaceae				
Wurmbea dioica 'Swamp Form'	B	East		New taxa
Cyperaceae				
Caustis dioica	T	RH		
Chorizandra enodis	B	Other		
Cyathochaeta avenacea	T B C	Other		
Cyathochaeta clandestina	T B	Other		PR/NR (T)
Mesomelaena graciliceps	B	Plateau		
Mesomelaena tetragona	T B C	Plateau		
Schoenus nanus	B	Other (rarely collected in the PR)		
Schoenus odontocarpus	B	Other		
Schoenus unispiculatus	B	Other (PR confined to Plateau)		
Dasypogonaceae				
Dasypogon obliquifolius	T C	Other		SR (C)
Calectasia grandiflora	B	Other		
Kingia australis	T B C	Plateau, NR (T) on the SCP		
Lomandra brittanii	B C	Plateau		
Lomandra odora	T B C	Plateau		
Dilleniaceae				
Hibbertia commutata	T	Plateau		
Hibbertia vaginata	B C	eastern sands		
Droseraceae				
Drosera macrantha 'robust'	T C	East		
Drosera menziesii ssp menziesii	B	Plateau		
Drosera nitidula	B	Endemic to the SCP (Lowrie, 1987)		
Drosera rosulata	B	Endemic to the SCP (Lowrie, 1987)		

Taxon	Bushland Area	East& other	Priority	Significant Record
Epacridaceae				
Andersonia lehmanniana	T C	Plateau		
Astroloma stomarrhena	C	uncommon on east Plain		
Leucopogon cymbiformis	T	RH		
Leucopogon gracillimus	T	Plateau		
Styphelia tenuiflora	T C	Plateau		
Fabaceae (Papilionaceae)				
Bossiaea ornata	C	Plateau		
Chorizema dicksonii	T	RH		
Daviesia horrida	T			
Daviesia physodes	B C	Plateau	2	
Daviesia podophylla	T	Plateau		
Gompholobium aristatum	T B	Plateau, coastal limestone		
Gompholobium preissii	C	Plateau		
Gompholobium marginatum	T B C	Plateau		
Gompholobium polymorphum	B C	Plateau		
Jacksonia alata	T	RH		
Jacksonia condensata	T	RH		
Jacksonia decumbens	T	RH		P R
Kennedia coccinea	C	Plateau, coastal limestone		
Nemcia spathulatum	T	RH		
Pultenaea ericifolia	T	RH		
Templetonia biloba	T B C	Plateau		
Goodeniaceae				
Lechenaultia biloba	T B C	Plateau		
Scaevola glandulifera	T B	Plateau		
Scaevola lanceolata	B	Plateau		
Velleia trinervis	B	Plateau		
Haemodoraceae				
Anigozanthos bicolor	T	Plateau		
Conostylis caricina	T B	Plateau		
Conostylis setosa	C	Plateau		SCP, NR
Haemodorum discolor	B	Plateau		
Haemodorum simplex	B	Plateau		
Haemodorum sparsiflorum	B	Plateau		
Tribonanthes brachypetala	T	Plateau		
Tribonanthes longipetala	T B	Plateau		
Haloragaceae				
Glishrocaryon aureum	T	RH		
Gonocarpus pithyoides	T B C		3	
Iridaceae				
Patersonia juncea	T B C	Plateau		
Mimosaceae				
Acacia auronitens	T	RH		
Acacia barbinervis	C	Plateau		
Acacia drewiana	B C	Plateau		
Acacia ericifolia	T	RH		
Acacia extensa	T	RH		
Acacia lasiocarpa	B	East		

Taxon	Bushland Area	East& other	Priority	Significant Record
Acacia obovata	T	RH		
Acacia teretifolia	T B	Plateau		
Myrtaceae				
Baeckea camphorosmae	B C	Plateau		
Baeckea crispiflora	T	RH		
Beaufortia purpurea	T	RH		
Calothamnus hirsutus	T	Plateau		?SR
Calothamnus sanguineus	T	Plateau, coast		
Calothamnus torulosus	T	RH		
Calytrix aurea	T B	Plateau		?SR
Darwinia thymoides	B	Plateau		
Eucalyptus lane-poolei	B	RH		
Eucalyptus wandoo	T	Plateau		
Kunzea micrantha	B C	Other		
Melaleuca acerosa	T C	Other, PR coast and east		
Melaleuca lateriflora	B	Plateau, only one collection from PR		
Verticordia lindleyi ssp lindleyi	B	East	3	
Verticordia pennigera	T B	Plateau		
Verticordia plumosa	B	Plateau		
Verticordia serrata	B	Plateau		
Orchidaceae				
Prasophyllum drummondii	B	Plateau		
Philydraceae				
Philydrella pygmaea	T B	Plateau		
Phormicaceae				
Agrostocrinum scabrum	T B C	Plateau		
Poaceae				
Agrostis plebeia	B	Plateau		
Amphipogon debilis	B	Plateau		
Aristida contorta	T C	Plateau		PR
Neurachne alopecuroidea	T B C	Plateau		
Polypogon tenellus	B	Plateau		
Stipa campylachne	T	Plateau		Endemic to PR
Stipa elegantissima	T C	Other, east, scarp and coast in PR		
Stipa pycnostachya	T	Plateau		PR
Stipa semibarbata	T	third record		
Stipa aff. trichophylla	C	?New taxa, also Forrestfield		
Proteaceae				
Conospermum huegelii	T	Plateau		
Conospermum incurvum	T	Only record from a reserve in PR		
Dryandra armata	T	Plateau		
Dryandra bipinnatifida	B C	Plateau		
Grevillea bipinnatifida	T B C	Plateau		
Grevillea endlicheriana	T	RH		SCP
Grevillea glabrata ssp glabrata	T	RH		SCP
Grevillea pilulifera	B C	Plateau		
Grevillea quercifolia	C	Plateau		SCP
Grevillea wilsonii	B C	Plateau/JF		

Taxon	Bushland Area	East& other	Priority	Significant Record
Hakea auriculata	T B	Plateau		
Hakea ceratophylla	B	Plateau		
Hakea cyclocarpa	C	Plateau/JF		SCP
Hakea erinacea	T	Plateau		?SR
Hakea incrassata	B	Plateau		
Hakea lissocarpha	T B C	Plateau, coastal limestone		
Hakea myrtoides	T	RH	3	SCP
Hakea stenocarpa	T C	Plateau		
Hakea trifurcata	T B C	Plateau, coastal limestone		
Hakea undulata	T B	Plateau, coastal limestone		
Isopogon asper	T B C	Plateau		
Isopogon drummondii	T	*RH	1	
Isopogon dubius	T	Plateau		
Isopogon scaber	T	Plateau		
Lambertia multiflora 'var darlingensis'		T B C	*Plateau	
Persoonia elliptica	C	Plateau		
Petrophile biloba	T	Plateau		
Petrophile media var. juncifolia	B	East		
Petrophile seminuda	B	Plateau		
Petrophile striata	T B	Plateau		
Synaphea acutiloba	T	Plateau	3	Endemic to PR
Synaphea petiolaris	T B C	Plateau		
Synaphea pinnata	T	Plateau	4	SCP,Endemic PR
Restionaceae				
Harperia lateriflora	T B	Plateau		
Lepyrodia macra	B C	Other		
Rhamnaceae				
Cryptandra glabriflora	T	Plateau		
Sterculiaceae				
Thomasia foliosa	T	Plateau		
Thomasia grandiflora	T	Plateau		
Stylidiaceae				
Levenhookia pusilla	T B C	Plateau		
Levenhookia stipitata	T B	Plateau		
Stylidium affine	T	Plateau, JF		SCP
Stylidium bulbiferum[1]	T B C	Plateau		
Stylidium breviscapum	T	Plateau		
Stylidium dichotomum	T B C	Plateau		
Stylidium ecorne	B	Plateau		
Stylidium mimeticum	B	Plateau		
Styliduium pulchellum	B	Plateau		
Stylidium utricularioides	B	East		
Thymelaeaceae				
Pimelea imbricata				
var. piligera	T C	Plateau		
var. major	B	East		
Tremandraceae				
Tetratheca nuda	T	Plateau		

	Bushland Area	East& other	Priority	Significant Record
Xanthorrhoeaceae				
Xanthorrhea acanthostachya	T	RH		NR/SCP Endemic to PR

1 *Stylidium bulbiferum* has coastal and eastern forms, see p74. The taxonomic status of these forms is yet to be determined.

PART VIII: FLORISTICS OF THE WANDI NATURE RESERVE, TOWN OF KWINANA.

INTRODUCTION

Wandi Nature Reserve (Reserve 36110) is a small triangular shaped reserve of 30.59 hectares situated in the Town of Kwinana.on Hope Valley Road. This area of bushland was recognised in the System 6 Report as being an area of *Banksia* Open Woodland on grey sands (Bassendean Sands) 'in an undisturbed condition' and was recommended for vesting as a reserve for the conservation of flora and fauna. This recommendation has been implemented for several years.

GEOMORPHOLOGY AND SOILS

Wandi Nature reserve is located on the western margin of the Bassendean Sands (S8: Gozzard 1986). These aeolian sands are extremely well drained and have been leached since their deposition.

VEGETATION

A vegetation map is not necessary for this area as *Banksia* (*B. menziesii* and *B.attenuata*) and Sheoak (*Allocasuarina fraseriana*) Low Woodland covers all of Wandi Nature Reserve. A permanent site has been established in the area which will be included in a detailed floristic Survey of the Swan Coastal Plain, the GinGin to Busselton Bushland Survey. However the shrub, herb and sedge strata in the Reserve show considerable diversity in the species present and the density of some of these species. For example the dominant sedge in the sedge layer changes from *Lyginia barbata* on the low lying eastern side of the Reserve to *Mesomelaena pseudostygia* on the ridge to the west. The presence of *Mesomelaena pseudostygia* is interesting as it is generally found to be indicative of the Spearwood Dune System. *Eremaea pauciflora* follows the same pattern of distribution in the Reserve. The density of species present throughout the Reserve also changes, for example *Leucopogon conostephioides* is the dominant shrub on the ridge, but only one of three dominants to the east.

Wandi Nature reserve is mapped by Heddle et al. (1980) as being in the Bassendean Complex - Central and South, which encompasses the plant community observed at Wandi. However Heddle et al. record a transition from *Eucalyptus todtiana* to *E. marginata* in the region of Perth but both of these species are present at Wandi over 25 kms south of Perth.

The vegetation indicates that the Wandi Nature Reserve is located in the area of the interface between the Spearwood and Bassendean Sands.

Vegetation Condition

The Reserve is in Very Good Condition (Appendix 1, p 68) with all strata in the communities intact and only a few species of common non-aggressive weed species. present. Such weeds are **Ursinia anthemoides*, **Hypochaeris glabra* and **Aira cupaniana*

The dense understorey has allowed few opportunities for weed propagules to become established. The presence of mature *Jacksonia sternbergiana*, *Kunzea ericifolia* and *Adenanthos cygnorum* shrubs over two metres in height indicates that the bushland has not been disturbed by repeated fire and/or dieback. The absence of these two disturbance factors, so common in small patches of bushland in the metropolitan area, has contributed to the very good condition of the understorey.

On the southern margin of the Reserve there is some marginal occurrences of **Ehrharta calycina* that do not penetrate into the bushland.

FLORA

Wandi Nature Reserve contains over 165 taxa (Appendix 2, p68). Of these 158 are natives and 7 exotics. The Anthericaceae (13 taxa), Asteraceae (8 taxa), Cyperaceae (8 taxa), Dasypogonaceae (7 taxa), Epacridaceae (7 taxa), Fabaceae (13 taxa), Haemodoraceae (7 taxa), Myrtaceae (11 taxa), Orchidaceae (8 taxa), Proteaceae (9 taxa) and the Stylideaceae (7 taxa) are the most species diverse families.

These groups represent nearly two-thirds of the taxa present and are the principal components of the tree, shrub, herb and sedge strata of the plant communities of the Reserve. The shrub flora is rich in species of Epacridaceae, Fabaceae, Myrtaceae and Proteaceae as is expected in the south-west of WA but is relatively poor in the Mimosaceae (4 taxa). Indications are now that there is a low percentage of this family on the entire Swan Coastal Plain (GinGin to Busselton Bushland Survey, observations).

Significant Flora

Five species present at Wandi are of significance. These are

- *Gonocarpus pithyoides* , a Priority 3 species.
- *Brachyloma preissii* is an uncommon species of the sands on the western Swan Coastal Plain, currently; this is the only population of this species recorded from a reserve in the Perth area.
- *Caesia occidentalis* which on the Swan Coastal Plain has previously only been recorded in winter wet flats in Bassendean Sands.
- *Macarthuria australis*, here at the southern limit of its range (Marchant et al., 1987) and this population has a covering of golden hairs on young branchlets, a character it shares with an undescribed species of *Macarthuria* found in the Coojarloo area during the Sandplain Survey (Griffin and Keighery,1989).
- and *Eucalyptus todtiana* is here south of the recognised southern limit of its range, Armadale (Marchant et al., 1987).

CONCLUSION

Wandi Nature Reserve is a very good example of *Banksia* Woodland on the interface between the Spearwood and Bassendean Sands south of Perth. Although small in area the Reserve has a relatively high species diversity and the vegetation in remarkably good condition and deserves its recognition as a Nature Reserve.

ACKNOWLEDGEMENTS

The Department of Conservation and Land Management gave permission to undertake this survey in the Reserve.

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Appendix 1: Vegetation Site Description for the Wandi Nature Reserve

Site 1 : ***Banksia*** **Woodland.**
Banksia attenuata, B. menziesii **and** ***Allocasuarina fraseriana*** **Low Woodland over** ***Adenanthos cygnorum*** **and** ***Kunzea ericifolia*** **High Open Shrubland over** ***Stirlingia latifolia, Leucopogon conostephioides, Scholtzia involucrata*** **and** ***Hibbertia hypericoides*** **Low Open Heath over** ***Amphipogon turbinatus*** **Open Grassland, mixed Open Herbland and** ***Lyginia barbata*** **Open Sedgeland.**

CONDITION	Rating	Very Good	
Soil:	grey sand over grey sand: S8 Gozzard (1986)		
Litter	90%	Bare Ground	2%
Drainage:	good	Aspect:	gentle, SE

Appendix 2: Flora of the Wandi Nature Reserve

Records from quadrat data and opportunistic collecting, 1992-93. Families in alphabetical order. An * indicates non-native taxa.

GYMNOSPERMS

ZAMIACEAE
- Macrozamia riedlei

ANGIOSPERMS

AIZOACEAE
- *Carpobrotus edulis

AMARANTHACEAE
- Ptilotus drummondii
- Ptilotus polystachyus

ANTHERICACEAE
- Arnocrinum preissii
- Arthropodium capillipes
- Caesia occidentalis
- Corynotheca micrantha
- Laxmannia ramosa
- Sowerbaea laxiflora
- Thysanotus manglesianus
- Thysanotus multiflorus
- Thysanotus patersonii
- Thysanotus sparteus
- Thysanotus triandrus
- Thysanotus thyrsoideus
- Tricoryne elatior

APIACEAE
- Homalosciadium homalocarpum
- Hydrocotyle callicarpa
- Platysace compressa
- Trachymene pilosa
- Xanthosia huegelii

ASTERACEAE
- Asteridea pulverulenta
- *Hypochaeris glabra
- Lagenifera huegelii
- Pithocarpa pulchella
- Podolepis gracilis
- Podotheca chrysantha
- *Ursinia anthemoides
- Waitzia suaveolens

BRASSICACEAE
- Stenopetalum gracile

CAMPANULACEAE
- Wahlenbergia preissii

CASUARINACEAE
- Allocasuarina fraseriana
- Allocasuarina humilis

CENTROLEPIDACEAE
- Centrolepis drummondiana

COLCHICACEAE
- Burchardia umbellata

CRASSULACEAE
- Crassula colorata

CYPERACEAE
- Isolepis cernua
- Lepidosperma angustatum
- Lepidosperma ?tenue
- Mesomelaena pseudostygia
- Schoenus clandestinus
- Schoenus curvifolius
- Schoenus subbulbosus

Tetraria octandra

DASYPOGONACEAE
- Dasypogon bromeliifolius
- Calectasia cyanea
- Lomandra caespitosa
- Lomandra hermaphrodita
- Lomandra nigricans
- Lomandra preissii
- Lomandra suaveolens

DILLENIACEAE
- Hibbertia huegelii
- Hibbertia hypericoides
- Hibbertia racemosa
- Hibbertia subvaginata

DROSERACEAE
- Drosera erythorhiza
- Drosera leucoblasta
- Drosera menziesii ssp. penicillaris
- Drosera pallida

EPACRIDACEAE
- Astroloma pallidum
- Brachyloma preissii
- Conostephium pendulum
- Conostephium preissii
- Leucopogon conostephioides
- Leucopogon parviflorus
- Lysinema ciliatium

EUPHORBIACEAE
- Monotaxis grandiflora
- Phyllanthus calycinus
- Poranthera microphylla

FABACEAE (PAPILIONACEAE)
- Bossiaea eriocarpa
- Daviesia divaricata
- Daviesia triflora
- Gompholobium aristatum
- Gompholobium confertum
- Gompholobium tomentosum
- Hardenbergia comptoniana
- Hovea trisperma var. trisperma
- Isotropis cuneifolia
- Jacksonia furcellata
- Jacksonia sternbergiana
- Kennedia prostrata
- Nemcia reticulatua

GOODENIACEAE
- Dampiera linearis
- Lechenaultia floribunda
- Scaevola canescens
- Scaevola repens

HAEMODORACEAE
- Anigozanthos humilis
- Anigozanthos manglesii
- Conostylis aculeata ssp. aculeata
- Conostylis juncea
- Conostylis setigera
- Haemodorum spicatum
- Phlebocarya ciliata

HALORAGACEAE
- Gonocarpus pithyoides

IRIDACEAE
- *Gladiolus caryophyllaceus
- Patersonia occidentalis

JUNCACEAE
- Juncus bufonius

LAMIACEAE
- Hemiandra pungens

LAURACEAE
- Cassytha flava
- Cassytha pubescens

LOBELIACEAE
- Lobelia gibbosa
- Lobelia tenuior

LOGANIACEAE
- Mitrasacme paradoxa

MIMOSACEAE
- Acacia huegelii
- Acacia pulchella
- Acacia stenoptera
- Acacia willdenowiana

MOLLUGINACEAE
- Macarthuria australis

MYRTACEAE
- Calytrix angulata
- Calytrix flavescens
- Calytrix fraseri
- Eremaea pauciflora
- Eremaea aff brevifolia D.Coates MI175
- Eucalyptus marginata
- Eucalyptus todtiana
- Hypocalymma robustum
- Kunzea ericifolia
- Melaleuca thymoides
- Scholtzia involucrata (prostrate)

ORCHIDACEAE
- Caladenia flava
- Caladenia latifolia
- Elythranthera brunonis
- Leporella fimbriata
- Lyperanthus nigricans
- Prasophyllum calcicola R.Bates
- Pterostylis recurva
- Pterostylis vittata

PHORMIACEAE
- Dianella divaricata

POACEAE
- *Aira cupaniana
- Amphipogon turbinatus
- *Briza maxima
- Danthonia occidentalis
- *Ehrharta calycina
- Neurachne alopecuroidea
- Stipa compressa
- Stipa flavescens

POLYGALACEAE
- Comesperma calymega

PORTULACACEAE
- Calandrinia corrigioloides

PROTEACEAE
- Adenanthos cygnorum
- Banksia attenuata
- Banksia ilicifolia
- Banksia menziesii
- Dryandra nivea
- Persoonia saccata
- Petrophile linearis
- Stirlingia latifolia
- Synaphaea spinulosa

RESTIONACEAE
- Alexgeorgia nitens
- Loxocarya cinerea
- Loxocarya flexuosa
- Lyginia barbarta

RUBIACEAE
- Opercularia vaginata

RUTACEAE
- Boronia crenulata
- Eriostemon spicatus

SANTALACEAE
- Leptomeria cunninghamii

STYLIDIACEAE
- Levenhookia stipitata
- Stylidium brunonianum
- Stylidium calcaratum
- Stylidium junceum
- Stylidium piliferum
- Stylidium repens
- Stylidium schoenoides

VIOLACEAE
- Hybanthus calycinus

XANTHORRHOEACEAE
- Xanthorrhoea preissii

PART IX: THE FLORA OF THREE COASTAL BUSHLAND AREAS (System 6 Areas M 46, M 91 and M106) IN THE PERTH METROPOLITAN AREA

INTRODUCTION

Six coastal bushland areas within the metropolitan section of the System 6 Report (Department of Conservation and Environment, 1983) were the subject of recommendations. Three of these areas are the subject of this study. From north to south these three areas are:
(i) M 46 - Swanborne Beach and Rifle Range, City of Nedlands and Perth, adjacent to M 47 (Bold Park)
(ii) M 91- Reserve 24309 Coogee, City of Cockburn, adjacent to M 92, the western chain of the Cockburn Wetlands
(iii) M106 - Becher Point, adjacent to Lake Cooloongup Regional Park.
All three areas are adjacent to inland bushland areas.

GEOMORPHOLOGY AND SOILS

The three bushland areas contain a variety of coastal land forms and soils.
(i) M 46 is located on a series of relatively steep mobile Quindalup Dunes of aeolian origin. Soils are mapped as calcareous sands (Safety Bay Sands; S1- foredunes, S2 - mobile dunes) which are underlain, at varying depths, by Tamala Limestone (Gozzard 1983a).
(ii) M 91 is located on exposed Tamala Limestone (LS 1). Along the coast the limestone outcrops as a series of cliffs. Shallow pockets of soil are found on the exposed limestone and deeper sands have collected between the limestone ridges (Gozzard, 1986).
(iii) M 106 is located entirely on Quindalup Dunes but unlike those in M 46 most are regular low dunes lying parallel to the coast (S13). A narrow band of mobile sands (S 1) occur on the coast and there is a pocket of similar sands (S 2) at Point Becher. In the interdunal depressions between the parallel dunes are peaty sands (Gozzard, 1983b). This area has been the subject of a detailed geomorphological study (Searle, Semeniuk and Woods, 1988).

VEGETATION

Over the period of 1990-93 the authors visited the bushland areas and compiled records on the flora. Foot transects supported by vehicle transects, when appropriate, were made in the three areas. Vouchers were collected if the plants were not known to the authors or were considered significant. In two of the areas, M 91 and M 106, permanent sites have been established for the GinGin to Busselton Bushland Survey.

A wide variety of coastal plant communities are encompassed by these three bushland areas. Other studies have described the communities of these areas (Trudgen, 1988 and Kaeshagen and Carr, 1993) and a general treatment is included in this study.

The plant communities are closely related to topography. The principal communities are:
(i) M 46 - The communities of the foredunes (S1) are a series of Herblands and Grasslands merging with *Olearia axillaris* Heaths. On the valleys of the mobile dunes (S2) are Tuart (*Eucalyptus gomphocephala*) Woodlands, *Agonis* Woodlands, *Banksia* Woodlands and *Acacia rostellifera* Shrublands and on the ridges are Low Heaths where *Calothmanus quadrifidus* or *Chamelaucium uncinatum* may be dominant. On the northern face of a dune along Rochdale Rd are *Allocasuarina lehmanniana* Shrublands.

Kaeshagen and Carr (1993) have compiled a vegetation map the area of M 46 in the City of Perth.

(ii) M 91 - On the coastal limestone cliffs are Low Closed Heaths (under 0.5m) dominated by *Atriplex cinerea* and *Frankenia pauciflora.* Low Closed Heaths (under 0.5m) are also found on the limestone ridges but these are dominated by a series of shrubs, such as *Dryandra sessilis*, *Petrophile serruriae*, *Melaleuca huegellii* and *Hibbertia spicata* ssp *leptotheca.* On the deeper sands between the limestone ridges are some small patches of *Banksia* Low Open Woodland but generally mixed Low Closed Heaths (greater 1m to 1.5 m) and Shrublands, dominated by *Acacia* species, *Hibbertia hypericoides* and *Petrophile serruriae.*

(iii) M 106 - The communities of the foredunes (S1) are a series of Herblands and Grasslands merging with *Olearia axillaris* Low Open Heaths. On the parallel dunes the predominant community is *Jacksonia furcellata* and *Acacia lasiocarpa* Low Heath. However the density of other species present in the community alters and some areas are dominated by other species. The most significant are the *Acacia rostellifera* Open Heaths to Open Scrub and *Stipa flavescens* Grasslands. A series of linear wetlands are found between many of the dunes. These wetlands are characterised as Sedgelands. The older interdunal wetlands are fringed by *Xanthorrhoea preissii* Shrubland and occasionally edged by *Melaleuca* woodlands. These wetlands are unique geomorphologically (Searle, Semeniuk and Woods, 1988). Two of these communities, the *Jacksonia furcellata* and *Acacia lasiocarpa* Low Heath (extending east to the western margins of the Lake Cooloongup Regional Park) and the Sedgelands of the ephemeral freshwater wetlands between the dunes were identified as being rare by Keighery and Keighery (1992).

Of particular interest are the localised occurrences of Tuart and in the foredunes adjacent to the southern boundary of the area patches of *Hibbertia cuneiformis* Low Open Heaths occurring adjacent to areas of exposed clay below the sands (these are best developed in the Anstey Swamp area to the south, Semeniuk et al. , 1989).

Trudgen (1988) has mapped the plant communities at M 106.

Vegetation Condition

In assessing the condition of a bushland areas the general characteristics of the areas vegetation needs to be noted. In coastal areas it is necessary to consider that these areas are subjected to high levels of natural disturbance and the predominant native species are, of necessity colonising species. Consequently the following features of the vegetation are of importance in the assessment of the condition of the vegetation of coastal areas:

- the abundance and density of native species in the herb layer in the communities.
- the presence of areas of bare sand, these areas occur naturally and are important habitat areas (How and Dell, 1989).
- the occurrence of extensive moss swards in sheltered locations in shrublands
- the abundance and density of native grasses.

These four features of the coastal communities must be assessed in spring when native and non-native annuals are evident.

Of the three areas the M 106 area is in the best condition, being in generally in excellent to very good condition as there are bare sand areas and moss swards, the herb layer is composed of predominantly native species, such as *Daucus glochidiatus* and *Hydrocotyle diantha* and the native grasses, *Stipa flavescens*, *Poa porphyroclados* and *Poa poiformis.* These grasses are widespread, forming a grass stratum in most communities and, at times, are the dominant species forming a grassland in their own right. There are disturbed patches which appear to be associated with past grazing, vehicle activity and burning regimes. However these areas are isolated and the activities of the Port Kennedy

Land Conservation group have reduced disturbance allowing the native species to re-establish. The weeds of greatest concern are **Homeria flaccida* and **Euphorbia terracina*. **Ehrharta calycina*, which can replace *Stipa flavescens* in disturbed sandy coastal areas was not observed in the M 106 area. The common coastal weed **Pelargonium capitatum* is also uncommon.

By comparison the Tuart Woodlands and the fringing *Banksia* Woodlands at M 46 are significantly invaded by the perennial grass, **Ehrharta calycina*. Invasion by **Ehrharta calycina* is not as significant in the other communities but the herb layer in all communities is predominantly weed species. The weeds of greatest concern are **Myrsiphyllum asparagoides* and **Euphorbia terracina*. Generally the area is in good to poor condition with much of the heath in very good condition. There has been significant disturbance in the area associated with road building, tracks, rubbish dumping and adjacent irrigated areas.

At M 91 substantial disturbance has occurred due to partial clearance, past grazing, uncontrolled access tracks, fires, substantial rabbit grazing and 'enrichment planting'. The impact of this disturbance is greatest in the sandy areas between the ridges where the herbs are replaced by weeds and the moss swards are absent. Where the limestones outcrops, the weeds are less abundant, but the grazing by rabbits is still evident in the cropped sedges. The weed of greatest concern is **Homeria flaccida* (not palatable) and **Myrsiphyllum asparagoides* present in the adjacent bushland. Generally the area is in good to poor condition with much of the heath in very good condition.

FLORA

The recorded flora of the three areas is given in Appendix 1, p76. A comparison of the flora between the three areas is shown in Table 1.

Table 1 A Comparison of the Floras of M 46, M 91 and M 106.

Bushland Area	Total taxa	Native taxa	Non - native taxa	Native taxa shared	Native taxa not shared
M 46	177	117	58 (33%)	49 (42%)	17 (15%)
M 91	142	86	56 (39%)	49 (57%)	25 (29%)
M 106	240	172	68 (28%)	49 (28%)	78 (45%)

As expected the largest area with the greatest diversity of habitat, M 106, has the greatest diversity of flora. This diversity is also reflected in the number of native taxa recorded only at M 106. The presence of freshwater wetlands at M 106 accounts for the presence of many of these taxa, such as *Pteridium esculentum*, *Baumea acuta*, *Baumea articulata*, *Baumea juncea*, *Bulboschoenus caldwellii*, *Lepidosperma effusa*, *Schoenus nitens*, *Loxocarya pubescens*, *Juncus kraussii*, *Triglochin procera*, *Typha domingensis*, *Centella cordifolia*, *Cotula coronopifolia*, *Sonchus hydrophilus*, *Lobelia alata*, *Melaleuca rhaphiophylla*, *Melaleuca teretifolia* and *Epilobium billardierianum*. Also, other taxa uncommon in coastal area are associated with the damp interdunal areas of M 106, for example the Orchidaceae and Haemodoraceae taxa. The diversity at M 106 is further enhanced by the presence of several taxa that are generally associated with outcropping Tamala limestone, such as *Acacia lasiocarpa*, *Trymalium albicans* and *Cryptandra mutila*.

A significant proportion of the taxa at M 91 are not shared by the other areas. Some of these taxa such as *Wilsonia backhousei* and *Lawrencia spicata* are normally associated with saline wetlands while *Lavatera pleibea* var *tomentosa* and *Wilsonia humilis*,

normally confined to offshore islands, are found here in small remnant populations in the cliff top heath. *Wilsonia humilis* is not mentioned in Marchant et al. (1981), although there are old records from Rottnest Island.

Significant Flora

A series of species identified by Keighery (1992) as being possibly endemic to the western side of the Swan Coastal Plain are found in the study areas. These are from:
- M46, M 91 & M106: *Rhagodia baccata* R.Br. ssp *dioica* (range, Lancelin to Leuwin Ridge) and *Nemcia reticulata* (coastal form, range, Yalgorup to Grey).
- M46 & M106, the dune form of *Hemiandra pungens* GK 12,794 (range, Becher Point to Seabird). This is a prostrate glabrous plant, with short ovate pungent leaves.
- M 91: *Grevillea thelemanniana* (range, Yalgorup to Cervantes), *Petrophile serruriae* ssp nov. (range, Cervantes to Bunbury - Hamelin Bay, apparently disjunct between Bunbury and Hamelin Bay), *Hibbertia spicata* ssp. *leptotheca* (range, Yalgorup to Lancelin), *Pimelea calcicola* (Yanchep, Neerabup and Yalgorup National Parks) and *Stylidium bulbiferum* (range, Yalgorup to Yanchep). *Petrophile serruriae* ssp nov. is a pink flowered variant of a normally yellow flowered species on the Darling Range. The type collection of *Stylidium bulbiferum* is from the Swan Coastal Plain, not the Darling Range, as assumed previously (A.H. Burbidge, pers. comm.).
- M106 *Trymalium albicans* (range, Yalgorup to Lancelin) and *Diplopeltis huegelii* var *huegelii* (range, Perth to Dongara).

Keighery (1992) also identified a series of taxa occurring at the ends of their ranges in the near coastal section of the Swan Coastal Plain. Nine of these taxa occur in the bushland areas . This study has identified some northern and southern extensions of some of these taxa.

Agonis flexuosa:	Range	N = Bold Park
Allocasuarina lehmanniana	Range	S = M 46/ Bold Park
Chamelaucium uncinatum	Range	S = M 46/Bold Park (M47)
Cryptandra mutila	Range	S = was Point Peron now M106
Diplolaena dampieri	Range	N = Garden Is/Rottnest, M 106 most northern on the mainland.
Hibbertia cuneiformis	Range	N = M 106
Lavatera plebeia var *tomentosa*	Range	Only mainland record at M 91; known from offshore islands - Rottnest, Green, Shag Rock.
Zygophyllum fruticulosum	Range	S = was Cottesloe, now M 106.

CONCLUSION

Although these three coastal areas are within 50 kilometres of each other they encompass a different suite of species expressed in a variety of plant communities. These communities reflect the different geomorphological units on which they are located. Although much of these coastal areas have been subject to considerable disturbance the heaths have remained in generally very good condition. The M 106 area is unusual in that the sandy soil communites, the most disturbed communities in the other areas, are in very good condition.

ACKNOWLEDGEMENTS

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Appendix 1: Flora of M 91, M 106 and M46

Records from opportunistic collecting, 1990-93. Families in alphabetical order and according to Marchant et al., (1987). An * indicates a non-native taxon.

TAXON	M 91	M 106	M46
FERNS			
DENNSTAEDIACEAE			
Pteridium esculentum		+	
GYMNOSPERMS			
ZAMIACEAE			
Macrozamia riedlei	+	+	+
CUPRESSACEAE			
Callitris preissii		+	
ANGIOSPERMSS			
AIZOACEAE			
*Carpobrotus edulis	+	+	+
C. edulis x virescens	+		
Carpobrotus virescens		+	+
*Tetragonia decumbens	+	+	+
Tetragonia implexicoma			+
Tetragonia tetragonioides		+	+
AMARANTHACEAE			
Ptilotus drummondii	+		
ANTHERICAEAE			
Arthropodium capillipes		+	
Caesia micrantha		+	
Corynotheca micrantha		+	
Sowerbaea laxiflora		+	
Thysanotus arenarius		+	+
Thysanotus manglesianus		+	
Thysanotus patersonii	+	+	
Thysanotus sparteus		+	
Tricoryne elatior	+	+	
APIACEAE			
Apium annuum	+	+	+
Apium prostratum		+	
Centella cordifolia		+	
Daucus glochidiatus	+	+	+
*Foeniculum vulgare	+		
Hydrocotyle diantha		+	
Hydrocotyle hispidula		+	
Trachymene coerulea			+
Trachymene pilosa		+	
APOCYNACEAE			
Alyxia buxifolia		+	

TAXON	M 91	M 106	M46
ASPHODELEACEAE			
*Asphodelus fistulosus	+	+	+
*Trachyandra divaricata	+	+	+
ASTERACEAE			
Angianthus cunninghamii		+	
Actites megalocarpa		+	
*Arctotheca calendula	+	+	+
*Arctotheca populifolia		+	+
*Arctotis stoechadifolia			+
*Aster subulatus		+	
Calocephalus brownii			+
*Carduus pycnocephalus		+	+
*Centaurium melitensis	+	+	
*Cirsium vulgare	+	+	+
*Conyza albida	+	+	+
*Conyza bonariensis	+		
Cotula australis		+	
Cotula cotuloides		+	
Cotula coronopiifolia		+	
*Dittrichia graveolens	+	+	
Helichrysum cordatum	+	+	+
Hyalospermum cotula	+		
*Hypochaeris glabra	+	+	+
Lagenifera huegelii		+	+
Leptorhynchos scabrus		+	
Millotia myosotidiifolia		+	
Olearia axillaris	+	+	+
Olearia rudis		+	
Podotheca angustifolia		+	
*Pseudognaphalium luteo-album		+	
Senecio lautus ssp. dissectifolius		+	
Senecio lautus ssp. maritimus	+	+	+
*Senecio tamoides			+
Siloxerus humifusus			+
*Sonchus asper	+		
Sonchus hydrophilus		+	
*Sonchus oleraceus	+	+	+
*Ursinia anthemoides		+	+
*Urospermum picroides	+		
*Vellerophyton dealbatum	+		
Waitzia aurea		+	
Waitzia suaveolens			+
BRASSICACEAE			
*Brassica tournefortii	+	+	+
*Cakile maritima		+	+
*Heliophila pusilla	+	+	+
Stenopetalum gracile		+	+
CAMPANULACEAE			
Wahlenbergia preissii		+	+

TAXON	M 91	M 106	M46
CARYOPHYLLACEAE			
*Cerastium glomeratum		+	
*Minuartia hybrida	+	+	+
*Petrorhagia velutina	+	+	+
*Sagina maritima	+	+	
*Silene gallica	+	+	+
*Spergula arvensis			+
*Stellaria media	+		
CASUARINACEAE			
Allocasuarina humilis	+		+
Allocasuarina lehmanniana			+
CHENOPODIACEAE			
Atriplex cinerea	+	+	+
Atriplex hypoleuca		+	
Atriplex isatidea			+
*Chenopodium murale	+	+	
Rhagodia baccata ssp baccata	+	+	+
Rhagodia baccata ssp dioica	+	+	+
Salsola kali		+	+
Sarcocornia quinqueflora	+		
Suaedea australis	+		
Threkeldia diffusa	+		+
COLCHICACEAE			
Wurmbaea monantha		+	
CONVOLVULACEAE			
Wilsonia backhousei	+		
Wilsonia humilis	+		
CRASSULACEAE			
Crassula colorata	+	+	+
Crassula exserta	+	+	+
*Crassula glomerata	+	+	+
*Crassula natans		+	
Crassula pedicellosa			+
CUSCUTACEAE			
*Cuscuta epithymum		+	
CYPERACEAE			
Baumea acuta		+	
Baumea articulata		+	
Baumea juncea		+	
Bulboschoenus caldwelli		+	
Carex preissii		+	+
Cyperus tenuiflorus		+	
Isolepis cernua	+	+	+
Isolepis nodosa	+	+	+
Lepidosperma angustatum	+	+	+
Lepidosperma effusum		+	
Lepidosperma gladiatum	+	+	+
Lepidosperma longitudinale	+	+	+

TAXON	M 91	M 106	M46
Lepidosperma scabrum			+
Lepidosperma ?tenue		+	
Mesomelaena pseudostygia		+	+
Schoenus clandestinus		+	
Schoenus grandiflora	+	+	+
Schoenus nitens		+	
Tetraria octandra		+	
DASYPOGONACEAE			
Acanthocarpus preissii	+	+	+
Lomandra hermaphrodita		+	
Lomandra maritima	+	+	+
DILLENIACEAE			
Hibbertia acerosa	+		
Hibbertia cuneiformis		+	
Hibbertia hypericoides	+		
Hibbertia racemosa	+		+
Hibbertia spicata ssp. leptotheca	+		
EPACRIDACEAE			
Acrotriche cordata	+	+	
Leucopogon australis	+		
Leucopogon parviflorus		+	+
EUPHORBIACEAE			
*Euphorbia peplus	+	+	+
*Euphorbia terracina	+	+	+
Phyllanthus calycinus	+	+	+
Poranthera microphylla		+	+
Ricinocarpus glaucus		+	
FABACEAE (PAPILIONACEAE)			
Daviesia decurrens			
Daviesia nudiflora			
Daviesia triflora			
Gompholobium tomentosum	+	+	+
Hardenbergia comptoniana	+	+	+
Jacksonia furcellata	+	+	
Kennedia coccinea	+		
Kennedia prostrata		+	+
*Lotus angustissimus		+	+
*Lupinus consentinii			+
*Medicago polymorpha		+	+
*Meliotis indica	+	+	+
Nemcia reticulata	+	+	+
*Trifolium angustifolium			+
*Trifolium campestre	+		+
*Trifolium cernuum	+	+	+
*Vicia sativa			+
FRANKENIACEAE			
Frankenia pauciflora	+		

TAXON	M 91	M 106	M46
FUMARIACEAE			
*Fumaria capreolata			+
*Fumaria muralis			+
GENTIANACEAE			
*Centaurium erythraea		+	+
*Cicendia filiformis		+	
GERANIACEAE			
*Erodium botrys		+	
*Erodium cicutarium	+	+	+
*Geranium molle			+
Geranium solanderi		+	+
*Pelargonium capitatum	+	+	+
Pelargonium littorale		+	+
GOODENIACEAE			
Lechenaultia linearoides			+
Scaevola canescens			+
Scaevola crassifolia	+	+	+
Scaevola holosericea		+	
Scaevola nitida		+	
Scaevola thesioides			+
GYROSTEMONACEAE			
Tersonia cyathifolia			+
HAEMODORACEAE			
Anigozanthos humilis		+	
Anigozanthos manglesii		+	+
Conostylis aculeata	+	+	+
Conostylis candicans		+	+
Haemodorum laxum			+
Haemodorum spicatum		+	+
Haemodorum paniculatum			+
Phlebocarya ciliata		+	
HYACINTHACEAE			
*Ornithogalum ?caudatum			+
IRIDACEAE			
*Freesia leichtlinii		+	
*Gladiolus caryophyllaceus	+		
*Homeria flaccida		+	
*Homeria ?flaccida 'yellow'	+		
Patersonia occidentalis		+	
*Romulea rosea	+	+	+
JUNCACEAE			
Juncus bufonius		+	
Juncus krausii		+	
Juncus pallidus		+	
JUNCAGINACEAE			
Triglochin calcitrapa	+	+	+

TAXON	M 91	M 106	M46
Triglochin procera		+	
Triglochin striata		+	
Triglochin trichophora		+	+
LAMIACEAE			
Hemiandra pungens		+	+
*Stachys arvensis		+	
Westringia dampieri		+	
LAURACEAE			
Cassytha flava	+	+	+
Cassytha pubescens	+	+	+
Cassytha racemosa	+	+	
LOBELIACEAE			
Lobelia alata		+	
Lobelia gibbosa			+
Lobelia tenuior		+	+
LOGANIACEAE			
Logania vaginalis		+	
MALVACEAE			
Lavatera pleibia var tomentosa	+		
Lawrencia spicata	+		
MIMOSACEAE			
Acacia cochlearis		+	+
Acacia cyclops	+	+	+
Acacia lasiocarpa	+	+	+
Acacia pulchella	+		+
Acacia rostellifera	+	+	+
Acacia saligna	+	+	+
Acacia truncata	+		+
MYOPORACEAE			
Eremophila glabra	+	+	+
Myoporum insulare	+	+	+
MYRTACEAE			
Astarea fasicularis		+	
Agonis flexuosa			+
Calothamnus quadrifidus	+	+	+
Chamelaucium uncinatum			+
Eucalyptus decipiens	+		
Eucalyptus gomphocephala		+	+
Melaleuca acerosa	+	+	+
Melaleuca huegelii	+	+	
Melaleuca rhaphiophylla		+	
Melaleuca teretifolia		+	
OLACACEAE			
Olax benthamiana		+	+

TAXON	M 91	M 106	M46
ONAGRACEAE			
Epilobium billardierianum		+	
Epilobium hirtigerum		+	
*Oenothera drummondii		+	+
ORCHIDACEAE			
Acianthus reniformis		+	+
Caladenia flava		+	
Caladenia latifolia	+	+	+
Caladenia longicauda		+	
Microtis media		+	
*Monadenia bracteata	+		
Prasophyllum calcicola			+
Prasophyllum fimbria		+	
Pterostylis nana		+	
Pterostylis vittata		+	
OROBANCHACEAE			
*Orobanche minor	+	+	+
OXALIDACEAE			
Oxalis perennans		+	+
PHORMIACEAE			
Dianella divaricata	+	+	+
PHYTOLACCACEAE			
*Phytolacca octandra	+		
PLANTAGINACEAE			
Plantago ?exilis	+		
POACEAE			
+Agropyron racemosus			+
Agrostis avenacea		+	
*Aira caryophyllea	+	+	+
Amphipogon turbinatus		+	
*Avellina michelii		+	
*Avena barbata	+	+	+
*Briza maxima	+	+	+
Bromus arenarius		+	+
*Bromus diandrus	+	+	+
*Bromus hordeaceus	+	+	
*Bromus madritensis		+	
*Catapodium rigidum	+	+	+
*Cynodon dactylon		+	+
Danthonia occidentalis	+	+	+
*Ehrharta calycina	+		+
*Ehrharta longiflora		+	
*Eragrostis curvula		+	
*Holcus lanatus		+	
*Lagurus ovatus	+	+	+
*Lolium multiflorum	+	+	+
*Phalaris minor	+		
*Poa annua	+		

TAXON	M 91	M 106	M46
Poa drummondiana	+	+	+
Poa poiformis		+	+
Poa porphyroclados	+	+	+
Sporobolus virginicus	+	+	
Spinifex hirsutus		+	+
Spinifex longifolius	+	+	+
*Stenotraphum secundatum			+
Stipa compressa		+	
Stipa elegantissima		+	+
Stipa flavescens	+	+	+
Stipa semibarbata		+	
*Vulpia myuros	+		+
POLYGALACEAE			
Comesperma integerrimum		+	+
Comesperma confertum	+	+	+
POLYGONACEAE			
Muehlenbeckia adpressa		+	
*Rumex crispus		+	
PORTULACACEAE			
Calandrinia corrigioloides	+	+	+
Calandrina granulifera		+	+
Calandrinia liniflora		+	
PRIMULACEAE			
*Anagallis arvensis	+	+	+
Samolus junceus	+	+	
Samolus repens	+		
PROTEACEAE			
Banksia attenuata	+		+
Banksia menziesii	+		+
Dryandra nivea	+		
Dryandra sessilis	+		+
Grevillea thelemanniana	+		
Grevillea vestita	+		+
Hakea lissocarpha	+		
Hakea prostrata	+		+
Petrophile brevifolia			
Petrophile serruriae	+		
RANUNCULACEAE			
Clematis microphylla			+
RESTIONACEAE			
Loxocarya cinerea		+	+
Loxocarya flexuosa	+	+	+
Loxocarya pubescens		+	
RHAMNACEAE			
Cryptandra mutila	+	+	
Spyridium globulosum	+	+	+
Trymalium albicans		+	

TAXON	M 91	M 106	M46
RUBIACEAE			
*Galium aparine	+		
*Galium murale		+	+
Opercularia vaginata		+	+
Opercularia aff. vaginata		+	
RUTACEAE			
Diplolaena dampieri		+	
SANTALACEAE			
Exocarpus sparteus		+	+
Santalum acuminatum	+	+	+
SAPINDACEAE			
Diplopeltis huegelii			+
SCROPHULARIACEAE			
*Bellardia trixago		+	
*Dischisma arenaria		+	+
*Parentucellia viscosa	+	+	
Verbascum virgatum	+		
SOLANACEAE			
Anthocercis ilicifolia			+
Anthocercis littorea		+	
*Lycium ferocissimum			+
*Nicotiana glauca	+		
*Solanum nigrum	+	+	+
*Solanum sodomaeum	+	+	
Solanum symonii	+	+	+
STACKHOUSIACEAE			
Stackhousia pubescens		+	
STERCULIACEAE			
Thomasia cognata	+	+	
THYMELAEACEAE			
Pimelea calcicola	+		
TYPHACEAE			
Typha domingensis		+	
*Typha orientalis		+	
STYLIDIACEAE			
Stylidium bulbiferum	+		
URTICACEAE			
Parietaria debilis	+	+	+
VALERIACEAE			
*Centranthus macrosiphon			+

TAXON	M 91	M 106	M46
VERBENACEAE			
*Phyla nodiflora		+	
VIOLACEAE			
Hybanthus calycinus	+		
XANTHORRHOEACEAE			
Xanthorrhoea preissii	+	+	
ZYGOPHYLLACEAE			
Zygophyllum fruticulosum	+	+	+