KINGS PARK

Boundary Definition: protected area boundary (Areas of bushland within the boundaries of the Site are not accurately mapped.)

SECTION 1: LOCATION INFORMATION

Bush Forever Site no. 317
Area (ha): bushland 320.8
Map no. 46, 47
Map sheet series ref. no. 2034–II SW
Other Names: not known
Local Authorities (Suburb): City of Perth (West Perth)
System 6 (1983): M49 part System area bushland and part scattered native plants (canopy), all vegetation described

SECTION 2: REGIONAL INFORMATION

LANDFORMS AND SOILS
Pinjarra Plain
Guildford Formation (Qha: S14) (not naturally vegetated)
Spearwood Dunes
Sands derived from Tamala Limestone (Qts: S7)
Tamala Limestone (Qtl: LS1)
VEGETATION AND FLORA
Vegetation Complexes
Spearwood Dunes
Karrakatta Complex — Central and South
Marine (Lagoonal and Estuarine) Deposits
Vasse Complex (not vegetated)
Floristic Community Types: *not sampled, type inferred
Supergroup 4: Uplands centred on Spearwood and Quindalup Dunes
*27 Species-poor mallees and shrublands on limestone (scarp)
28 Spearwood *Banksia attenuata* or *B. attenuata—Eucalyptus* woodlands
WETLANDS
Wetland Types: artificial lake
Swan Coastal Plain Lakes EPP: none identified
THREATENED ECOLOGICAL COMMUNITIES
Not assessed

SECTION 3: SPECIFIC SITE DETAIL

Landscape Features: river — limestone cliff, vegetated uplands
Vegetation and Flora: limited survey (Anon. 1993, Beard 1967, Kings Park and Botanic Garden 1995, part Site — Gibson *et al.* 1994 (King 01–02), Main and Serventy 1957, Mattiske EM & Associates 1987); detailed survey (part Site — Baird 1977, Bennett 1988, 1995)
Structural Units: mapping (Anon. 1993, Bennett 1988, Mattiske EM and Associates 1987)
Uplands — Sands derived from Tamala Limestone: *Eucalyptus marginata* Open Forest to Woodland with *Banksia menziesii* and *Xanthorrhoea preissii*; *Eucalyptus gomphocephala, E. marginata, E. calophylla* Woodland with *Banksia grandis* and *Hibbertia hypericoides*; *Eucalyptus marginata, Banksia ilicifolia* Open Forest to Woodland with *Xanthorrhoea preissii, Mesomelaena pseudostygia*; *Eucalyptus gomphocephala* Open Woodland; all of these structural units have eucalypts with *Allocasuarina fraseriana, Banksia attenuata* and at least one other *Banksia* species
Uplands — Tamala Limestone: *Melaleuca huegelii* Mixed Closed Heath with *Grevillea preissii* and *Templetonia retusa*
Scattered Native Plants: *Eucalyptus gomphocephala, E. calophylla, E. marginata* Open Forest to Woodland; 10 — 20% of Park
Vegetation Condition: >15% Excellent, <85% Very Good to Good, with small areas of severe localised disturbance
Total Flora: 293 native taxa, 172 weed taxa (estimated >95% expected flora) (Bennett 1995)
Significant Flora: *Acacia benthamii* (2), *Lasiopetalum membranaceum* (2), *Jacksonia sericea* (3), *Dodonaea hackettiana* (4); *Callitris preissii, Conospermum triplinervium, Gnephosis angianthoides* (= *Calocephalus angianthoides*, not recently recorded, probably associated with sandy flats beside the river, see Site 368), *Acacia alata* var. *tetrantha, Trachymene coerulea, Astroloma macrocalyx, Ricinocarpos glaucus, Lechenaultia linarioides, Grevillea preissii, Trymalium ledifolium* var. *ledifolium, Glischrocaryon aureum*; rare or uncommon

on coastal plain in PMR — *Pterostylis picta* (only occurrence in PMR), *Caladenia attingens* subsp. *attingens*, *Amyema miquelii* (uncommon on the Plain), *Cartonema philydroides* and the fern *Anogramma leptophylla*; typical Tamala Limestone taxa — *Melaleuca huegelii*, *Grevillea preissii*, *Trymalium ledifolium* var. *ledifolium*, *Caladenia longicauda* subsp. *calcigena* ms, *Petrophile serruriae* subsp. nov. (GJK 11421)

Fauna: structured surveys for birds (61 species) (Western Australian Museum 1996 D and others (e.g. Recher and Serventy 1991)), native mammals (1 species) (How *et al.* 1993), and reptiles (25 species) and amphibians (4 species) (How and Dell 1994). Significant birds: Carnaby's Cockatoo, Weebill, Broad-tailed, Western and Yellow-rumped Thornbills and Australian Sittella. Good assemblage of nectar feeders. Significant bird species: category 1 (1), category 3 (8) and category 4 (8). Significant reptile species: a skink (*Cyclodomorphus celatus*). Important research and teaching site for assessment of faunal changes

Linkage: no adjacent bushland; part of Greenways 19, 24 (Tingay, Alan & Associates 1998a); part of a regionally significant potential bushland/wetland linkage (Part A, Map 7)

SECTION 4: INTERNATIONAL AND NATIONAL SIGNIFICANCE

Subject to protection under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

SECTION 5: SELECTION CRITERIA AND RECOMMENDATIONS

Criteria: Representation of ecological communities, Rarity, Scientific or evolutionary importance, General criteria for the protection of wetland, streamline and estuarine fringing and coastal vegetation, Criteria not relevant to determination of regional significance, but which may be applied when evaluating areas having similar values

Recommendation: Site with Some Existing Protection; the existing care, control and management intent of the reserve is endorsed. The purpose of the reserve should be amended to include conservation and appropriate mechanisms applied in consultation with the management body (see Table 3, Volume 1).

KINGS PARK

Boundary Definition: protected area boundary (Areas of bushland within the boundaries of the Bushplan Site are not accurately mapped.)

SECTION 1: CADASTRAL INFORMATION

(Lots, locations and derived information to be updated in the public submission period)

Bushplan Site no. 317 **Map no.** 56 **Map sheet series ref. no.** 2034–II SW

System 6 (1983): M49 part System area bushland and part scattered native plants (canopy), all vegetation described

Other Names: not known

Area (ha): total 406.3; bushland 320.8 (267 — Anon. 1993)

Local Authorities (Suburb)
City of Perth (West Perth)

Zoning
MRS: Parks and Recreation
TPS: Landscape

Ownership Categories
Private (including commercial organisation), Local Government, Not identified

Lot/Location/Reserve numbers (Purpose), Street name
0, 3, 59, 61, 62 Mounts Bay Rd; 1, 2, 4, 5 Bellevue Tce; 50 Mount St; 7 Cliff St
Crown Reserve

SECTION 2: REGIONAL INFORMATION

LANDFORMS AND SOILS

Pinjarra Plain
Guildford Formation (Qha: S14) (not naturally vegetated)

Spearwood Dunes
Sands derived from Tamala Limestone (Qts: S7)
Tamala Limestone (Qtl: LS1)

VEGETATION AND FLORA

Vegetation Complexes

Spearwood Dunes
Karrakatta Complex — Central and South

Marine (lagoonal and estuarine) Deposits
Vasse Complex (not vegetated)

Floristic Community Types: *not sampled, type inferred

Supergroup 4: Uplands centred on Spearwood and Quindalup Dunes
*27 Species poor mallees and shrublands on limestone (scarp)
28 Spearwood *Banksia attenuata* or *B. attenuata* — *Eucalyptus* woodlands

WETLANDS

Wetland Types: artificial lake
Swan Coastal Plain Lakes EPP: none identified

THREATENED ECOLOGICAL COMMUNITIES

Not assessed

SECTION 3: SPECIFIC SITE DETAIL

Landscape Features: river — limestone cliff, vegetated uplands

Vegetation and Flora: detailed survey (part Bushplan Site — Baird 1977; Bennett 1988, 1995); limited survey (Anon. 1993; Beard 1967; Kings Park and Botanic Garden 1995; part Bushplan Site — Gibson *et al.* 1994 (King 01–02); Main and Serventy 1957; Mattiske 1987)

Structural Units: mapping (Anon. 1993; Bennett 1988; Mattiske 1987)
Uplands - Sands derived from Tamala Limestone: *Eucalyptus marginata* Open Forest to Woodland with *Banksia menziesii* and *Xanthorrhoea preissii*; *Eucalyptus gomphocephala, E. marginata, E. calophylla* Woodland with *Banksia grandis* and *Hibbertia hypericoides*; *Eucalyptus marginata, Banksia ilicifolia* Open Forest to Woodland with *Xanthorrhoea preissii, Mesomelaena pseudostygia*; *Eucalyptus gomphocephala* Open Woodland; all of these structural units have eucalypts with *Allocasuarina fraseriana, Banksia attenuata* and at least one other *Banksia* species.
Uplands - Tamala Limestone: *Melaleuca huegelii* Mixed Closed Heath with *Grevillea preissii* and *Templetonia retusa*

Scattered Native Plants: *Eucalyptus gomphocephala, E. calophylla, E. marginata* Open Forest to Woodland; 10% to 20% of Park

Vegetation Condition: >15% Excellent, <85% Very Good to Good, with small areas of severe localised disturbance

Total Flora: 293 native taxa, 172 weeds (estimated >95% expected flora) (Bennett 1995)

Significant Flora: *Acacia benthamii* (2), *A. alata*, *Lasiopetalum membranaceum* (2), *Jacksonia sericea* (3), *Dodonaea hackettiana* (4); *Callitris preissii*, *Conospermum triplinervium*, *Gnephosis angianthoides* (= *Calocephalus angianthoides*, not recently recorded, probably associated with sandy flats beside the river, see BS368), *Trachymene coerulea*, *Astroloma macrocalyx*, *Ricinocarpos glaucus*, *Lechenaultia linarioides*, *Grevillea preissii*, *Trymalium ledifolium* subsp. *ledifolium*, *Glischrocaryon aureum*; rare or uncommon on coastal plain in PMR — *Pterostylis picta* (only occurrence in PMR), *Caladenia attingens* subsp. *attingens*, *Amyema miquelii*, *Cartonema philydroides* and the fern *Anogramma leptophylla*; typical Tamala Limestone taxa — *Melaleuca huegelii*, *Grevillea preissii*, *Trymalium ledifolium* subsp. *ledifolium*, *Caladenia longicauda* subsp. *calcigena* ms, *Petrophile serruriae* subsp. nov. (GJK 11421)

Fauna: multiple and structured surveys by Western Australian Museum of Natural Science (unpublished) and others (eg. Recher and Serventy 1991) for birds (61) and by Western Australian Museum of Natural Science (How *et al.* 1993) for native mammals (1), reptiles (25) (How and Dell 1994), and amphibians (4). Significant birds: Carnaby's Cockatoo, Weebill, Broad-tailed, Western and Yellow-rumped thornbills and Australian Sittella. Good assemblage of nectar feeders. Significant bird species: category 1 (1), category 3 (8) and category 4 (8). Significant reptile species: a skink (*Cyclodomorphus celatus*). Important research and teaching site for assessment of faunal changes

Linkage: no adjacent bushland; part of proposed Greenways 20, 24 (Tingay, Alan & Associates 1997a); part of a regionally significant potential bushland/wetland linkage (Volume 2A, Map 8)

SECTION 4: INTERNATIONAL AND NATIONAL SIGNIFICANCE

Not listed

SECTION 5: SELECTION CRITERIA AND RECOMMENDATIONS

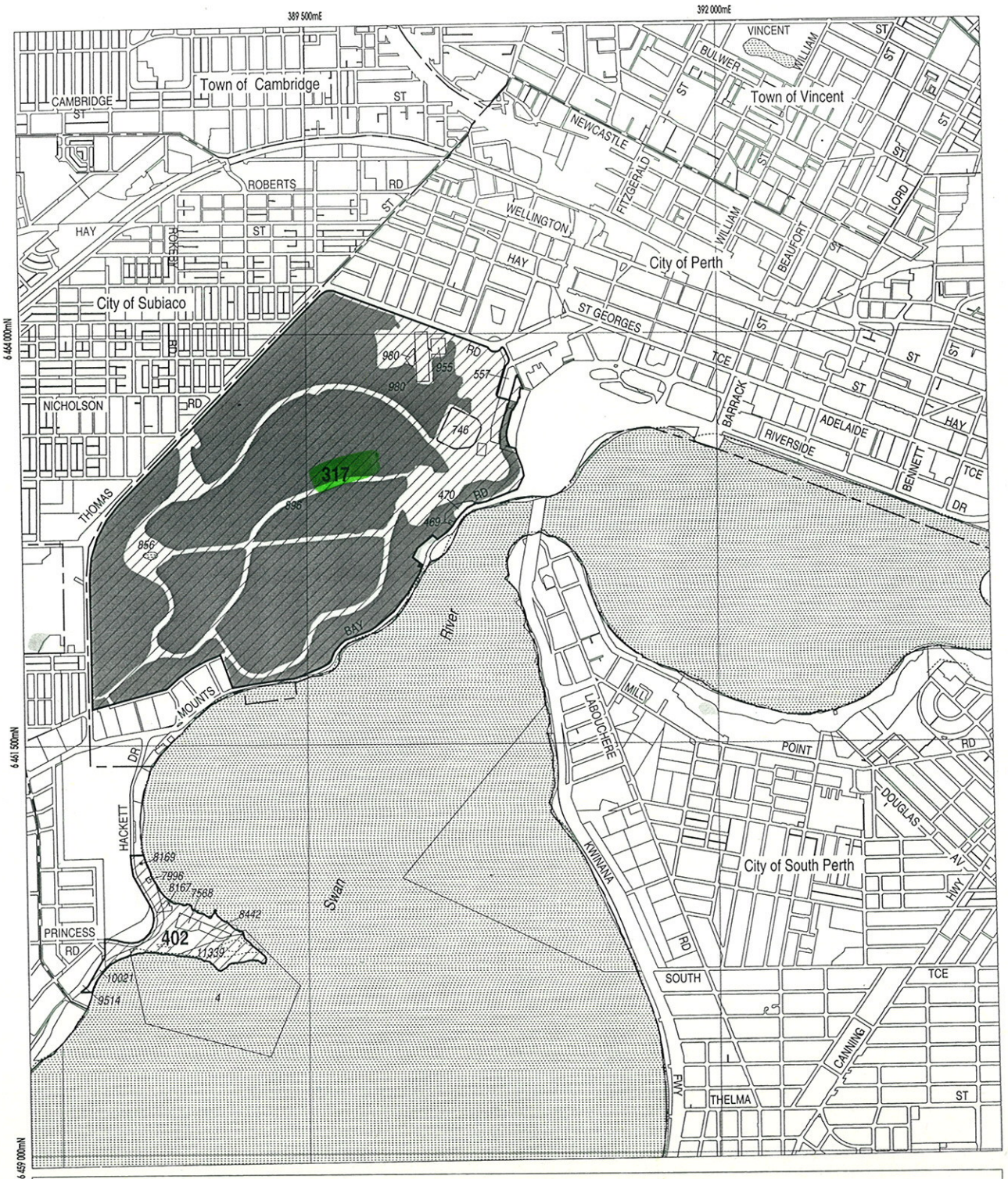
Criteria: Representation of ecological communities, Rarity, Scientific or evolutionary importance, General criteria for the protection of wetland, streamline and estuarine fringing and coastal vegetation, Criteria not relevant to determination of conservation value, but which may be applied when evaluating areas having similar values

Opportunities and/or Constraints

Opportunities: Bushplan Site/part Bushplan Site subject to Swan and Canning Rivers EPP; location of Scheduled Fauna; under MRS Parks and Recreation Reservation and TPS Landscape Zoning, Crown Reserve

Constraints: private land

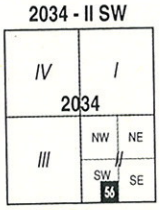
Recommendation: The existing purpose, care, control and management of this Bushplan Site is endorsed.



LEGEND

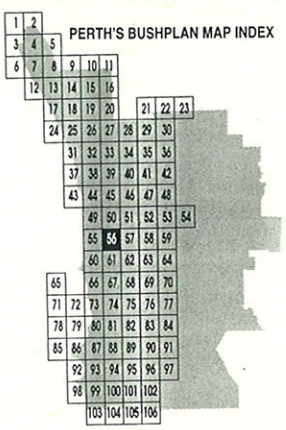
- 472 — Bushplan Sites With Regionally Significant Bushland
- Other Native Vegetation
- Conservation Category Wetlands
- Bushplan Sites With Some Existing Protection
- 696 — Lot Number, Location Number
- Channel Wetlands
- Local Government Boundary

2034 - II SW



1 : 25 000 AMG Reference Grid showing Perth's Bushplan Map Sheet Breakdown

PERTH'S BUSHPLAN MAP INDEX



N

SCALE

0 500 1000

Metres

Produced by Project Mapping Section
Land Information Branch, Ministry for Planning, Perth W.A. November 1998

ntw-map18//environ/bushplan//bushv2_56.dgn

Cadastral Data supplied by Department of Land Administration, W.A.

Wetlands Data supplied by Water and Rivers Commission

Native Vegetation Extent for Study Area supplied by Agriculture Western Australia

Bushplan Site Map

Map 56

BS 317

R. A. O. U. T R A C K I N G D A T A B A S E

23/06/96 PARK SIGHTINGS REPORT Page No. 1

King's Park (M49)

ORDER:	REF:	BIRD NAME	NO. SIGHTINGS
0022	0203	Black Swan	1
0028	0202	Australian Wood Duck	1
0032	0208	Pacific Black Duck	2
0326	0988	Laughing Turtle-Dove	2
0356A	1266	White-tailed Black-Cockatoo 1	1
0[illegible]7	0273	Galah	2
0366	0254	Rainbow Lorikeet	2
0386	0294	Australian Ringneck	3
0411	0344	Shining Bronze-Cuckoo	1
0446	0322	Laughing Kookaburra	2
0453	0329	Rainbow Bee-eater	1
0492	0976	Striated Pardalote	3
0512	0465	Weebill 3	3
0517	0463	Western Gerygone	1
0531	0486	Yellow-rumped Thornbill 3	1
0537	0638	Red Wattlebird	3
0539	0637	Little Wattlebird 4	2
0561	0608	Singing Honeyeater	3
0583	0597	Brown Honeyeater	3
0588	0632	White-cheeked Honeyeater	2
0597	0592	Western Spinebill	1
0653	0401	Rufous Whistler	1
0673	0361	Grey Fantail	1
0676	0364	Willie Wagtail	2
0[illegible]5	0702	Grey Butcherbird	1
0698	0705	Australian Magpie	2
0706	0930	Australian Raven	2
0763	0357	Welcome Swallow	3
0765	0359	Tree Martin	1
0781	0574	Silvereye	1

*** END OF REPORT ***

(1) 1

(2)

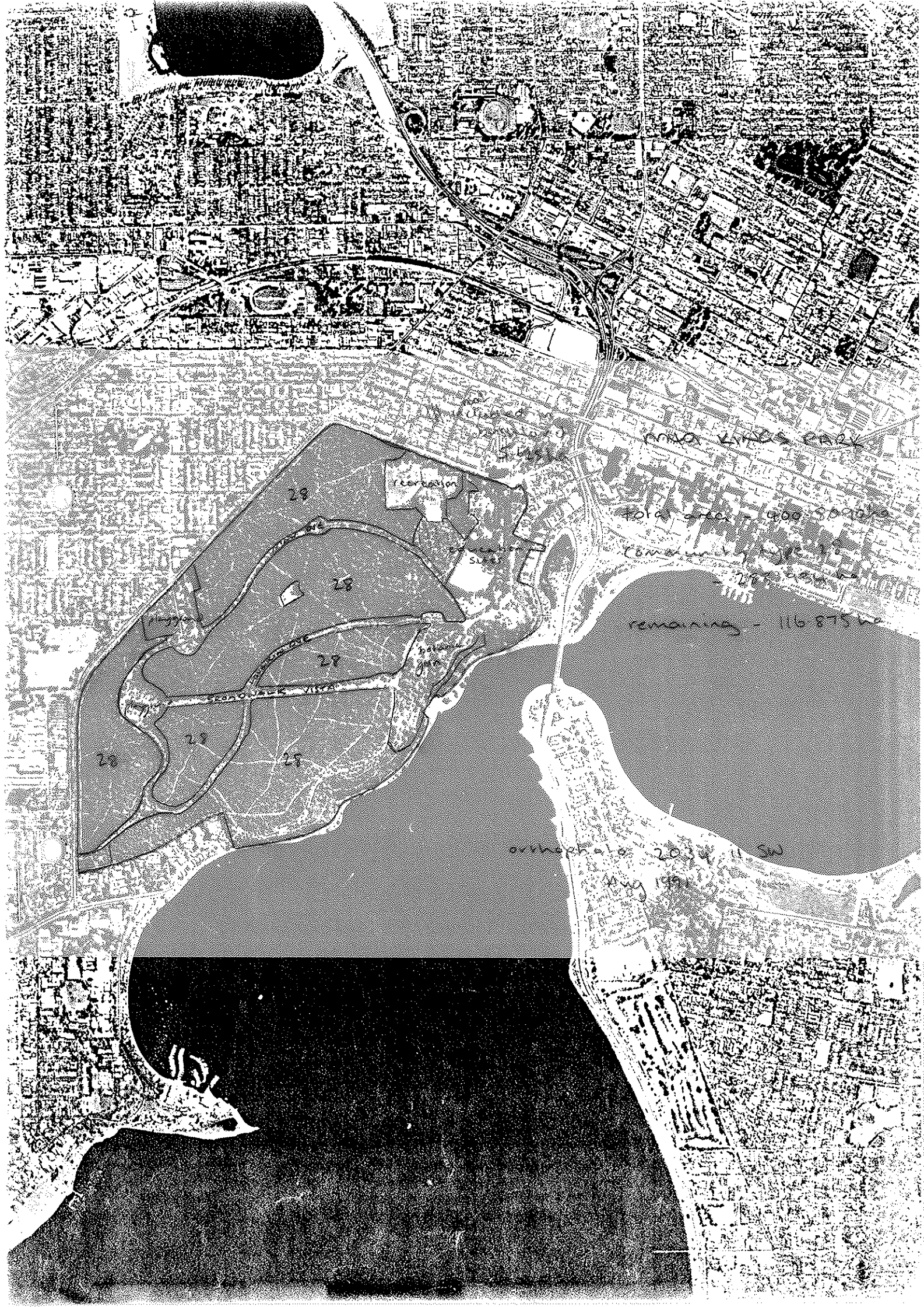
(3) 2

(4) 1

SUMMARY REPORT

TOTAL BIRDS SIGHTED	30
TOTAL NUMBER OF CARDS	3

*** END OF SUMMARY ***


recreation
28
28
28
28
28
28

AREA INFORMATION

System 6 Area (C or M) or Update Area (Update)

Conservation Area	
Nature Reserve	
Reserve No	
National Park	
Reserve No	
Local Government	
Reserve No	
Other	M49 KINGS PARK A1720, C22352 – Kings Park Board
Proposed Conservation Areas	
Local Government	
Reserve No	
Other	

Conservation Area

Nature Reserve	
Reserve No	
National Park	
Reserve No	
Local Government	
Reserve No	
Other	

TOTAL AREA

~~Bushland~~ Area	400.809	hectares
Completely Degraded	116.875 ha	– buildings, roads, car parks, lawns
weed invasion, firewood cutting ? dieback		

AREA MAPPED FLORISTIC UNITS

Units	Site (Condition) Code G · KING	Bound	Area (ha)
28	01 (2), 02 (3.5)	B	283.934

Boundaries determined by use of

aerial photograph	Metro Street Directory run 8 5/1/91
orthophoto	2034 11 Sw Aug 1991
vegetation map	Bushland Draft management Plan 1993 Kings Park + Botanic Garden 1993 - 2003
~~soil~~ map	CALM map Metro 5

M49 Kings Park

Kings Park and Botanic Gardens - Draft Bushland Management Plan

Friends Advocate Management

Other Names:

Specific Study/studies Miscellaneous studies

Flora

Vegetation Map 1 2 3

Flora list 1 2 3 4

Significant Taxa done / suitable / doubtful

Fauna

Mammals	1	2	
Birds	1	2	RAOU
Reptiles and Amphibia	1	2	
Invertebrates	1	2	

Vegetation Condition Map Sites Comment

Disturbance Factors Comment Management

Swan Coastal Plain Floristic Survey

AHC: National Estate Listed / Interim / Nominated / Notified NT (WA): Heritage Classification

in progress

Notes
Friends of Kings Park

M49 Kings Park Kings Park and Botanic Gardens - Draft Bushland Management Plan		
M49.1 Regional park recommendations be applied to this area.	Implemented	Management of Kings Park through the Kings Park Board conforms with the regional park recommendation.

SHEET 1: System 6 - REPORT Information Search Date 5/94

Please circle the appropriate response or respond in the space provided.

Area M 49 Name	Kings Park
Title	

Bennet, M.E. and Dundas, P.J. 1988 The Bushland Plants of Kings Park, Western Australia , Kings Park Board, Perth.

Purpose (why was the report prepared?)
Government
Corporate
Community Group
Management Plan

Soils			
Units	mapped	described	referenced

Landscape		
Features	described	referenced

Flora						
Vegetation Map						
Units				Site based (no)		
Mapped						
Veg Units	Comparable Heddle *et al*		Compared Heddle *et al.*		Unit not mapped by Heddle *et al.*	
Flora list	most taxa illustrated					
Timing	%completion 98%				Significant Taxa	
years	Trees	Shrubs Herbs	Sedges	Weeds	DEC	CALM Priority Other

Fauna			
Timing	%completion		Significant Taxa
	Mammals	Birds	Sched1 Sched2 Other
	Reptiles	Invertebrates	

Vegatation Condition		
Site based	Mapped	Units
Disturbance Factors		
Phytophthora	observed	Other incidental
	tested	itemised

Notes

System 6 - REPORT Information Search Date 5/94

Please circle the appropriate response or respond in the space provided.

Area M 49 Name Kings Park
Title

Author: Baird A.M.
Date: 1977
Title: Regeneration after fire in Kings Park, Perth, Western Australia.
Source: Journal of the Royal Society of Western Australia 60: 1-22

Author: Baird A.M.
Date: 1984
Title: Observations in Kings Park
Source: In: Proceedings of a seminar held on 29 September 1983 by Dept. Fisheries & Wildlife pp. 18-20

Author: Bell D.T. Loneragan W.A. Ridley W.J. et al.
Date: 1992
Title: Response of tree canopy species of Kings Park, Perth, Western Australia to the severe summer wildfire of January 1989
Source: Journal of the Royal Society of Western Australia 75: 35-40

Author: Bessell-Browne J.A.
Date: 1990
Title: Kings Park Soil Survey
Source: Kings Park Board, Unpublished Report

Units		Site based (no)	
Mapped			
Veg Units	Comparable Heddle *et al*	Compared Heddle *et al.*	Unit not mapped by Heddle *et al.*
Flora list			
Timing	%completion		Significant Taxa
	Trees Shrubs Herbs Sedges	Weeds	DRF CALM Prority Other

Fauna			
Timing	%completion		Significant Taxa
	Mammals	Birds	Sched1 Sched2 Other
	Reptiles	Invertebrates	

Vegatation Condition		
Site based	Mapped	Units
Disturbance Factors		
Phytophthora	observed	Other incidental
	tested	itemised

Notes

System 6 - REPORT Information Search Date 5/94

Please circle the appropriate response or respond in the space provided.

Area M 49 Name	Kings Pk
Title	Natural Woodland in Kings Park, Perth W.A. Naturalist 10: 77-84
Published/Unpublished	Date 1967
Author/s	J.S. Beard
Location of Publication	- widespread
Purpose (why was the report prepared?)	
Government	
Corporate	
Community Group	
Management Plan	

Soils			
Units	mapped	described	referenced

Landscape		
Features	described	referenced

Flora	Description past and present veg in Kings Park.					
Vegetation Map						
Units				Site based (no)		
Mapped						
Veg Units	Comparable Heddle *et al*		Compared Heddle *et al.*		Unit not mapped by Heddle *et al.*	
Flora list						
Timing	%completion				Significant Taxa	
	Trees	Shrubs Herbs	Sedges	Weeds	DRF	CALM Prority Other

Fauna			
Timing	%completion		Significant Taxa
	Mammals	Birds	Sched1 Sched2 Other
	Reptiles	Invertebrates	

Vegatation Condition				
Site based	Mapped	Units		
Disturbance Factors				
Phytophthora	observed		Other	incidental
	tested			itemised

Notes

not at EPA 3.10.96

SHEET 2: System 6 - VERBAL Information Search Date 3/5/94

Area M49 Name	Kings Park			
Source	R. House (and John Dell)			
Purpose (why was the study done?)				
Government				
Corporate				
Community Group				
Management Plan				
Publication Planned	Yes	No	Date	
Planned Location				

Soils		
Units	described	referenced

Landscape		
Features	described	referenced

Flora						
Vegetation Map						
Units				Site based (no)		
Mapped						
Veg Units	Comparable Heddle *et al*			Compared Heddle *et al*	Unit not mapped by Heddle et *al*	
Flora list						
Timing	%completion				Significant Taxa	
	Trees	Shrubs	Herbs	Sedges	Weeds	DRF	CALM Priority	Other

Fauna	Site based					
Timing	%completion				Significant Taxa	
1993-95	Mammals	100%	Birds	100%*	Sched1	Sched2	Other
(15 visits)	Reptiles	100%60%	Invertebrates	(<2%)		

Vegetation Condition			
Site based	Mapped	Units	
Disturbance Factors			
Phytophthora	observed	Other	incidental
	tested		itemised

Notes
* updating previous records

SHEET 1: System 6 - REPORT Information Search Date 4/5/94

Please circle the appropriate response or respond in the space provided.

Area M49 Name Kings Park

Title Bushland Management Plan
-Draft 1993 Final Document 1994

Published/Unpublished Date 1993 - 1994

Author/s Kings Park and Botanic Garden

Location of Publication Kings Park

Purpose (why was the report prepared?) Management

Government Kings Park Board

Corporate

Community Group

Management Plan

Soils

Units mapped (described) referenced

Landscape

Features (described) referenced

Flora

Vegetation Map map from Mattiske

Units Site based (no)

Mapped

Veg Units Comparable Heddle *et al* (Compared Heddle *et al*) Unit not mapped by Heddle *et al*

Flora list from Bennett

Timing %completion (Significant Taxa)

Trees Shrubs Herbs Sedges Weeds DRF CALM Priority Other

Fauna From Museum study and literature

Timing %completion (Significant Taxa)

(Mammals) (Birds) Sched1 Sched2 Other

(Reptiles) (Invertebrates)

Vegatation Condition

Site based Mapped Units

Disturbance Factors

Phytophthora observed Other incidental

tested itemised

Notes Contact Bob Dixon, Keren Keys

System 6 - VERBAL Information Search Date 5/94

Area M49 Name	KINGS PARK		
Source	Swan Coastal Plain Floristic Survey (see general)		
Purpose (why was the study done?)			
Government			
Corporate			
Community Group			
Management Plan			
Publication Planned	Yes	No	Date
Planned Location			

Soils		
Units	described	referenced

Landscape		
Features	described	referenced

Flora						
Vegetation Map						
Units				Site based (no)	2	
Mapped						
Veg Units	Comparable Heddle *et al*		Compared Heddle *et al.*		Unit not mapped by Heddle *et al.*	
Flora list						
Timing	%completion				Significant Taxa	
	Trees	Shrubs Herbs	Sedges	Weeds	DRF	CALM Prority Other

Fauna			
Timing	%completion		Significant Taxa
	Mammals	Birds	Sched1 Sched2 Other
	Reptiles	Invertebrates	

Vegetation Condition				
Site based	Mapped	Units		
Disturbance Factors				
Phytophthora	observed		Other	incidental
	tested			itemised

Notes

Plant Biodiversity Information for Bush Forever Site 317 – Kings Park

prepared by the

Perth Region Plant Biodiversity Project

a collaboration between the West Australian Local Government Association's Perth Biodiversity Project (PBP), the Department of Environment (DoE) and the Department of Conservation and Land Management (CALM).

Background Information

There is a wealth of site specific area and plot based information on the flora and plant communities of the Perth region that should be taken into consideration by anyone involved in land use planning or management of bushland and vegetated wetlands and waterways. However, with such a complex pattern of plant biodiversity in our unique natural ecosystems much of this information is not readily available. Training is also required to provide the skills needed to interpret and use this information.

The Perth Region Plant Biodiversity Project aims to make this information more accessible and understandable to users. To commence this process, two workshops were held in January 2004, one for each of the natural biological regions of Perth. The morning session introduced the Project, demonstrated what information is currently available and the suggested formats for presenting this information to users by the Project. In the afternoon a discussion was held as to what available information sets would be most useful to users and the best ways to make these accessible.

The current information for each of the natural regions is at different stages of development and accessibility. For the **Swan Coastal Plain** information has been compiled over a number of years through programs such as System 6, the Southern Swan Coastal Plain Survey, System 6 Update, Perth's Bushplan and Bush Forever. There are 287 potential Reference Sites (Bush Forever Sites) on the Plain for which information has been compiled into detailed Site Descriptions. There are over 800 permanent potential Reference Plots on the Plain each with its own species list and area specific information. For the **Jarrah Forest** the information available is quite different with only some information sets compiled through forest management planning and studies such as System 6. Potential Reference Sites and Plots have yet to be determined for the Jarrah Forest.

The Perth Region Plant Biodiversity Project complements and supports a number of existing projects by DoE, CALM, PBP and the Department for Planning and Infrastructure (DPI), these being:

- a linked website for Bush Forever Volumes 1 & 2 (DoE/DPI)
- Southern Swan Coastal Plain species list (DoE/CALM: Keighery GJ, Keighery BJ and Longman VM 2004, in prep. *Native and Weed Flora of the Southern Swan Coastal Plain.*)
- Report updating information on the floristic community types of the Swan Coastal Plain (DoE/CALM)
- Local Biodiversity Planning Guidelines (PBP)
- Natural area initial assessment templates & user's guide (PBP).

The attached information is a draft prepared for use by Kings Park in developing a proposal for a detailed vegetation survey of the park. It complements the more detailed information photocopied from the DoE Bush Forever Reference Site file (as attached).

Bush Forever Site 317: Kings Park

Aerial Photography: Perth Metro Area - North West 2003

Floristic Survey Sites of the Southern Swan Coastal Plain
- GJKENV
- GRIFFIN
- SCP
- SYS6ENV
- SYS6ENV2

Bush Forever Sites

Local Government Authority Boundaries

100 0 100 200 Meters

N

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Projection: Map Grid of Australia (MGA94)

Department of Environment
Western Australia

This map has been produced using various data from other agencies. No responsibility is accepted for any error or omission.

Species Lists from Floristic Plots King 01-02 (Gibson et al 1994).
Taxonomy according to Keighery G., Keighery B and Longman V. (2004, in prep.) as of 29 March 2004.

Plotorsp	Family	SpCode	Na	Genus	Species	IntraspRank	IntraspName	Infor	ConsvCode
KING-1	Amaranthaceae	PTIDRUDR		Ptilotus	drummondii	var.	drummondii		
KING-1	Anthericaceae	CAEMIC		Caesia	micrantha				
KING-1	Anthericaceae	LAXSQU		Laxmannia	squarrosa				
KING-1	Anthericaceae	SOWLAX		Sowerbaea	laxiflora				
KING-1	Anthericaceae	THYARE		Thysanotus	arenarius				
KING-1	Anthericaceae	THYSPA		Thysanotus	sparteus				
KING-1	Anthericaceae	THYTRI		Thysanotus	triandrus				
KING-1	Apiaceae	DAUGLO		Daucus	glochidiatus				
KING-1	Apiaceae	TRAPIL		Trachymene	pilosa				
KING-1	Apiaceae	XANHUEHU		Xanthosia	huegelii	subsp.	huegelii	MS	
KING-1	Asparagaceae	ASPASP	*	Asparagus	asparagoides				
KING-1	Asteraceae	CONBON	*	Conyza	bonariensis				
KING-1	Asteraceae	HYPGLA	*	Hypochaeris	glabra				
KING-1	Asteraceae	OZOCOR		Ozothamnus	cordatus				
KING-1	Asteraceae	URSANT	*	Ursinia	anthemoides				
KING-1	Brassicaceae	CARHIR	*	Cardamine	hirsuta				
KING-1	Casuarinaceae	ALLHUM		Allocasuarina	humilis				
KING-1	Colchicaceae	BURCON		Burchardia	congesta				
KING-1	Cupressaceae	CALPRE		Callitris	preissii				
KING-1	Cyperaceae	LEPSPCO		Lepidosperma	sp. (Coastal terete) (BJ Keighery and N Gibson 231)				
KING-1	Cyperaceae	LEPSQU		Lepidosperma	squamatum				
KING-1	Cyperaceae	MESPSE		Mesomelaena	pseudostygia				
KING-1	Cyperaceae	TETOCT		Tetraria	octandra				
KING-1	Dilleniaceae	HIBHYP		Hibbertia	hypericoides				
KING-1	Droseraceae	DROPAL		Drosera	pallida				
KING-1	Droseraceae	DROSTOPO		Drosera	stolonifera	subsp.	porrecta		
KING-1	Epacridaceae	ASTPAL		Astroloma	pallidum				
KING-1	Epacridaceae	CONPRE		Conostephium	preissii				
KING-1	Euphorbiaceae	PHYCAL		Phyllanthus	calycinus				
KING-1	Goodeniaceae	SCAANC		Scaevola	anchusifolia				
KING-1	Goodeniaceae	SCACAN		Scaevola	canescens				
KING-1	Haemodoraceae	CONACU		Conostylis	aculeata				
KING-1	Iridaceae	GLACAR	*	Gladiolus	caryophyllaceus				
KING-1	Iridaceae	ORTLAXLA		Orthrosanthus	laxus	var.	laxus		
KING-1	Iridaceae	PATOCC		Patersonia	occidentalis				
KING-1	Lauraceae	CASRAC		Cassytha	racemosa				
KING-1	Lobeliaceae	LOBTEN		Lobelia	tenuior				
KING-1	Mimosaceae	ACACOC		Acacia	cochlearis				
KING-1	Mimosaceae	ACAPUL		Acacia	pulchella				
KING-1	Myrtaceae	HYPROB		Hypocalymma	robustum				
KING-1	Myrtaceae	MELHUEHU		Melaleuca	huegelii	subsp.	huegelii		
KING-1	Myrtaceae	MELSYS		Melaleuca	systena				
KING-1	Orchidaceae	CALARE		Caladenia	arenicola				
KING-1	Papilionaceae	GOMARI		Gompholobium	aristatum				
KING-1	Papilionaceae	HARCOM		Hardenbergia	comptoniana				
KING-1	Papilionaceae	HOVTRITR		Hovea	trisperma	var.	trisperma		
KING-1	Papilionaceae	NEMCAP		Nemcia	capitata				
KING-1	Papilionaceae	TRICAMCA	*	Trifolium	campestre	var.	campestre		
KING-1	Phormiaceae	DIAREVDI		Dianella	revoluta	var.	divaricata		
KING-1	Poaceae	AUSOCC		Austrodanthonia	occidentalis				
KING-1	Poaceae	AUSELE		Austrostipa	elegantissima				
KING-1	Poaceae	AUSFLA		Austrostipa	flavescens				
KING-1	Poaceae	BRIMAX	*	Briza	maxima				
KING-1	Poaceae	EHRCAL	*	Ehrharta	calycina				
KING-1	Poaceae	VULBRO	*	Vulpia	bromoides				
KING-1	Poaceae	VULMYU	*	Vulpia	myuros				
KING-1	Primulaceae	ANAARV	*	Anagallis	arvensis				
KING-1	Proteaceae	BANATT		Banksia	attenuata				
KING-1	Proteaceae	DRYLIN		Dryandra	lindleyana				
KING-1	Proteaceae	DRYSESSE		Dryandra	sessilis	var.	sessilis		
KING-1	Proteaceae	PETLIN		Petrophile	linearis				
KING-1	Proteaceae	PETMAC		Petrophile	macrostachya				
KING-1	Restionaceae	DESFAS		Desmocladus	fasciculatus				
KING-1	Rhamnaceae	CRYARBTU		Cryptandra	arbutiflora	var.	tubulosa		
KING-1	Rhamnaceae	STETRI		Stenanthemum	tridentatum				P4
KING-1	Rhamnaceae	TRYLEDLE		Trymalium	ledifolium	var.	ledifolium		
KING-1	Rubiaceae	GALDIV	*	Galium	divaricatum				
KING-1	Xanthorrhoeaceae	XANPRE		Xanthorrhoea	preissii				
KING-1	Zamiaceae	MACRIE		Macrozamia	riedlei				

Species Lists from Floristic Plots King 01-02 (Gibson et al 1994).
Taxonomy according to Keighery G., Keighery B and Longman V. (2004, in prep.) as of 29 March 2004.

Plotorso	Family	SpCode	Na	Genus	Species	InfraspRank	InfraspName	Infor	ConsvCode
KING-2	Anthericaceae	SOWLAX		Sowerbaea	laxiflora				
KING-2	Anthericaceae	THYARE		Thysanotus	arenarius				
KING-2	Anthericaceae	THYMAN		Thysanotus	manglesianus				
KING-2	Anthericaceae	TRIELA		Tricoryne	elatior				
KING-2	Apiaceae	TRAPIL		Trachymene	pilosa				
KING-2	Asparagaceae	ASPASP	*	Asparagus	asparagoides				
KING-2	Asteraceae	HYPGLA	*	Hypochaeris	glabra				
KING-2	Asteraceae	OZOCOR		Ozothamnus	cordatus				
KING-2	Asteraceae	SONOLE	*	Sonchus	oleraceus				
KING-2	Asteraceae	UROPIC	*	Urospermum	picroides				
KING-2	Asteraceae	URSANT	*	Ursinia	anthemoides				
KING-2	Casuarinaceae	ALLFRA		Allocasuarina	fraseriana				
KING-2	Colchicaceae	BURCON		Burchardia	congesta				
KING-2	Cyperaceae	LEPSCA		Lepidosperma	scabrum				
KING-2	Cyperaceae	LEPSQU		Lepidosperma	squamatum				
KING-2	Cyperaceae	MESPSE		Mesomelaena	pseudostygia				
KING-2	Cyperaceae	SCHGRA		Schoenus	grandiflorus				
KING-2	Dasypogonaceae	LOMCAE		Lomandra	caespitosa				
KING-2	Dasypogonaceae	LOMNIG		Lomandra	nigricans				
KING-2	Dasypogonaceae	LOMPRE		Lomandra	preissii				
KING-2	Dilleniaceae	HIBHYP		Hibbertia	hypericoides				
KING-2	Droseraceae	DROSTOPO		Drosera	stolonifera	subsp.	porrecta		
KING-2	Epacridaceae	CONPEN		Conostephium	pendulum				
KING-2	Euphorbiaceae	MONGRA		Monotaxis	grandiflora				
KING-2	Goodeniaceae	SCACAN		Scaevola	canescens				
KING-2	Goodeniaceae	SCAREPRE		Scaevola	repens	var.	repens		
KING-2	Haemodoraceae	ANIMANMA		Anigozanthos	manglesii	subsp.	manglesii		
KING-2	Haemodoraceae	CONACU		Conostylis	aculeata				
KING-2	Haemodoraceae	HAESPI		Haemodorum	spicatum				
KING-2	Iridaceae	FREALB	*	Freesia	alba x leichtlinii				
KING-2	Iridaceae	GLACAR	*	Gladiolus	caryophyllaceus				
KING-2	Myrtaceae	HYPROB		Hypocalymma	robustum				
KING-2	Orchidaceae	CALFLAFL		Caladenia	flava	subsp.	flava		
KING-2	Orchidaceae	CALLON		Caladenia	longicauda				
KING-2	Papilionaceae	DAVNUDNU		Daviesia	nudiflora	subsp.	nudiflora		
KING-2	Papilionaceae	DAVTRI		Daviesia	triflora				
KING-2	Papilionaceae	GOMTOM		Gompholobium	tomentosum				
KING-2	Papilionaceae	HARCOM		Hardenbergia	comptoniana				
KING-2	Papilionaceae	JACSER		Jacksonia	sericea				P4
KING-2	Papilionaceae	NEMCAP		Nemcia	capitata				
KING-2	Phormiaceae	DIAREVDI		Dianella	revoluta	var.	divaricata		
KING-2	Poaceae	BRIMAX	*	Briza	maxima				
KING-2	Poaceae	EHRCAL	*	Ehrharta	calycina				
KING-2	Poaceae	MICSTI		Microlaena	stipoides				
KING-2	Proteaceae	BANATT		Banksia	attenuata				
KING-2	Proteaceae	BANMEN		Banksia	menziesii				
KING-2	Proteaceae	PETLIN		Petrophile	linearis				
KING-2	Proteaceae	STILAT		Stirlingia	latifolia				
KING-2	Restionaceae	DESFAS		Desmocladus	fasciculatus				
KING-2	Restionaceae	LYGBAR		Lyginia	barbata				
KING-2	Stylidiaceae	STYBRUBR		Stylidium	brunonianum	subsp.	brunonianum		
KING-2	Xanthorrhoeaceae	XANPRE		Xanthorrhoea	preissii				

References

Gibson N, Keighery BJ, Keighery GJ, Burbidge AH and Lyons MN 1994. *A Floristic Survey of the Southern Swan Coastal Plain*. Unpublished Report for the Australian Heritage Commission prepared by the Department of Conservation and Land Management and the Conservation Council of Western Australia (Inc.).

Keighery GJ, Keighery BJ and Longman VM 2004, in prep. *Native and Weed Flora of the Southern Swan Coastal Plain.*

Evaluation of the National Estate Value of remnant bushland on the Swan Coastal Plain between Moore River and Mandurah

KINGS PARK AND BOTANIC GARDEN WEST PERTH

(System 6 area M49)

Prepared by I R Dixon and Keran Keys, with assistance from Mary Gray
For Kings Park and Botanic Garden
May 1995

NATURAL ENVIRONMENT NOMINATION: THE BUSHLAND OF KINGS PARK AND BOTANIC GARDEN

1. NAME OF PLACE The Bushland of Kings Park and Botanic Garden, System 6 area M49.

Note: Kings Park was listed 21-10-1980 on the RNE as an historic place, parks gardens and trees. This document provides information about the bushland of Kings Park, which will enhance the existing entry and may be treated as a sub-area of Kings Park.

AHC File Number: RR 10353

2. LOCATION/BOUNDARIES

Kings Park bushland is located in West Perth Western Australia, approximately 1.5 km from the General Post Office and adjacent to the Central Business District of Perth. Kings Park and Botanic Garden includes about 267 ha of bushland. The external boundaries of Kings Park are mainly delineated by the outer roads: Kings Park Rd, Thomas St, Winthrop Ave, Mounts Bay Rd. Internal bushland boundaries are mainly defined by edges of pathways or lawns.

Administrative area

State: WA

Within the boundaries of Perth City. Kings Park and Botanic Garden is administered and wholly managed by Kings Park Board which is constituted according to the Parks and Reserves Act 1895-1990.

Area

Approximately 267ha of bushland within Kings Park and Botanic Garden; total area approximately 400ha.

Title information

1. Crown Reserve A 1720 for Public Park. Vested in Kings Park Board which is a body corporate, whose President and members are appointed by the Governor of Western Australia to control and manage Kings Park Reserve A 1720 except Perth Lot L 56 and part of L 64 pursuant to the Parks and Reserve Act 1895-1990. Though the statutory responsibilities of the Park and Reserves Act remain with the Minister for Lands, the Board is (1995) now in the portfolio of the Minister for the Environment. Contact Kings Park and Botanic Garden West Perth WA 6005. Telephone (09) 480 3600 Fax (09) 322 5064

3. NOMINATOR

Nomination *prepared* by Ian Robert Dixon and Keran Keys of Kings Park and Botanic Garden, with assistance from Mary Gray, Wildflower Society of WA (Inc)

Signature of nominators..... Date 16/6/1995.

Mr George Savell, President, Kings Park Board

..... Date 16/6/1995

Mr J Robertson, President, Wildflower Society of W A (Inc)

4. Previous assessments

1. System 6, M49 Kings Park. An important education and recreational resource, also used regularly for research purposes. The concept of a 'regional park' is relevant to Kings Park. Recommendation - The Secretariat should review the Parks and Reserves Act 1895-1990, under which the Kings Park Board is appointed.

2. Kings Park and Botanic Garden was entered as an historic place 'Parks and Trees' in the Register of the National Estate on 21 October 1980. This separate application is to prepare a natural environment nomination specifically for the bushland.

3. A recent assessment (in 1993/94) of the bushland has resulted in the production of a 10 year management plan. The Bushland Draft Management Plan was launched in October 1993 by the Kings Park Board.

5. Description

Kings Park and Botanic Garden attracts over 2 million (adult) visitors a year. The bushland is located within a highly urbanised area in close proximity to the centre of the City of Perth on the Swan Coastal Plain, where few significant remnants of bushland still exist.

The escarpment rises steeply from the Swan River to a height of 65m and as a high point in the landscape is visible from the city foreshore and surrounding suburbs. Views from the escarpment overlook Perth City, the Swan River and Darling Scarp in the distance.

Geologically it is within the Spearwood Dune System with soils of the Karrakatta Soil Association . Over time, leaching of the calcareous sands has led to the formation of limestone at greater depths. This is demonstrated by the limestone cliffs exposed above Mounts Bay Road. As a result of past weathering, Kings Park slopes from high areas in the south-east to low lying areas in the south-west. The limestone cliffs have been exposed as the Swan River receded, and are a significant landform of the bushland. The soils can be divided into two main types: medium size, calcareous sands; and shallow sands with exposed limestone . Apart from sand varying in pH, degree of leaching and grain size, there are areas of sandy loams. The underlying sand loam sheets, with perched water tables (for some months of the year) are important as they coincide with more vigorous vegetation cover.

The bushland contains two readily distinguished plant communities that reflect the soils and landforms on which they are found: Mixed Closed Heath on the shallow calcareous soils with exposed limestone on the escarpment; and *Eucalyptus/Allocasuarina/Banksia* Open Woodland to Forests on the deep calcareous sands (four vegetation types are included within the last plant community). Examples of common plants and indicator species found within these vegetation types are as follows: Closed Heath- *Grevillea crithmifolia*, *Trymalium ledifolium* and indicator species *Grevillea thelemanniana* and *Templetonia retusa*; Open Forest Woodland- *Eucalyptus marginata, Allocasuarina fraseriana, Banksia ilicifolia, Banksia attenuata* and indicator species *Xanthorrhoea preissii, Mesomelaena pseudostygia* and *Bossiaea eriocarpa*; Open Woodland- *Eucalyptus gomphocephala, Banksia attenuata, Allocasuarina fraseriana,* indicator shrub species *Conospermum triplinervium* and *Phyllanthus calycinus;* Woodland- *Eucalyptus gomphocephala, Eucalyptus marginata, Eucalyptus calophylla, Allocasuarina fraseriana,*

Banksia attenuata, Banksia grandis and indicator shrub species *Hibbertia racemosa, Hibbertia hypericoides, Jacksonia sternbergiana* and *Hakea prostrata;* Open Forest-Woodland- *Eucalyptus marginata , Allocasuarina fraseriana, Banksia attenuata, Banksia menziesii,* and indicator species *Petrophile linearis, Conostephium pendulum, Hypocalymma robustum* and *Xanthorrhoea preissii.*

The plant communities are mapped within Heddle's (1980) Karrakatta Complex - Central South, of which only about 1% is represented in reserves. There are 290 (indigenous) species of native flowering plants growing in the area, which represents about 19% of the native flora of the Perth Region. There is also quite a variety of large fungi found in the bushland.

Only three relatively large areas of cliff-side (limestone) vegetation can now be found along the Swan River estuary: Blackwall Reach; Mt Henry, (at the mouth of the Canning Estuary) and Kings Park. The latter two are the most inland occurrences of these estuarine cliff communities and are contiguous with adjacent bushland areas. The Mixed Closed heaths of these cliffs contain a diverse and unique assemblage of shrubs. Dominant species include *Acacia rostellifera, Melaleuca huegelii, Grevillea thelemanniana* and *Cryptandra arbutiflora.* Other species generally associated with the limestone heaths of nearer coastal areas include herbs e.g. Native Carrot *(Daucus glochidiatus)* and *Hydrocotyle hispidula*; sedges e.g. Pale Rush (*Juncus pallidus)*, Coast Sword-sedge *(Lepidosperma gladiatum)* and grasses e.g. *Stipa elegantissima.* Kings Park bushland has no rivers or streams but water flows from springs occurring along the base of the limestone escarpment.

Kings Park and Botanic Garden is the most popular tourist destination in Western Australia and gathers world-wide tourist attention during the peak flowering period in spring. Besides tourists, the bushland is extensively used for public recreation (passive), interpretation and education, and scientific research. Although the bushland has no Declared Rare Flora, it does contain six species of priority plants listed by the Department of Conservation and Land Management in need of special protection: *Hydrocotyle hispidula, Lasiopetalum membranaceum, Cartonema philydroides, Gonocarpus pithyoides, Jacksonia sericea* and Hackett's Hop Bush *(Dodonaea hackettiana).* Kings Park was also the site for several type collections by early botanical collectors e.g.*Baumea preissii* and *Scaevola holosericea* by Preiss.

There are about sixty eight species of native birds eg. Brown Goshawk (*Accipiter fasciatus),* Red-capped Parrot *(Platicercus spurius),* Tawny frogmouth *(Podargus strigoides),* Rainbow Bee-eater *(Merops ornatus),* Scarlet Robin *(Petroica multicolor),* Western Spinebill *(Acanthorhynchus superciliosus)*; five species of snake eg. Blind Snake (*Ramphotyphlops australis),* Dugite *(Pseudonaja affinis);* and twenty species of lizard eg. Western Dragon *(Pagona minor),* Bob-Tail *(Tiliqua rugosa)* and Racehorse Goanna (*Varanus gouldii)* recorded for Kings Park bushland. Several are first-time, or uncommon recordings for Kings Park bushland eg. Black Racehorse Goanna (*Varanus tristus)* a skink *Morethia lineocellata* and a snake *Simoselaps bimaculata.* The Brushtail Possum *(Trichosurus vulpecula)* and a number of bat species represent native mammals. The bushland is als the home of several native snail species including a disjunct population of *Bothriembrion indutus.* The normal habitat for this species is the Darling Range and escarpments. In Kings Park it exists only on the limestone escarpment.

SIGNIFICANCE AGAINST REGISTER CRITERIA

A1 Importance in the evolution of Australia's flora, fauna, landscapes or climate	**Disjunct populations** Kings Park bushland is the site of a recent discovery of the Painted Rufous Greenhood (*Pterostylis picta)*, which is the only population in the Perth metropolitan area (Anon.1).	**very high**
	The only geographically isolated population (gene pool) of a native snail *Bothriembrion indutus*, occurs on the limestone escarpment (Slack-Smith, pers. comm., 10/12/91).	**very high**
	The area provides a gene pool for *Aganippe rhaphiduca*, a trap door spider with a disjunct population in Kings Park bushland. It shows 'localised ' population differences (usually found along the Darling scarp in Jarrah forest south to Albany), (Bailey, pers. comm., 31/5/94).	**very high**
	Kings Park provides the gene pool of the extremely rare spider *Chasmocephalon neglectum* . The species has been reported from the south coast but no-where else in the Perth metro area (Bailey, pers. comm., 31/5/94).	**very high**
	Some species of katydids (Tettigoniidae) have not only regional significance but strong links with relic species in the lower south-west of WA and Kings Park is the northern end of their range (Bailey, pers. comm. 24/2/92). Bushcrickets or Katydids have a number of interesting species of which some are still unnamed. Also an unnamed species of the genus *Tympanophora* is only just surviving in the south-western corner of the bushland. It does not have a wide distribution out side of the Park (Bailey, pers. comm. 31/5/94).	**very high**
	Geological formations Kings Park is underlain by Tamala limestone and lies on the boundary of the Spearwood and Bassendean dunes, with superb views of Swan Coastal Plain and Yilgarn Block landforms. Therefore it is a prime site for education and interpretation programs on the evolution of the Swan Coastal Plain landforms and associated flora and fauna.	**very high**
	There is a fossilised dune with lithified deposits of limestone which have been cut into by the (estuarine) Swan River to create cliff formations. Cross-bedding is clearly seen in the cliffs, exhibiting past processes of dune formation. At the cliff base, a narrow apron of deposited sediment has formed a strip of dry land, with freshwater springs emerging along the junction between cliff and sediment (Vinnicombe, 1989). Only Mounts Bay Road separates the fresh springs from the estuarine river.	**very high**

A2 Importance in maintaining existing processes or natural systems at the regional or national scale	**Continuing biological processes (evolution)** There is a corridor benefit to local birds and invertebrates from Kings Park, through Shenton Park bushland, to Bold Park bushland, allowing the continuation of the migration of species within an urban environment. Kings Park bushland is the western-most example of urban bushland colonised by the Red-Capped Robin, which is highly unusual; the robin must have used urban gardens as a pathway from wheatbelt areas (Dell pers. comm. 31/5/94). It is rare in the event of fire for the whole of the bushland to be burnt, allowing refuge for species escaping fire because of the relatively large size of Kings Park.	**very high**
	The viable size (267ha) of this inner-urban native bushland ensures the continuation of a variety of habitats to be maintained. The bushland provides the habitat of some rare fauna species, 'localised' populations as well as Priority Listed flora (Slack-Smith, pers. comm., 10/12/1991;Bailey, pers. comm., 31/5/94, Kings Park Board, 1993).	**very high**
	Kings Park provides an important gene pool and habitat for the snail *Bothriembrion indutus*. This particular provenance only exists on the scarp of Kings Park and exhibits a different colour to other populations (Slack Smith, pers. comm., 10/12/1991).	**very high**
	Kings Park provides the habitat for an extremely rare spider, *Chasmocephalon neglectum*, that has not been recorded elsewhere in the Perth metro area (Bailey, pers. comm., 31/5/1994).	**very high**
	The bushland contains the gene pool and habitat for *Aganippe rhaphiduca*, a trap door spider with a disjunct population in Kings Park bushland. It shows 'localised ' population differences. It is usually found along the Darling scarp in Jarrah forest south to Albany (Bailey, pers. comm., 31/5/1994).	**very high**
A4 Importance for association with events, developments or cultural phases which have had a significant role in the human occupation and evolution of the nation, State, region or community	**Aboriginal and Historic-changing patterns in culture and land use.** The base of the escarpment was used as a major Aboriginal camp (*Goonininup*) for Yellagonga and his family group, as well as a ritual and ceremonial site and a halting place on the trade route through to Busselton until the camp was taken over by Capt. Irwin and 63rd Regiment in 1829 (Vinnicombe, 1989), leading to rapid demise of local Aboriginal families. In 1833 hunting was still occurring, using fire to drive game over the scarp (to their deaths), (Wycherley, 1994).	**very high**

	Early pioneering botanical collections Preiss collected from 15/12/1838 to 16/10/1840 22 plant specimens from Mount Eliza (Bennett, pers. comm., 19/9/94). This included type collections of 14 taxa of flowering plants [*Baumea preissii, Scaevola holosericea* (currently *Scaevola anchusifolia), Pomaderris albicans* (currently *Trymalium albicans), Drosera porrecta* (currently *D. stolonifera*), *Pachysurus angianthoides* (currently *Gnephosis angianthoides*), *Elynanthus octandrus* (currently *Tetraria octandra*), *Patersonia turfosa* (currently *Patersonia occidentalis*), *Candollea parviflora* (currently *Hibbertia racemosa*), *Eurybia axillaris var. exaltata* (currently *Olearia axillaris*), *Casuarina preissiana* (currently *Allocasuarina humilis*), *Grevillea preissii* (currently *Grevillea thelemanniana subsp preissii*), *Grevillea vestita var. dilatata* (currently *Grevillea vestita subsp vestita*), *Cryptandra tridentifera var. tomentosa* (currently *Cryptandra tridentata*), *Libertia laxa* (currently *Orthrosanthus laxus*)] (Bennett in preparation) and fungi *Agaricus australius* (currently *Lepiota australiana*)], (Bennett, pers. comm., 19/9/94). There are also five other type collections (collected in the early 1900's) known from Kings Park, *Helipterum roseum var. nigropapposum* (currently *Rhodanthe chlorocephala subsp rosea*), *Simsia latifolia var. gracilis* (currently *Stirlingia latifolia*), *Gompholbium tomentosum f intricata* (currently *Gompholobium tomentosum*), *Anigozanthos manglesii var. flavescens* (currently *Anigozanthos manglesii*) and *Dodonaea hackettiana* (Bennett in preparation).	**very high**
	Historic landuse by Perth colony The Kennedy Fountain (spring) at the base of Kings Park scarp was one of the first supplies of fresh water to the Perth colony. Governor Kennedy had a cistern made and the water was piped in 1861 (Bessell-Browne, 1990). Up until 1880 it was only one of two public water sources in Perth (Wright, 1960). It is still used by locals as a source of fresh, iron-free, carbonated water (Vinnicombe, 1989) and is a point of interest for tourists.	**high**
	Historic landuse (economic) by Perth colony Saw pits were established from early logging in the bushland, resulting in the first export to London from the Perth colony of 5 tonnes of Jarrah in 1836 (Wycherley, 1994). Jarrah timber was also used for construction of Fremantle Prison; Perth Town Hall and Government House (Anon.2 leaflet "Know Kings Park Number 13 Saw Pit").	**very high**
B1 Importance for rare, endangered or uncommon flora, fauna, communities, ecosystems, natural landscapes or phenomena, or as a wilderness.	**Outstanding environmental feature** The area provides a large remnant of natural bushland landscape (approx 267ha). Perth is the only capital city in Australia to have such a large area of remnant bushland so close to the city, being about 1.5 km from the General Post Office. The bushland is bounded by natural (Swan River), urban (Perth City) and suburban areas (Crawley, Subiaco, Shenton Park) and is readily accessible to local residents and tourists alike.	**very high**

	Uncommon landform and biological communities/assemblages The process of evolution of 2 different landforms are evident. Of particuar importance is the limestone escarpment. Only three relatively large areas of cliff-side vegetation, Kings Park, Blackall Reach and Mt Henry can now be found along the estuary. The Mixed Closed Heaths of the escarpment contain a diverse and unique assemblage of shrubs, herbs, sedges and grasses normally associated with limestone heaths of nearer coastal areas. The Mixed Closed Heaths at Kings Park are one of the most inland occurrences of these estuarine cliff communities and are contiguous with adjacent bushland areas (Kings Park Board, 1993).	**very high**
	Priority Listed flora Kings Park bushland contains six priority species listed by CALM : *Cartonema philydroides* (P3), *Dodonaea hackettiana* (P4), *Gonocarpus pithyoides* (P3), *Hydrocotyle hispidula* (P1), *Jacksonia sericea* (P3), *Lasiopetalum membranaceum* (P2) (CALM, 1993). The escarpment supports an uncommon community and landscape in the metro area. It also contains priority listed species: *Lasiopetalum membranaceum*, which is restricted and poorly collected throughout its range; and *Hydrocotyle hispidula* (Bennett, 1988).	**very high**
	Uncommon fauna Kings Park supports a rare population and habitat of native snail - *Bothriembrion indutus.* Usually the species occurs along the Darling Range, which has a granite and lateritic environment. The disjunct population in Kings Park bushland exists on limestone cliffs.	**very high**
	The areas of bushland near The University of Western Australia are used for research, particularly invertebrates, by the Zoology Department. Some species of katydids (Tettigoniidae) have not only regional significance but strong links with relic species in the lower south-west of WA and Kings Park is the northern end of their range (Bailey, pers. comm. 24/2/92). Bushcrickets and Katydids have a number of interesting species of which some are still unnamed. Also an unnamed species of the genus *Tympanophora* is only just surviving in the south-western corner of the bushland. It does not have a wide distribution out side of the Park (Bailey, pers. comm. 31/5/94).	**very high**
	The Trap Door Spider *Aganippe rhaphiduca,* although not rare, has 'localised' population differences in Kings Park. Usually it occurs on the Darling scarp and in Jarrah forest to Albany. The "lungless" spider *Chasmocephalon neglectum* is recorded as possibly originating in Kings Park bushland, (collected as type specimen in 1864) and is extremely rare (Bailey, pers. comm., 31/5/94).	**very high**

B2 Importance in demonstrating a distinctive way of life, custom, process, land use, function or design no longer practised, in danger of being lost or of exceptional interest	**Evidence of historic human activity subject to changing land use.** Convict labour was used to log Jarrah (*Eucalyptus marginata*) from the bushland for both local and export supply of timber. Logging activity has left saw-pit depressions throughout the bushland (Anon. 2 leaflet "Know Kings Park Number 13 Saw Pit"). Maintenance to ensure erosion and deposition does not obscure the pits is addressed in the Bushland Draft Management Plan.	very high
C1 Importance for information contributing to a wider understanding of Australian natural history, by virtue of its use as a research site, teaching site, type locality reference or benchmark site.	**Benchmark site** Most visited tourist/recreation location in Western Australia, with two million adult visits per annum. Unparalleled opportunity to convey to visitors a wider understanding of Australian natural history due to close proximity to the central business district, high visitation and large expanse of bushland.	very high
	Type locality for botanical / faunal collections Kings Park is the Type Locality for 20 taxa of plants and two taxa of invertebrates. Plant taxa include *Baumea preissii, Scaevola holosericea (*currently *Scaevola anchusifolia), Pomaderris albicans* (currently *Trymalium albicans), Drosera porrecta* (currently *D. stolonifera*), *Pachysurus angianthoides* (currently *Gnephosis angianthoides*), *Elynanthus octandrus* (currently *Tetraria octandra*), *Patersonia turfosa* (currently *Patersonia occidentalis*), *Candollea parviflora* (currently *Hibbertia racemosa*), *Eurybia axillaris var. exaltata* (currently *Olearia axillaris), Casuarina preissii (*currently *Allocasuarina humilis), Grevillea preissii (*currently *Grevillea thelemanniana subsp preissii), Grevillea vestita var. dilatata (*currently *Grevillea vestita subsp vestita), Cryptandra tridentifera var. tomentosa (*currently *Crytandra tridentata), Libertia laxa (*currently *Orthrosanthus laxus)],* (Bennett, pers. comm., 19/9/94) and *Anigozanthos manglesii var. flavescens* (currently *Anigozanthos manglesii*), *Dodonaea hackettiana, Helipterum roseum var. nigropapposum (*currently *Rhodanthe chlorocephala subsp rosea), Simsia latifolia var. gracilis (*currently *Stirlingia latifolia*), *Gompholobium tomentosum f intricata* (currently *Gompholobium tomentosum*), (Bennett in preparation), and *Agaricus australius* (currently *Lepiota australiana*) (Bennett, pers. comm., 19/9/94). Type locality for invertebrate collections: Trap Door Spider *Aganippe rhaphiduca.* Although not rare, the species has 'localised' population differences in Kings Park. It usually occurs in the Darling scarp and in Jarrah forest to Albany. The "lungless" spider *Chasmocephalon neglectum* was collected as type specimen in 1864; records suggest Kings Park bushland was the source. It is extremely rare.	very high very high

	Teaching and research site As a teaching site, the bushland is used extensively by local schools and university students. The Kings Park and Botanic Garden Draft Bushland Management Plan provides areas for educational hands-on activities	**high**
	The Museum of Western Australia uses specific areas of bushland for on-going ground fauna, especially lizard research. The Museum is also keeping bird records; Kings Park bushland is the western most site of colonisation by Red Capped Robin (of the metro area from the wheatbelt). This is considered to be highly unusual as it shows the robin must have used metro gardens as passage to the Park bushland (Dell, pers. comm., 31/5/94).	**high**
	Areas of bushland near The University of Western Australia are used for research by the Zoology Department, especially invertebrates. Some species of katydid (Tettigoniidae) have not only regional significance but strong links with relic species in the lower south-west of WA, and Kings Park is the northern end of their range (Bailey, pers. comm. 24/2/92). Bushcrickets or Katydids have a number of interesting species of which some are still unnamed. Also an unnamed species of the genus *Tympanophora* is only just surviving in the south western corner of the bushland. It does not have a wide distribution out side of the Park (Bailey, pers. comm., 31/5/94).	**very high**
	Kings Park bushland contains quadrat sites for the Swan Coastal Plain Floristics Survey conducted by The Department of Conservation and Land Management and the Wildflower Society of WA (Gibson, Keighery *et. al.* 1994). Alison Bairds botanical survey quadrats laid down in 1936-40 provide valuable data for bushland ecology and management, and are used as an historical comparison with other similar bushland habitats (Baird,1977).	**very high**
D1 Importance in demonstrating the principal characteristics of the range of landscapes, environments or ecosystems, the attributes of which identify them as being characteristic of their class.	**Characteristic of local natural environment** Kings Park provides good representation of Karrakatta Complex plant communities (including mixed eucalypt woodland and mixed closed heath) within an urban setting (Kings Park and Botanic Garden, 1993). Comparisons with other communities eg Shenton Park, Bold Park ,Blackwall Reach and Mt Henry at the mouth of Canning River serve to illustrate the many similarities and yet unique properties of Kings Park bushland. The limestone cliffs (ancient sand dunes) are clearly shown to observers and the vegetation supported on the shallow cliff soil is one of the most inland representations of the vegetation type on the Swan Coastal Plain (Kings Park and Botanic Garden 1993). Few other similar sites along the Swan River have such a combination of outstanding position in the landscape, large size (approx. 267ha), degree of cultural history, condition and integrity, number of priority listed species, unusual/rare fauna and number of fresh water springs.	**very high**

E1 Importance for a community for aesthetic characteristics held in high esteem or otherwise valued by the community.	**Historic views and natural vistas** Kings Park is an important part of the identity of Perth. The visual landscape is an invaluable resource, which includes the bushland, the diversity of vegetation, landforms and distinctive limestone scarp (Kings Park Board, 1993). The view of the bushland rising up from the Swan River is seen from suburbs surrounding the area e.g. Crawley, South Perth, including the City of Perth. Shenton Park, Nedlands and West Perth residents neighbouring the Park also enjoy bushland views. The panoramic view from atop the escarpment takes in the entire City of Perth Central Business District, a large section of the Swan River and mouth of the Canning River and many local suburbs, with the Darling Scarp in the distance. The view gives visitors an understanding of the local geography and landforms in relation to the city and is often depicted in historical photography, e.g. *A City and Its Setting* by Seddon & Ravine, (1986).	**very high**
	Aesthetically pleasing displays of wildflowers especially in spring, attract world-wide tourist attention (63% of all international visitors to Western Australia) (Bureau of Tourism Research, 1991). A recent bushland survey showed frequent use by local residents: 83% of survey respondents were local residents, 33% visiting once a week (Calladine *et al.*). A recent Bold Park survey showed 92% of visitors lived in the Perth metro area and 30% visited more than once a week. The Kings Park survey showed 44% of visitors came from suburbs adjacent to the bushland, compared to Bold Park where only 23% of visitors were from adjacent suburbs. Kings Park is far more accessible to a greater number of people. Kings Park bushland is frequently used by tour companies to show overseas tourists an example of Western Australian bushland (Calladine *et al.*); for many tourists, it is the only example of Western Australian bushland they encounter. It is the most popular tourist destination in Western Australia with an estimated 2,200,000 adult visitations per annum (derived from three Australian Bureau of Statistics surveys and Kings Park Guides interstate visitor enquires). When children are factored in, estimates of total visitations are in the region of 5,000,000.	**very high**
	The bushland occupies two thirds of Kings Park and Botanic Garden, which is protected as an A Class Reserve.	**very high**

G1 Importance as a place highly valued by a community for reasons of religious, spiritual, symbolic, cultural, educational or social associations.	**Aboriginal religious / spiritual and cultural heritage** The escarpment in Kings Park bushland was created by *Waugal*, a rainbow serpent and creator spirit (Vinnicombe, 1989) according to Aboriginal legend.	very high
	Cultural and Social associations The escarpment is a natural high point in the landscape and is in a natural state, providing landscape value quintessential to the community's sense of place. The bushland is therefore held in high esteem by local as well as interstate and overseas visitors.	very high
	"The view from Kings Park, on Mt. Eliza is the finest of its kind in all Australia. In no other city is there such a combination of city, suburb and river, backed by a mountain range. It certainly is a view that no visitor should miss" (Seddon, 1972).	very high
	Proposals to clear bushland for a hospital, a swimming pool complex and an orchestral shell raised such public concern that amendments were made to the Parks and Reserves Act to further protect the bushland area (Kings Park & Botanic Garden, 1993).	very high
	When first requested, permission to log timber from the bushland was refused by John Septimus Roe in 1831. It was not until the 1860's that logging of Jarrah occurred in the bushland.	high
	The bushland is part of one of the State's early public parks (set aside in 1872) and has many well known figures of the 19th Century associated with its management and history e.g. W. De Vlamingh (explorer, 1697); Sir Jonn Forrest (first President of the Board); John Septimus Roe (first Surveyor-General) and James Drummond (botanist).	high
	Tree lined Memorial Avenues commemorating those who died for their country in Western Australia, line 2 of the 3 roads that travel through the bushland. Flowers are laid at the base of the trees, in front of the memorial plaque to each soldier each Anzac Day.	very high
	Kings Park and Botanic Garden is a focus for all levels of tourism, with adult visitors numbering approximately 2 million adults each year (Population Survey Monitor).	very high
	Educational value The bushland is much requested by teachers, especially through Kings Park Voluntary Guides, Schools Education Committee "Programmes for Schools" (years 1 to 7) and lecturers as a resource base for educational tours and research projects. The long association with the University of Western Australia and its research areas in the south west of the bushland add to the recognition of the Parks education values.	very high
	Kings Park Bushland Draft Management Plan has made provision for "hands on areas" where school students can study the bushland using transects and carry out bushland restoration (Kings Park and Botanic Garden, 1993).	High

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STATEMENT OF SIGNIFICANCE

(extracts from table)

The base of the escarpment was used as a major Aboriginal camp (Goonininup) for Yellagonga and his family group, as well as a ritual and ceremonial site and halting place on the trade route to Busselton. The escarpment, according to Aboriginal legend, was created by Waugal, a rainbow serpent and creator spirit.

Early botanical collectors included Preiss who collected from 15/12/1838 to 16/01/1840 22 plant specimens from Mount Eliza, including type collections of 14 taxa. Another six type collections are known to have been collected in Kings Park. The bushland is also the type locality for two invertebrate collections.

Historic land use included logging by convicts in the bushland, resulting in the first export to London from the Perth colony of five tonnes of Jarrah in 1836. Jarrah timber was also used for construction of Perth Town Hall and Government House.

Perth is the only capital city in Australia to have such a large area of remnant bushland so close to the city, being about 1.5 km from the General Post Office.

The viable size (267ha) of this inner-urban bushland ensures the continuation of a variety of habitats being maintained; there is also a corridor benefit to local birds and invertebrates, allowing the continuation of species migration within an urban environment. Of particular importance is the limestone escarpment. Only three relatively large areas of cliff-side vegetation, Kings Park, Blackall Reach and Mt Henry can now be found along the estuary. The Mixed Closed Heaths of the escarpment contain a diverse and unique assemblage of shrubs, herbs, sedges and grasses normally associated with limestone heaths of nearer coastal areas. The Mixed Closed Heaths at Kings Park are one of the most inland occurrences of these estuarine cliff communities and are contiguous with adjacent bushland areas.

Kings Park bushland contains six priority species listed by Conservation and Land Management: *Cartonema philydroides* (P3), *Dodonaea hackettiana* (P4), *Gonocaprus pithyoides* (P3), *Hydrocotyle hispidula* (P1), *Jacksonia sericea* (P3) and *Lasiopetalum membranaceum* (P2).

As a teaching site, the bushland is used extensively by local schools and university students. The Museum of Western Australia uses specific areas of bushland for on-going ground fauna, especially lizard research and is also keeping extensive bird records. The long association with The University of Western Australia and its research areas in the south west of the bushland provide a good baseline for future research as well as adding to the recognition of the Parks education values. Alison Bairds botanical survey quadrats laid down in 1936-1940 provide valuable data for bushland ecology and management, and are used as an historical comparison with other similar bushland habitats.

Few other similar sites along the Swan River have such a combination of outstanding position in the landscape, large size, degree of cultural history, condition and integrity, number of priority listed species, unusual/rare fauna and number of fresh water springs.

The escarpment is a natural high point in the landscape and is in a natural state, providing landscape value quintessential to the community's sense of place. The bushland is therefore held in high esteem by local as well as interstate and overseas visitors. Kings Park is the most popular tourist destination in Western Australia with an estimated 2 200 000 adult visitations per annum, when children are factored in estimates of total visitations are in the region of 5 000 000.

The view from Kings Park, on Mount Eliza, is the finest of its kind in all Australia. In no other city is there such a combination of city, suburbs and river, backed by a mountain range. It certainly is a view that no visitor should miss.

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NATURAL WOODLAND IN KING'S PARK, PERTH

By J. S. BEARD, D.Phil., King's Park and Botanic Garden, Perth, Western Australia.

432 acres of land on Mount Eliza, overlooking the Swan River, were reserved in 1872 "for the purpose of a public park and recreation ground." The area was extended to approximately 1,000 acres in 1890, and today (with minor alterations to boundaries) stands at 996 acres. The original title of "PERTH PARK" was changed to "THE KING'S PARK" in 1901.

Beautification and the development of civic amenities was commenced in 1895, but about four-fifths of the area, that is, about 800 acres, still remains under natural woodland—natural in the sense that it is self-sown and has not been artificially cleared or planted, but not virgin in the sense of an undisturbed climax vegetation which has remained unchanged for centuries. In spite of certain popular sentiment which likes to regard King's Park as "unspoiled virgin bushland," the plain fact is that the bush of the Park has become severely degraded during the present century. Everywhere large old forest trees stand stagheaded or dead and there are no vigorous young ones of the same species to replace them. To the most casual observer it is apparent that a former tall, open woodland dominated by eucalypts is in process of replacement by a low dense woodland consisting mainly of banksia and casuarina. In 1965 a detailed study of a small area of 16 acres of the park was made, in order to reconstruct a picture of the original eucalypt stratum from relics which still remained; to obtain accurate data on the structure and composition of the present woodland; and to endeavour to understand some of the degradation processes at work.

King's Park is so well known that no preliminary description of conditions affecting its ecology should be necessary. It may be useful, however, to cast a glance at the principal types of vegetation found on the Swan Coastal Plain, of which the Park forms a part. Woodland types predominate and a series can be traced related to increasing age and leaching of the soil from the coast inland. Near the coast stands of *Eucalyptus gomphocephala* (tuart) occur, usually on ridges, where the stand is dense, canopy almost closed and there is a sparse understory of small trees and large shrubs consisting mainly of wattle *(Acacia cyanophylla* and *A. spp.)* and *Xanthorrhoea*. Height of the eucalypts may attain 100 feet and the soil is a deep yellow sand with irregular projections of hard lime-

stone. This is the finest woodland on the coastal plain. On rather more leached soil, height is reduced to 60-80 feet, the tuarts becoming sparser and mixed with *Eucalyptus marginata* (jarrah) and *Banksia* and *Casuarina* appear in the understory. This is the King's Park type.

The next community along a scale of reduction with increasing leaching of the soil is to a pure jarrah overwood 50-60 feet in height with a well-developed lower layer of *Banksia* and *Casuarina*. This type again merges into a more reduced one 25-30 feet tall mainly of *Banksia attenuata* and *B. menziesii* with occasional specimens of *E. todtiana* which barely emerge above the general canopy. This last type is found essentially on deep white sands of coarse texture in which leaching of nutrients and the finer soil fractions has proceeded to an extreme and water-holding capacity has become extremely low. The same type of vegetation is also found locally on limestone outcrops carrying little or no soil where moisture is equally a critical factor.

It would be natural, where any one of these types of plant community had been damaged or destroyed, for it to be replaced at least temporarily by a different one resembling another related community further down the scale, in the series representing a deterioration within the same general type of habitat. The writer has observed that this is frequently the case with disturbance communities in other parts of the world. Thus we should expect that a general collapse of the ecosystem of the King's Park eucalypt woodland would lead to its replacement by a lower growth of the more tolerant *Banksia* and *Casuarina*, resembling in physiognomy the *Banksia-E. todtiana* type

THE STOCKTAKING SURVEY

The area chosen is shown in Fig. 1 and was a part of the Park

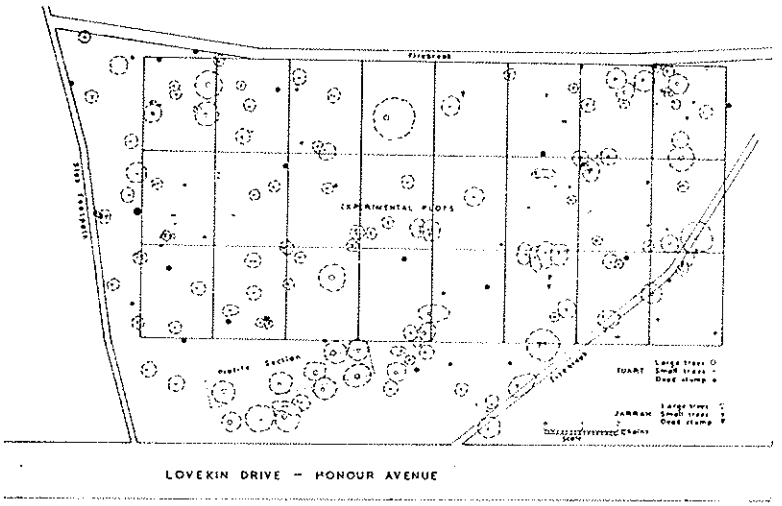

Fig. 1.—Plan of area studied with positions of trees plotted.

in which 24 x ¼ acre plots had been laid down for an experiment in vegetation management. The existence of the plot boundaries facilitated plotting of the positions of the included trees, and the data recorded would also in the long run prove useful in the experiment itself. In addition to the plot area of 12 acres, about 4 acres of ground between the plots and Lovekin Drive and a nearby slab track were also included. Within this total area, the position of all eucalypt trees, living or dead, was plotted, with a record of species, diameter, height and condition of the tree. The smaller and more numerous banksia and casuarina trees were not plotted, but instead the total number of each was counted in each of the ¼ acre plot areas. Considering first the eucalypt population, only two species are present, tuart and jarrah, in the proportion of 3 : 1. Of the large trees 18 in. diameter and over, 84% are tuart, but the proportion of these is less among the small trees (65%). Large jarrah may have been felled and sawn by early settlers, leaving only inferior coppice to replace it; or alternatively, tuart may always have been preponderant. Distribution is irregular, and a pattern is noticeable of alternation of relatively dense groves of large-sized tuart without jarrah and areas of smaller trees where the two species mix. It is supposed that this is due to soil conditions.

In order better to illustrate structure of the stand and its deterioration, a profile was measured in the study area 300 feet long and 50 feet deep, and this is shown in Fig. 2 with the stand as it appears today contrasted with a reconstruction showing the existing trees in full canopy. The profile was not selected at random but was chosen to include as many large trees as possible in order to dramatise the degradation of the stand. The profile is actually more densely stocked with eucalypts than the average of the study area and correspondingly understocked in the lower story.

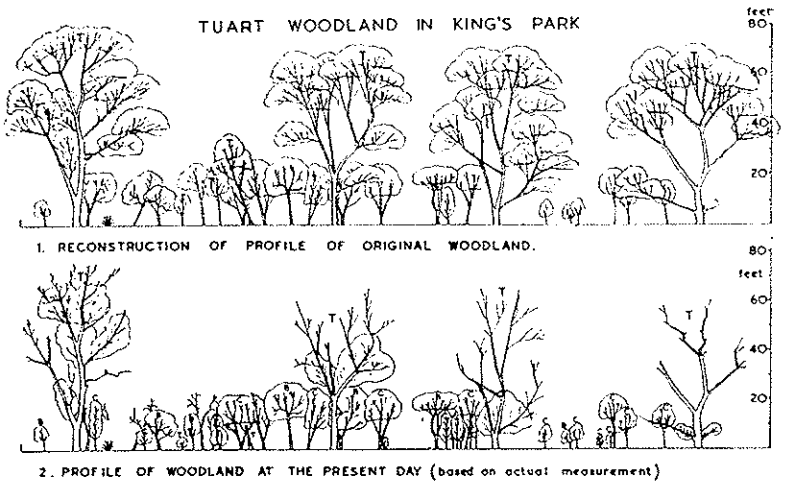

Fig. 2.—Measured profiles of tuart woodland in King's Park.

It is possible to say in general, however, that originally the woodland consisted of an open stand of large, spreading trees, the dominants averaging 60 ft. in height with some reaching 75 ft. or 80 ft. and 2-3 ft. in diameter with some reaching 5 ft. These trees branch or fork low down usually between 5 ft. and 15 ft. above ground and the branches spread widely. Owing to the bad condition of the surviving trees it is difficult to obtain an exact figure for crown spread, but many of the better dominants spread to 30 ft. to 50 ft. in radius from the butt. Between the large dominants a slightly smaller number of smaller trees is found reaching 50 ft. in height and 18 in. in diameter which are thought to represent suppressed trees growing in the vicinity of old dominants and partly young trees on their way up in gaps; with the general deterioration of the stand any young trees seem to have stagnated also, and died back so that the normal process of regeneration has been arrested. This applies also to saplings and seedling regeneration. The condition of the 194 eucalypt trees (144 tuarts and 50 jarrahs) recorded in February 1965 is shown in the accompanying table.

	Dominants			Small trees			Total	%
	t*	j*	all	t*	j*	all		
Full foliage	0	1	1	3	4	7	8	4
Stagheaded	11	8	19	20	16	36	55	28
Died back to 1/3-2/3 of height	15	0	15	4	2	6	21	11
Died back to 0-1/3	16	0	16	10	4	14	30	16
Died back to base	18	2	20	13	4	17	37	19
Dead	24	5	29	10	4	14	43	22
Totals	84	16	100	60	34	94	194	100

*t—tuart; j—jarrah.

Stumps of all trees that had died in recent years were located and recorded as far as possible but some may have been missed. On the record, of 194 trees 43 (22%) have died completely and only 8 (4%) retain something like full vigour. The rest are in various stages of dieback. The jarrah have tended to remain in better condition than the tuart, 50% of all jarrah being recorded as stagheaded only, and 10% as in full foliage; all the same their general appearance is poor and it is probable that little or no growth is being made. In the same way small trees have tended to retain vigour longer than dominants and there is a relatively large number in the stagheaded class.

The symptoms of recession in these trees are a progressive dieback of the crown; foliage is confined first to epicormic growth on the branches (stagheaded), later on main limbs only, later still on the lower part of the trunk, and on coppice shoots arising from the stump, until finally death supervenes. Basically the trouble is an inability to restore foliage lost through bushfire or borer attack, which suggests weakening of the tree by some other cause. A small proportion of living trees are fire-scarred at base, and some on being felled are found to have termites active in the heartwood but

neither of these can contribute in a general way to the weakening of the stand.

It is possible to work out from the data the area of eucalypt crown cover which still remains, though to compare this with the original stand is more difficult. The total crown area of the living eucalypt trees at the present day is estimated at 7060 sq. yds., or 9% of the area of 16 acres. Stand density, with 194 trees on 16 acres, is 12 per acre, 6 of these being dominants and 6 smaller trees. Owing to the falling away of the limbs of half-dead trees it is difficult to form an accurate impression of the crown spread of the original stand. As an approximation the crown spread of the least deteriorated trees in the study area in the Park was plotted against the stem diameter at breast height and appeared to show a linear relationship which may be interpreted as 20 feet of crown diameter for every 1 foot of stem diameter. On this basis the crown cover of the original woodland is estimated as 21,770 sq. yds. or 4.5 acres, 28% of the total of 16 acres. This is three times the present day figure, and is of course purely conjectural.

With the decay of the former eucalypt overwood, canopy dominance is now assumed by the lower stratum of *Banksia spp.* and *Casuarina fraseriana* (Sheoak) which attains only 25 feet in height. It seems probable that the members of this stratum have increased in numbers since stand degradation set in. All these trees in the 24 x ½ acre plots of the vegetation management experiment were counted, taking as trees all specimens over 6 feet in height, and the figures set out in the accompanying table. The three species of banksia present (*B. grandis, B. menziesii* and *B. attenuata*) were not enumerated separately since *B. grandis* is relatively rare and the other two intermingle freely and appear to be ecologically equivalent. Stocking is variable but the average per acre is as follows (in round figures):—

Tuart	trees	8			
	saplings	1	=	9	5%
Jarrah	trees	4			
	saplings	3	=	7	4%
TOTAL EUCALYPTS				16	9%
Banksia		69			39%
Casuarina		92			52%
Other		1			
TOTAL ALL SPECIES		178			

This estimate is based on 12 acres instead of the 16 used for the eucalypt enumeration cited earlier but the number of eucalypt trees (disregarding saplings) is the same per acre. The enormous preponderance in numbers of the banksias and casuarinas over the eucalypts is most striking, as is the scarcity of eucalypts in the sapling stage.

A few of the tuart saplings—3 or 4 in the area studied—appear vigorous and in good condition and may be fairly recent seedlings. The rest, and all the jarrah, are as wretched and full of dieback as the older specimens of their species. Many, especially jarrah, have obviously been burnt back repeatedly and consist of clumps of cop-

pice. If the eucalypt community as a whole were in normal healthy condition, the amount of regeneration present would actually be adequate, but as things are the young individuals are clearly not on their way up to restore eucalypt dominance. They share in the general deterioration. Banksia and casuarina on the other hand can be seen regenerating in open spaces and (depending on frequency of fires) may be maintaining their populations. These two elements intermingle freely but a tendency to form pure groups is also noticeable. The conditions of their regeneration appear to be somewhat different and would account for this. Casuarinas frequently form dense thickets and once established are very hardy and persist for many years. A dead one (in the absence of fire) is hardly ever observed and many specimens live to a great age. Banksias on the other hand regenerate and establish more freely, and are relatively short-lived so that the bush is full of dead individuals which have succumbed naturally, especially in the summer. Both banksia and casuarina are hardy to fire and well withstand severe crown fires which destroy not only their leaves but the smaller branches as well.

It is very difficult to obtain an estimate of the crown cover of the *Banksia-Casuarina* stratum since the stand is so irregular, but with 160 individuals per acre and a probable mean cover of about 15 sq. yds. each, the total cover would be approximately 50%. The stratum is not a closed one except locally in thickets.

It has been shown that the crown cover of the eucalypt stratum has been reduced to about a third of its probable original value, and observation suggests that crown cover of the lower story has increased in the process.

CAUSES OF DETERIORATION

It is easy enough to show what has happened to the King's Park woodland, but less easy to assign causes for the change. However, deterioration can only be due to adverse changes in environmental factors, either climatic, edaphic or anthropogenic. It is difficult to envisage any adverse changes in the first two, so that the anthropogenic factor must be responsible.

It is believed that the early settlers of Perth felled jarrah in the Park for building purposes, but there is no evidence that tuart was worked to any extent. Felling of jarrah must have taken place a very long time ago, probably before 1871 when the first part of the Park was reserved, and certainly not after 1890 when the Park was consolidated and placed under management. The fellings may, however, have initiated the cycle of deterioration. Otherwise the principal disturbance factor has been the bushfire.

It is known that Aborigines used to burn off the country but we have unfortunately no detailed information about their practice. Fires are also set by lightning, and used to arise from this cause. The primitive or "original" woodland of King's Park grew up in equilibrium with the fire pattern of its early days, and subsequent changes in the fire pattern would tend to evoke changes in the vegetation. What has happened is that low-canopy dominance has replaced high-canopy dominance. An equilibrium between a tall eucalypt stratum

and a sparse understory has been replaced by another in which a dense understory is dominant to the exclusion of tall eucalypts.

The writer suggests that the sequence of events may have been as follows:—

1. Early settlers opened the canopy by felling jarrah. This stimulated the understory.
2. Fires became less frequent but more destructive due to more fuel and so damaged eucalypt canopy more.
3. The canopy was progressively more and more opened, and the undergrowth became denser and thicker between fires.
4. Eventually the increased number of understory trees came to compete for moisture in summer with the eucalypt dominants which died back progressively.

As far as can be ascertained, dieback of the eucalypts first became noticeable in the 1920s, and began to accelerate in the 1930s. At that time it seems that resources for firefighting were somewhat limited, and fires in severe weather would have been difficult or impossible to control. During the administration of Superintendent J. E. Watson from 1938, firebreaks and mechanical firefighting equipment were introduced and a policy of controlled burning-off in cool weather. These measures undoubtedly reduced fire damage but none the less it was during this period that the eucalypts became worst affected. The reason for this, it is suggested, may have been that copious regeneration of banksia and casuarina had already followed earlier fires. Protection allowed these to grow up into a dense layer that could compete too strongly with the eucalypt overwood. Protection, in other words, coming at this juncture, administered the final blow.

MEASURES OF REHABILITATION

It is assumed as a desirable object of park management that the process of deterioration in the bush should if possible be arrested and reversed. It could be desirable to recreate the character of the primitive woodland in selected areas, and basically the problem—which is to restore only 12 healthy tuart and jarrah trees per acre—might appear a simple one. However, replanting which had been done sporadically over the past 25 years has hardly added one new healthy dominant to the Park bush. Young trees can be established easily enough, but it has been found that after only a few years they become stagnant; any tuarts among them are attacked by insects and go into a decline. Marri *(E. calophylla)* remain healthy but grow slowly. In any case all of them have been subjected to fire damage.

It has been found in studies of tuart regeneration in the forest at Ludlow (Mr. G. E. Brockway, private communication) that the species will regenerate vigorously on ashbeds but is soon susceptible to the competition of established surrounding trees and declines as in King's Park. In open, cleared plots, however, young tuart will continue to make good, healthy progress. Evidently, therefore, there are two requisites to success—freedom from competition and from bushfires.

Experiments in King's Park over three years have now succeeded in developing a technique for successful mass establishment of six to nine month old seedling trees. If planted in natural gaps in the bush canopy which have been cultivated by rotary hoe, these will survive the following summer and make good growth, without watering or attention, and even if apparently drought-tender species like *E. diversicolor* (karri) and *E. guilfoylei* (tingle) are included. Height growth and luxuriance are much improved by dressings of organic manure.

It is thought that healthy trees, therefore, can be grown in the Park bush if they are properly treated and fire-protected.

It will be necessary to continue experiments for some years, planting out groups of young tuarts, jarrah and marri, manuring and tending them, and gradually removing competition by banksia and casuarina from their vicinity. This will necessitate vigorous progressive felling of the latter, but we already know from past experience that unless this is done the eucalypts cannot be expected to make good growth. Mowing of the ground vegetation around the groups of trees will be relied on for fire protection.

OCCURRENCES OF THE DOUBLE-BANDED DOTTEREL IN WESTERN AUSTRALIA

By JULIAN FORD, Perth.

The Double-banded Dotterel *(Charadrius bicinctus)* is a New Zealand breeding species which during the post-breeding period virtually deserts the South Island, and congregates on the North Island, while a considerable proportion of birds migrates across the Tasman Sea to coastal eastern Australia, Tasmania and South Australia where a small number of non-breeding birds remain during the normal nesting season (W. B. Oliver, *New Zealand Birds*, Wellington, 1955, p. 259). Some birds penetrate many miles inland in eastern Australia (J. Hobbs, *The Emu*, 61, 1961: 30; 56, 1956: 434). It also visits Lord Howe, Norfolk and the New Hebrides Islands, and on rare occasions a few wander along the south coast as far as South-western Australia (D. L. Serventy and H. M. Whittell, *Birds of Western Australia*, Perth, 1962, p. 190), where it has been observed at six localities. Because of some confusion regarding these few known occurrences in Western Australia, plus the fact that details of several specimens collected in the State have never been publicised, all definite sightings of the Double-banded Dotterel including a recent record are listed.

Point Malcolm, east of Esperance. J. T. Tunney collected three specimens - two males and one female - at Point Malcolm on June 16/17, 1906. The two males, one being in breeding plumage and the other in advanced moult into breeding plumage, are now in the American Museum of Natural History (nos. 736952/3), while the female, which is in eclipse plumage, is in the W.A. Museum (no. 8921).

INDEX OF PLANT NAMES

The scientific name of the plant is in bold type, the common name is in normal type. Where the plant is refered to several times the first number is the page facing the illustration. Where the plant is not illustrated the name is followed by a #.

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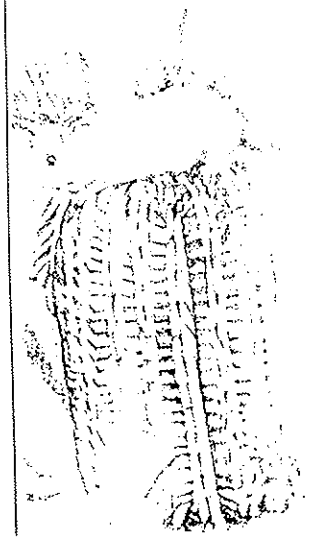

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PLANT SPECIES OF THE KINGS PARK BUSHLAND

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BACKGROUND

The Swan River Colony was founded in 1829 with John Septimus Roe, the first Surveyor General for the Colony, undertaking the planning for the city. The first indication that the area of Mount Eliza was to set aside for public purposes occured in 1831 when he refused permission for timber to be cut from Kings Park. Unfortunately permission was eventually given and in 1835 five tonnes of jarrah cut from the vicinity of Mount Eliza was the first export from the Colony. For several years after that timber continued to be cut. Today, the remains of saw pits can be seen throughout the bushland. In 1872 Malcolm Fraser, the Surveyor General, gazetted 175ha on Mount Eliza as a public park and in 1890 this was increased by John Forrest to its current size of 400ha with the first Board being appointed in 1895.

The founding fathers certainly intended Kings Park to remain as bushland when Sir Malcolm Fraser wrote in the Western Australian Year Book for 1902-1904, "Everything has been done to preserve the natural trees and flora, so that the wild flowers and shrubs are a delightful feature of the Park". John Forrest expressed a similar view when he said about Kings Park being a "sanctuary of bush land right in the heart of the City". This view has continued today both with the staff of the Park and the public of Western Australia.

HISTORY OF THE BUSHLAND SINCE SETTLEMENT

The bushland of Kings Park was altered considerably before it was gazetted as a public park. As mentioned above, most of the tall timber, especially Jarrah *(Eucalyptus marginata)* was cut for use in buildings - the Perth Town Hall and Government House were built with timber felled in Kings Park. The trunks of Blackboys, *Xanthorrhoea preissii*, were taken for kindling so only a few larger specimens of these remain. Banksia trees were felled for firewood and limestone was quarried from the scarp, especially from Quarry Point near Kennedy Fountain.

In the 1930's there was an attempt to beautify the bushland of Kings Park, so several non-native species were planted. These included *Eucalyptus cladocalyx* (Sugar Gum), *Melaleuca lanceolata* (Rottnest Teatree), *Brachychiton populneus* (Kurrajong) and *Agonis flexuosa* (Peppermint Tree). Planting continued with other species including the pink flowering forms of

Eucalyptus calophylla (Marri), *Eucalyptus erythrocorys* (Illyarrie), *Acacia* species and *Chamelaucium uncinatum* (Geraldton Wax). Many of these have now become established in the bushland.

More recently seeds of *Verticordia monadelpha* were scattered through the bushland and several plants of this species can be seen mainly along the road verges. *Hakea costata* seeds, scattered in an area of the Nature Trail, have established successfully and spread considerably.

Perennial Veldgrass (*Ehrharta calycina*) was first recorded at the Crawley end of the Park in 1924 by which time there was a dense growth of about 1/4 acre in extent. The grass was then hailed as a valuable fodder grass and encouraged as a saleable commodity. The flowering heads were collected and sold to the residents of Subiaco as horse feed. This has subsequently proven to be a very unpleasant introduction. Many experiments have been undertaken to eradicate it. Between 1949 and 1951 during the flowering season of veldgrass, the Board tried to control it by means of cattle grazing. This attempt appeared to be soundly based as cattle ate the grass, but unfortunately they also ate the native vegetation. Ungerminated seeds of Veldgrass were left, the litter and soil layers were broken up by the hooves of the animals, leaving areas for this and other weeds to invade. Recently the use of a selective herbicide has been very successful and large quantities of the grass have now disappeared. It is essential that follow up spraying continue to avoid any reinfestation.

For many decades King Park has been used as a "dumping" ground by the resident of Perth and nearby suburbs. As a result many weeds have been introduced. Freesias, Gladiolus and other cormous or bulbous plants are established in the bushland and reproduce very successfully often to the detriment of the native species.

Fires have been a problem in Kings Park with a few very extensive ones having been recorded, the last being in February 1989 when about 1/2 of the bushland was burnt. For several years in the 1930's it was the Board's policy to control burn designated areas of the Park at 4 year intervals, but in the last decade very little control burning has been undertaken. Certainly there has been no regular control burns.

The bushland is considerably altered from what it was at the time of settlement. Before settlement the vegetation would have been of tall Tuart (*Eucalyptus gomphocepha*), Jarrah (*Eucalyptus marginata*) and Marri (*Eucalyptus calophylla*) with an understorey of Banksia and Allocasuarina trees. Today the structure has changed so that Banksia and Sheoak predominate (Beard, 1967). The original ecosystem of a tall open forest of Tuart-Jarrah-Marri is probably collapsing and being replaced by a Banksia-Sheoak low open woodland which is typical of excessively drained sands of low nutrient status. This is a natural sequence but has probably been accelerated by disturbance.

GEOLOGY, GEOMORPHOLOGY AND SOILS

Kings Park was classified as being within the Spearwood Dune System with soils of the Karrakatta Soil Association (Bettenay *et al.*, 1960). These were further classified into a yellow phase (a grey to brown surface passing into a bright yellow subsoil) and a grey phase (grey surface passing into a bleached light grey to white subsurface overlying a pale yellow subsoil).

The Karakatta Soil Association is believed to have been formed between 10,000 and 6,000 years ago (McArthur and Bettenay, 1960) from calcareous beach sand (aeolianite) containing 50–70% calcium carbonate. Much of the calcium carbonate has been leached to form secondary calcite layers at greater depths. This leaching led to podzolized sands with yellow to brownish yellow sands at depth.

Most of the Park is composed of medium sized sand particles with a large area of coarse sand towards the southern end. There are significant areas of fine sand and some areas of sandy loam horizons, both of which have greater water holding capacity than the coarse and medium sands. The loam horizons also has a greater nutrient retention (Bessell-Brown, 1990).

The sandy loam horizon was found to coincide with a more vigorous vegetation cover. The sand above the layer was wet suggesting a perched water table during some months of the year. No water table was found close to the surface (Bessell-Brown, 1990).

BUSHLAND STUDY

For this study the bushland of the Park was divided into 12 areas using major tracks, firebreaks and roads (Figure 1). This survey commenced with the collecting of plants for illustration and inclusion in The Bushland Plants of Kings Park. All the species recorded (even if not recorded recently) within each of these areas is included and this list has been continually updated since 1985. After the fire of 1989, species which had not previously been recorded for the bushland were located and the number of others has been seriously depleted. The species, their areas of distribution and flowering months are given in Appendix I.

VEGETATION RELATIONSHIPS

Referring to the map of the 12 Areas in Figure 1, Area 12 is the limestone escarpment visible from Mounts Bay Road. Area 11 is directly above this and to the east of Forrest Drive. Both of these areas have exposed limestone, which are more abundant in Area 12 than Area 11. Most of the remiander of the Park is sandy soil with a mix of Banskia and Eucalyptus woodland.

Three areas, Area 12, Area 11 and Area 2, recorded species found only in these respective areas. *Poa porphyrocladus, Hydrocotyle hispidula, Leucopogon parviflorus, Daucus glochidiatus and Trymalium ledifolium* are restricted to Area 12, *Acacia lasiocarpa, Lasiopetalum membranaceum, Lyperanthus serratus* and *Caladenia hirta* to Area 11, and *Thysanotus thyrsoideus, Pimelea leucantha* and *Leucopogon racemulosus* to Area 2.

Areas 11 and 12 have several species in common but which are restricted to these two areas. These included

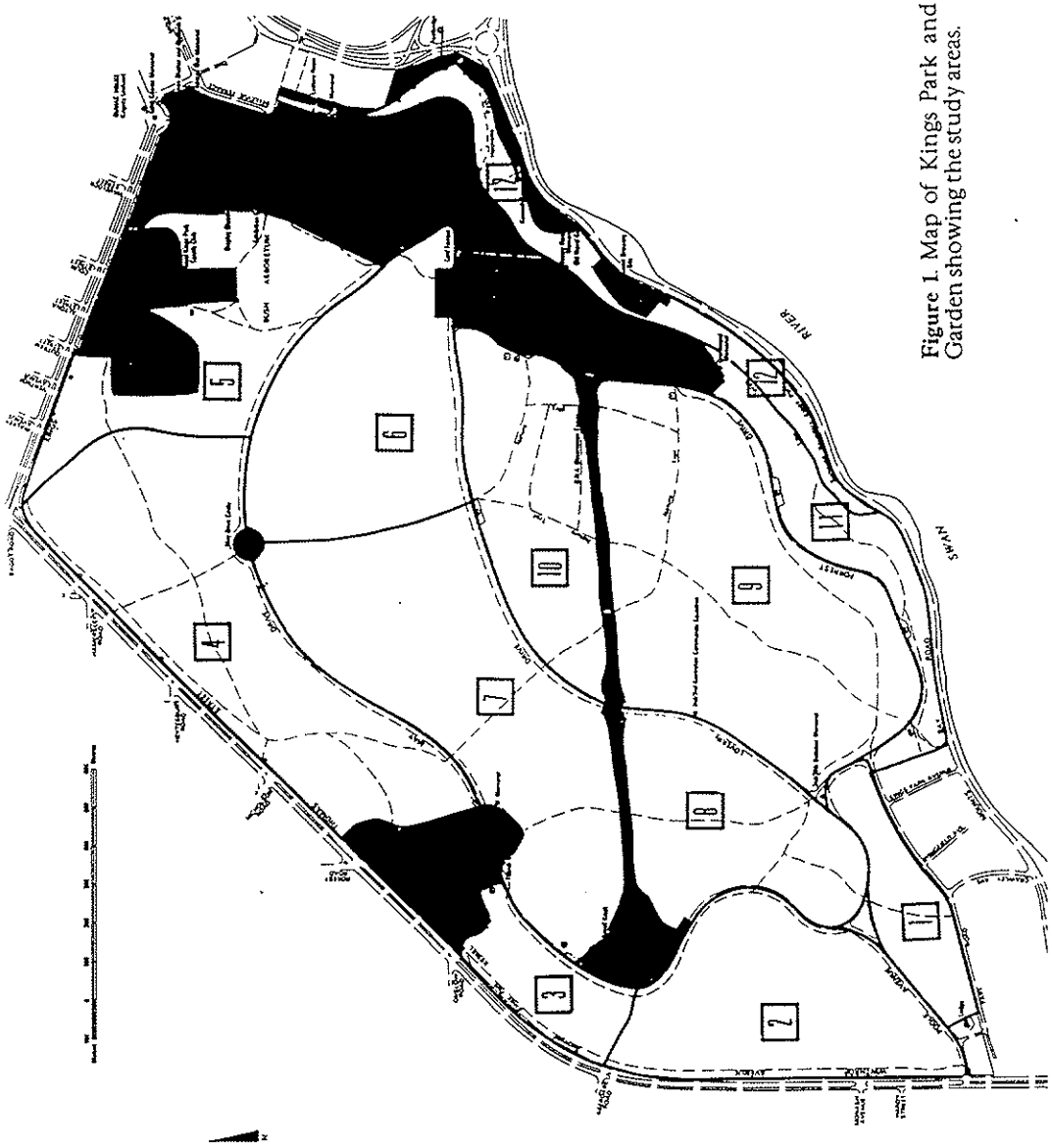

Figure 1. Map of Kings Park and Botanic Garden showing the study areas.

Acacia rostellifera, Acanthocarpus preissii, Calothamnus quadrifidus, Drosera macrantha, Gompholobium aristatum, Grevillea thelemanniana, Isolepis cernua, Isolepis nodosa, Melaleuca acerosa, Melaleuca huegelii, Stipa elegantissima and *Templetonia retusa*. As mentioned above, both these areas have limestone outcropping or close to the surface, which does not occur in the remainder of the bushland.

Occasional species are recorded as being restricted to other areas e.g. *Thelymitra crinita* to Area 2, *Arnocrinum preissii, Petrophile serruriae* and *Stylidium carnosum* (which has not been recorded recently) to Area 5, *Luzula meridonalis* to Area 6, *Pronaya fraseri* to Area 8, *Cassytha glabella* to Area 9, *Diuris brumalis, Eriochilus dilatatus* and *Schoenus brevisetis* to Area 10.

In 1987 Mattiske under took an ecological survey of Kings Park in which she recognised five Site Vegetation Types (Mattiske, 1987). The relationship between the current study and that of Mattiske are outlined in Table 2.

Site Vegetation Types, $E_{B.l}$, described as an "open forest of *Eucalyptus marginata, – Allocasuarina fraseriana – Banksia ilicifolia – Banksia attenuata* on deep moist pale yellow sands" with *Xanthorrhoea preissii, Melaleuca pseudostygia, Bossiaea eriocarpa* and *Stirlingia latifolia* listed as indicator species. This site is included in Area 2.

Site vegetation type ($A_{G.f.}$) described as a "closed heath of mixed Proteaceae – Myrtaceae – Mimosaceae, on shallow sands with frequent limestone pinnacles" corresponds with Area 12. The indicator species listed were *Grevillea thelemanniana, Tempeltonia retusa, Grevillea crithmifolia* and *Trymalium ledifolium.*

Site Vegetation Type $B_{C.f.}$ described as "open woodland of *Eucalyptus gomphocepahala – Banksia attenuata – Allocasuarina fraseriana* on red brown sand with frequent limestone pinnacles, corresponds with Area 11. The indicator species are *Conospermum triplinervium, Phyllanthus calycinus, Dryandra sessilis* and *Melaleuca acerosa*".

The two remaining Site Vegetation Types of Mattiske are $C_{E.g.}$, woodland of *Eucalyptus gomphocephala – Eucalyptus marginata – Eucalyptus calophylla – Allocasuarina fraseriana – Banksia attenuata – Banksia grandis* on yellow sands with weakly leached surface and $D_{E.m.}$, open forest of *Eucalyptus marginata – Allocasuarina fraseriana – Banksia attenuata – Banksia menziesii* on yellow sands, with leached surface.

Table 1. Relationship between Mattiske (1987) Site Vegetation Types (SVT) and study areas.

Mattiske Site Vegetation Types A = $A_{G.f.}$; B = $B_{C.f.}$; C = $C_{E.g.}$; D = $D_{E.m.}$; E = $E_{B.l.}$

AREA	SVT	AREA	SVT	AREA	SVT
1	C,D	5	C,D	9	C,D
2	C,D,E	6	C,D	10	C,D
3	D	7	C,D	11	B
4	C	8	C,D	12	A

Table 2. Origin of species occurring in the Kings Park bushland.

Number of naturally occurring species	293
Number of other Western Australian species, but introduced to the Kings Park bushland	11
Number of other Australian species, not Western Australian	10
Exotic species (extra Australian) and now naturalised	151

As these occur in pockets throughout the bushland the Areas of this study are not distinct with these Site Vegetation Types.

FLORA RESULTS

Several interesting results have arisen from this study with regard to the number of species by families, flowering times, priority listed species. These will be discussed below.

A. Number of Species

A total of 465 species has been recorded for the bushland. This includes those which are native as well as those which have been introduced and become naturalised.

A total of 38% of the Kings Park bushland flora is introduced. In the Flora of the Perth Region (Marchant, *et al.*, 1987) 27% species were recorded as alien and for the whole of Western Australia approximately 10% (Green, 1985).

There are no species endemic to the Kings Park bushland.

Table 3. Statistical Data

	Native	Alien	Total
Ferns	1	0	1
Gymnosperms	3	0	3
Angiosperms			
Dicotyledons	179	112	292
Monocotyledons	112	60	172

B. Largest Families

There are eight plant families which represent 4% or more of the total species in the Kings Park bushland. These are listed in Table 3 below in decreasing rank.

The family Poaceae has the highest percentage of species but most of these are naturalised in the bushland. The family Orchidaceae is the family with the highest percentage of native species. Of the naturalised species 46 originate from Europe and South Africa; 25 from the Mediterranean Region; 19 from Asia; 11 from north Africa; 9 from South America; 5 or less from eastern, southern and northern Australia, America, Argentina, California, India, Madagascar, Mexico, North America, Spain and Portugal.

The family with the largest number of native species in the bushland is Orchidaceae, which has only 1 naturalised species. Proteaceae and Anthericaceae both have 24 native species but there is an additional introduced species in Proteaceae. Poaceae is the family with the most naturalised species followed by Asteraceae and Papilionaceae. Anthericaceae, Cyperaceae, Haemodoraceae, Epacridaceae, Goodeniaceae and Droseraceae are all families which have no naturalised species in the bushland. It must be remembered that a naturalised species includes those which are

Table 4. F. .ilies with 4% or more of the total species in Kings Park.

FAMILY	NATIVE SPECIES	NATURALISED SPECIES	% OF TOTAL SPECIES
Poaceae	9	34	9
Asteraceae	17	23	8.5
Orchidaceae	38	1	8.3
Papilionaceae	18	12	6.4
Proteaceae	24	1	5.3
Myrtaceae	17	8	5.3
Anthericaceae	24	0	5.1
Iridaceae	2	18	4.3

native to other areas in Western Australia but which are not native to the Kings Park bushland.

Families with rankings 1–12 in Green are all represented in the bushland with the exception of Chenopodiaceae which is ranked at 9. Anthericaceae which is ranked at 24 by Green has the second largest number of native species present in the bushland. Another family of interest is Droseraceae which is ranked 36 in Green but 15 in the Kings Park bushland.

C. Flowering Times

The peak flowering months are September and October with August and November also recording many species in flower. There is a significant drop to July and December, tapering to a low in February and March as illustrated in Figure 2. It must be remembered that the months of flowering of many of the species is dependent upon the weather so if the rain comes early and is abundant the annual species will flower earlier,

Table 5. Families with 6 or more native species in the bushland and their ranking in Green (1985).

FAMILY	NATIVE SPECIES	NATURALISED SPECIES	RANKING IN GREEN
Orchidaceae	38	1	11
Proteaceae	24	1	4
Anthericaceae	24	0	24
Papilionaceae	18	12	2
Asteraceae	17	23	5
Myrtaceae	17	8	1
Cyperaceae	16	0	7
Mimosaceae	9	8	6
Haemodoraceae	9	0	27
Poaceae	9	34	3
Epacridaceae	8	0	10
Goodeniaceae	8	0	8
Apiaceae	7	1	22
Stylidiaceae	7	0	12
Droseraceae	6	0	36

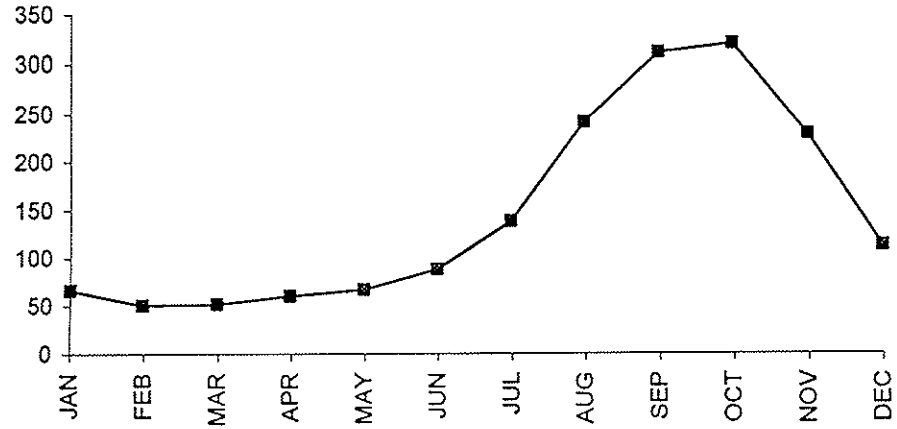

Figure 2. Number of species flowering each month.

similarly if spring ends abruptly with several hot days the bushland dries out quickly with the late flowering species quickly fading.

D. Percentage of Species in the 12 Areas.

Figure 3 illustrates the number of species in each of the 12 areas represented as a percentage of the total number of species. The difference was not significant but area 11, which is the area of the upper scarp, recorded the highest percentage. In this area there is an overlap of species from the upper sandy areas and the limestone escarpment.

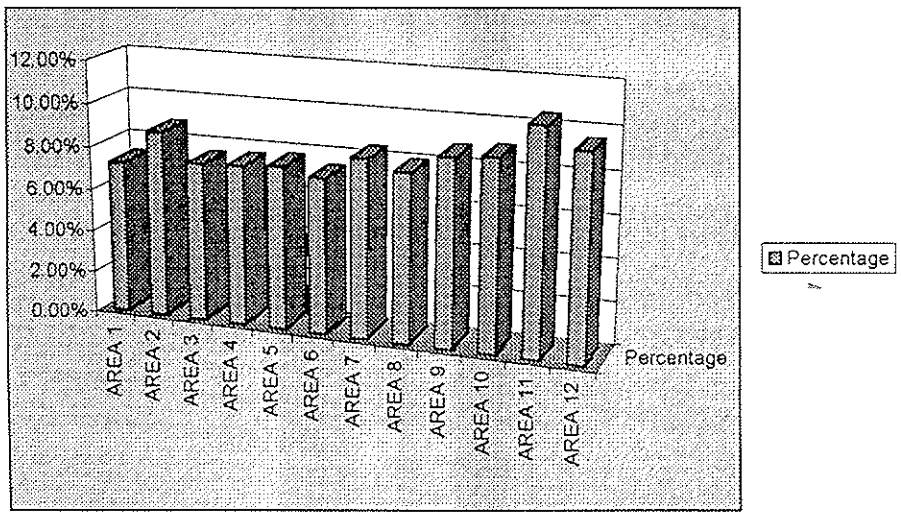

Figure 3. Percentage of total number of species occuring in each area.

E. Priority Listed Species

The Department of Conservation and Land Management publishes at regular intervals a list of priority species together with their priority number (Hopper *et al.*, 1990). The higher the number the less the plant is under threat. There are 3 priority species listed for the Kings Park bushland.

Table 6. Priority species occurring in the Kings Park bushland.

SPECIES	PRIORITY NUMBER
Dodonaea hakettiana	4
Jacksonia sericea	3
Lasiopetalum membranaceum	2

Jacksonia sericea is widespread throughout the bushland. *Dodonaea hakettiana* occurs in Areas 8, 9, 11, 12. The other species *Lasiopetalum membranaceum* is confined to the limestone escarpment. *Lasiopetalum membranaceum* is the species in the above list which is the most threatened.

F. Kings Park as a type locality.

Several type specimens have been collected from Kings Park. Many of these are now placed in synonymy under other species but the area still remains important. Many of the early collectors in the colony put the collecting locality as Swan River or Perth and it is quite likely that some of these were collected from the vicinity of Mt Eliza. However, in 1839, J.A.L. Preiss, a German botanist, made a collection of 22 species from Mt Eliza of which included type collections of 10 species and 2 varieties one of which is a fungus (Bennett, 1992). Since then other type collections have been made from the vicinity of Kings Park including *Anigozanthos manglesii* var. *flavescens* Ostenf. collected by Ostenfeld in 1914.

CONCLUSION

Although the Kings Park bushland has been altered since settlement it is still rich in native species. It is a valuable resource as remnant bushland, enjoyable for the public to walk or cycle through and see close hand some of Western Australia's unique wildflowers. It is also of importance historically for timber trees, limestone etc utilised and obtained from the Park by the early settlers.

ACKNOWLEDGEMENTS

Thanks are extended to many of the Kings Park Voluntary Guides who told me the locations of many species, in particular David Emery who provided many new locations for orchid species. Mr A. Brown provided the updated orchid names. Dr. P.R. Wycherley encouraged me with the preparation of the "Bushland Plants of Kings Park", during which time the major information was gathered.

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APPENDIX 1

Checklist of native and naturalised species of the Kings Park bushland, together with their occurrence and flowering months.
Species are arranged taxonomically under family and alphabetically under genus.
* = naturalised species
\+ = species recorded from this area
\- = not present
? = species listed as being present but no locality given.

Species Name	Area Number 111 123456789012	Flowering Months JFMAMJJASOND
ADIANTACEAE		
Anogramma leptophylla (L.)Link	----------+	---MJJASO--
ZAMIACEAE		
Macrozamia riedlei (Fischer ex Gaudich.) C.Gardner	++++++++++++	-FM-----SO--
CUPRESSACEAE		
Actinostrobus pyramidalis Miq. in Lehm.	----+-----+-	------ASON-
Callitris preissii Miq. in Lehm.	---+------++	-------SON-
AIZOACEAE		
Carpobrotus edulis (L.)L.Bolus*	----------+	------ASO--
AMARANTHACEAE		
Ptilotus drummondii (Moq.)F.Muell.	++++++++++-	-------SON-
Ptilotus polystachyus (Gaudich.)F.Muell.	++++++++++++	-----JASON-
APIACEAE		
Daucus glochidiatus (Labill.)Fischer	----------+	---------O--
Eryngium rostratum Cav.	++++++++++++	------ASON-
Foeniculum vulgare Miller*	----------+	J----JA SOND
Homalosciadium homalocarpum (F.Muell.) H.Eichler	-++++++++++-	---------OND
Hydrocotyle hispidula Bunge in Lehm.	----------+	---------ON-
Trachymene coerulea Graham	-------+--++	J-------OND
Trachymene pilosa Smith in Rees	-++++++++++-	------ASO--
Xanthosia huegelii (Benth.)Steudel	++++++++++++	------ASON-
APOCYNACEAE		
Vinca major L.*	----------++	------ASON-
ASTERACEAE		
Arctotheca calendula (L.)Levyns*	++++++++++++	-----JASO--
Asteridia pulverulenta Lindley	----------??	---------OND
Calocephalus angianthoides (Steetz)Benth.	----------??	---------ON-
Centaurea melitensis L.*	---------+-++	J-------SOND
Conyza albida Willd.*	++++++++++++	J-----ASOND
Conyza bonariensis (L.)Cronq.*	++++++++++++	JFMAM----OND
Conyza parva Cronq.*	--------+++--	-FM--------
Cotula bipinnata Thunb.*	----------+	-------S---
Cotula turbinata L.*	----------+++	-----JASO--
Dittrichia graveolens (L.)Greuter*	--------++++	--AMJJASON-
Gnaphalium coarctatum Willd.*	----------+-	---------O--
Hedypnois rhagadioloides (L.)F.W.Schmidt*	----------+-	---------O--
Helianthus debilis Nutt.*	----------+-	--MA--------

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From Bennett (1995) Plant Species of the Kings Park bushland

P Priority
L Limestone
S Significant

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ADIANTACEAE		
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ZAMIACEAE		
Macrozamia riedlei (Fischer ex Gaudich.) C.Gardner	++++++++++++	-FM-----SO--
CUPRESSACEAE		
Actinostrobus pyramidalis Miq. in Lehm.	----+-----+-	------ASON-
S *Callitris preissii* Miq. in Lehm.	---+------++	-------SON-
AIZOACEAE		
Carpobrotus edulis (L.)L.Bolus*	----------+	------ASO--
AMARANTHACEAE		
Ptilotus drummondii (Moq.)F.Muell.	++++++++++-	-------SON-
Ptilotus polystachyus (Gaudich.)F.Muell.	++++++++++++	-----JASON-
APIACEAE		
Daucus glochidiatus (Labill.)Fischer	----------+	--------O--
Eryngium rostratum Cav.	++++++++++++	------ASON-
Foeniculum vulgare Miller*	----------+	J----JASOND
Homalosciadium homalocarpum (F.Muell.) H.Eichler	-++++++++--	--------OND
Hydrocotyle hispidula Bunge in Lehm.	----------+	--------ON-
S *Trachymene coerulea* Graham	-------+--++	J-------OND
Trachymene pilosa Smith in Rees	-++++++++--	------ASO--
Xanthosia huegelii (Benth.)Steudel	++++++++++++	------ASON-
APOCYNACEAE		
Vinca major L.*	----------++	------ASON-
ASTERACEAE		
Arctotheca calendula (L.)Levyns*	++++++++++++	-----JASO--
Asteridia pulverulenta Lindley	----------??	--------OND
S *Calocephalus angianthoides* (Steetz)Benth.	----------??	--------ON-
Centaurea melitensis L.*	---------+-++	J-------SOND
Conyza albida Willd.*	++++++++++++	J-----ASOND
Conyza bonariensis (L.)Cronq.*	++++++++++++	JFMAM----OND
Conyza parva Cronq.*	-------+++--	-FM--------
Cotula bipinnata Thunb.*	----------+	-------S---
Cotula turbinata L.*	---------+++	-----JASO--
Dittrichia graveolens (L.)Greuter*	--------++++	--AMJJASON-
Gnaphalium coarctatum Willd.*	----------+-	--------OND
Hedypnois rhagadioloides (L.)F.W.Schmidt*	----------+-	--------O--
Helianthus debilis Nutt.*	----------+-	--MA-------

only 4 records in this area, here & Lowlands
= Craphosis org.

Helichrysum bracteatum (Vent.)Andrews*	-+----------	-------SO--
Helichrysum cordatum DC.	+++++++++++	JFMA----OND
Hypochaeris glabra L.*	+++++++++++	--AMJJASON-
Lactuca saligna L.*	+++++++++++	JFMAM-------
Lactuca seriola L.*	-+-+----++--	----------D
Lagenifera huegelii Benth. in Endl.	+++++++++++	-----JASOND
Millotia tenuifolia Cass.	----------+	--------O--
Olearia axillaris (DC.)F.Muell.	------+---++	--AMJJ-----
Olearia elaeophila (DC)F.Muell. ex Benth.	--------++--	--MAM-------
Olearia paucidentata (Steetz)F.Muell. ex Benth.	----------+-	--AMJJASON-
Osteospermum clandestinum L.f.*	----------++	-----JASO--
Podolepis gracilis (Lehm.)Graham	+++++++++++	-----ASOND
Podotheca angustifolia (Labill.)Less.	+++++++++++	-------SO--
Podotheca chrysantha (Steetz)Benth.	+++++++++++	-----ASON-
Pseudognaphalium luteoalbum (L.) Hilliard & B.L.Burtt*	-+---------+	JFMAMJJASOND
Quinetia urvillei Cass.	+++++++++++	-----ASOND
Rhodanthe chlorocephala (Turcz.) P.G. Wilson subsp.*rosea* (Hook.)P.G.Wilson*	-----+--++--	------ASO--
Rhodanthe citrina (Benth.) P.G.Wilson	----------?	-------SON-
Senecio hispidulus A.Rich.	---------+++-	JFMAMJJ-SOND
Senecio lautus G.Forster ex Willd.	+--+--+++++-	J-----ASOND
Siloxerus humifusus Labill.	----------	J------OND
Sonchus oleraceus L.*	+++++++++++	----JJASOND
Taraxacum officinale Wigg.*	-------+----	JFMAMJJASOND
Urospermum picroides (L.)Scop. ex F.W Scop. ex F.W.Schmidt*	+--+++++++x	--------ON-
Ursinia anthemoides (L.)Poiret*	+++++++++++	-----AS---
Waitzia suaveolens (Benth.)Druce	+++++++++++	--------OND
BRASSICACEAE		
Brassica oxyrrhina (Cosson)Willk.*	++--------++	-------SO--
Cardamine hirsuta L.*	+++++++----	-----AS---
Heliophila pusilla L.f.*	+++++++++++	-----ASO--
Raphanus raphanistrum L.*	----------+-	-----ASOND
BUDDLEJACEAE		
Buddleja madagascariensis Lam.*	----------++	-----JA----
CAMPANULACEAE		
Wahlenbergia capensis (L.)A.DC.*	+++++++++++	-------SON-
Wahlenbergia preissii Vriese	-+++++++---+	-------SO--
CARYOPHYLLACEAE		
Cerastium glomeratum Thuill.*	--------++++	-----ASON-
Petrorhagia velutina (Guss.)P.Ball & Heyw.*	+++++++++++	-------SON-
Polycarpon tetraphyllum (L.)L.*	--------++++	-------SON-
Sagina apetala Ard.*	----------++	-------SON-
Silene gallica L.*	++--+---+++-	-----JASOND
Spergula arvensis L.*	--------+++-	-----ASON-
Stellaria media (L.)Villars*	--------+++-	-----JAS---
CASUARINACEAE		
Allocasuarina fraseriana (Miq.)L.Johnson	+++++++++++	----MJJASO--
Allocasuarina humilis (Otto & Dietr.)L.Johnson	--------++++	----MJJASON-

COMMELINACEAE
Cartonema philydioides near DIVA tower

CHENOPODIACEAE		
Atriplex cinerea Poiret in Lam.	----------+	------SO--
Chenopodium album L.*	---++-------	--MA-------
Chenopodium ambrosioides L.*	----------+	--MAMJJ-----
Enchylaena tomentosa R.Br.	++----+--+--	----MJJAS---
Rhagodia baccata (Labill.)Moq. in DC.	--------++++	--MAMJ------
CONVOLVULACEAE		
Ipomoea indica (Burman)Merr.*	----------+	JFMA-----ND
CRASSULACEAE		
Crassula colorata (Nees)Ostenf.	++++++++++	-----ASO--
DILLENIACEAE *Hibbertia huegelii* (Endl.)F.Muell.	-++--++++++-	-----ASON-
Hibbertia hypericoides (DC.)Benth.	++++++++++	--AMJJASON-
Hibbertia racemosa (Endl.)Gilg in Endl.	-+++++++-+--	-----JASON-
DROSERACEAE		
Drosera erythrorhiza Lindley	++++++++++	--MAMJJ-----
Drosera glanduligera Lehm.	----------?	-----ASO--
Drosera macrantha Endl. in Endl.	----------++	----JJASO--
Drosera pallida Lindley	++++++++++-	-----ASON-
Drosera menziesii R.Br. ex. DC.	-++--------+-	-----ASON-
Drosera stolonifera Endl. in Endl.	++++++++++	----JAS---
EPACRIDACEAE		
Astroloma ciliatum (Lindley)Druce	------+-+---	---MJJASO--
S *Astroloma macrocalyx* Sonder in Lehm.	++++++++++--	--AMJJ-----
Astroloma pallidum R.Br.	++++++++++	--MAMJJASON-
Conostephium pendulum Benth. in Endl.	++++++++++	----JJAS---
Conostephium preissii Sonder in Lehm.	++++++++++--	---MJJ-----
Leucopogon parviflorus (Andrews)Lindley	----------+	----JAS---
Leucopogon propinquus R.Br.	++++++++++	--MAMJJ-----
Leucopogon racemulosus DC.	-+----------	--MAMJJ-----
EUPHORBIACEAE		
Adriana quadripartita (Labill.)Gaudich. in Freyc.	----------+	------SON-
Euphorbia australis Boiss.*	++++++++++	JFMAMJJASOND
Euphorbia peplus L.*	++++++++++	-----JASO--
Monotaxis grandiflora Endl. in Endl.	++++++++++	J-----ASOND
Phyllanthus calycinus Labill.	++++++++++	----JJASON-
Poranthera microphylla Brogn.	-++---++++	-----ASON-
S *Ricinocarpos glaucus* Endl. in Endl.	--++++--+---	----JJASO--
Ricinus communis L.*	----------+	-----AS---
FUMARIACEAE		
Fumaria capreolata L.*	++--++--++++	-----JASO--
GERANIACEAE		
Erodium botrys (Cav.)Bertol.*	++------+++-	-----AS---
Erodium moschatum (L.)L'Her. in Aiton*	++------+++-	------SO--
Geranium molle L.*	----------++	-------ON-
Pelargonium capitatum (L.)L'Her. in Aiton*	++---++++++	----JASON-
GOODENIACEAE		
Dampiera linearis R.Br.	++++++++++	----JASON-
Lechenaultia floribunda Benth. in Endl.	-------++-+-	-------ON-
Scaevola anchusifolia Benth.	--------++++	-------ON-

Scaevola canescens Benth. in Endl.	++++++++++++	--MAMJJASON-
Scaevola crassifolia Labill.	----------+	-----ASOND
Scaevola nitida R.Br.	----------+	---------ND
Scaevola paludosa R.Br.	++++++++++++	-------SOND
Scaevola thesioides Benth.	----------?	-------SOND
GYROSTEMONACEAE		
Tersonia cyathiflora (Fenzl.)A.S.George	-+----------	----JJASON-
HALORAGACEAE		
Glischrocaryon aureum (Lindley)Orch.	-+++--++----	-------SO--
Gonocarpus pithyoides Nees in Lehm.	----------?-	--------ON-
LAMIACEAE		
Hemiandra pungens R.Br.	+--++++----+	-------SO--
Leonotis leonurus (L.)W.T.Aiton*	----------++	--AM-------
Stachys arvensis (L.)L.*	----------+	-----ASO--
LAURACEAE		
Cassytha glabella R.Br.	--------+---	JFMAMJJASOND
Cassytha racemosa Nees	----------++	JFMAMJJASOND
LINACEAE		
Linum usitatissimum L.*	-+----------	--------ON-
LOBELIACEAE		
Isotoma scapigera (R.Br.)Don	----------+	-------SOND
Lobelia gibbosa Labill.	++++++++++	JFM-----ND
Lobelia tenuior R.Br.	++++++++++	J-------OND
LOGANACEAE		
Mitrasacme paradoxa R.Br.	-++---------	-------SON-
LORANTHACEAE		
Amyema miquelii (Lehm. ex Miq.)Tieghem	---------+--	--MAMJJ-----
Nuytsia floribunda (Labill.)R.Br. ex Fenzl.	--+---+-----	J---------ND
MALVACEAE		
Lavatera arborea L.*	--------+---	-----ASOND
Malva parviflora L.*	---------+--	-----ASON-
MIMOSACEAE		
Acacia acuminata Benth.*	------+---+-	-----JASO--
Acacia baileyana F.Muell.*	-++---++----	-----JA----
Acacia cochlearis (Labill.)H.L.Wendl.	++++++++++	-------AS---
Acacia cyclops Cunn.ex Don	-+---------+	J-------SOND
Acacia dealbata Link*	------+-----	-----JA----
Acacia decurrens (Wendl.)Willd.*	--+---------	-------S---
Acacia huegelii Benth. in Endl.	++++++++---	--------OND
Acacia lasiocalyx C.R.P.Andrews*	-++---------	-----ASO--
Acacia lasiocarpa Benth. in Endl.	----------+-	----JJASO--
Acacia microbotrya Benth.*	---+--+-----	--AMJJ-----
Acacia podalyriifolia A.Cunn. ex Don*	-++---+-----	----JJA----
Acacia pulchella R.Br. in W.T.Aiton	++++++++++	----JJASO--
Acacia pycnantha Benth.*	---+--+-+---	-------AS---
Acacia rostellifera Benth.	----------++	-----ASO--
Acacia saligna (Labill.)H.L.Wendl.	++++++++++	-------AS---
Acacia stenoptera Benth.	++++++++++-	----AJJAS---
Acacia willdenowiana H.L.Wendl.	++++++++++-	----JJASO--

MOLLUGINACEAE		
Macarthuria australis Huegel ex Endl.	- - - - - - - - +++ +	- - - - MJJAS ON -
MYOPORACEAE		
Eremophila glabra (R.Br.)Ostenf.	- - - - - - + - - +++	J - - - - - JAS OND
Myoporum insulare R.Br.	- - - - - - - - - - +	- - - - - - - ASON -
MYRTACEAE		
Agonis flexuosa (Sprengel)Schauer*	++++++++++ -	- - - - - - - - SOND
Calothamnus quadrifidus R.Br. in W.T.Aiton	- - - - - - - - - ++	- - - - - - - ASOND
Calytrix angulata Lindley	- - - +++ - - - - -	- - - - - - - - SOND
Calytrix flavescens Cunn.	- - - - ++ - - +++ -	J - - - - - - - - - ND
Calytrix fraseri Cunn.	++++++++++ -	JFM - - - - - - - - D
Chamelaucium uncinatum Schauer in Lehm.*	++++++++++	- - - - - - - ASON -
Eremaea pauciflora (Endl.)Druce	- +++++++++ - -	- - - - - - - - SOND
Eucalyptus calophylla Lindley	++++++++++	JFMAM - - - - - - -
Eucalyptus citriodora Hook.*	- - - +++++ - - + -	- - - - MJ - - - - - -
Eucalyptus cladocalyx F.Muell.*	- - - +++++ - - + -	JF - - - - - - - - -
Eucalyptus decipiens Endl. in Endl.	- - - - - - - - ++ - -	- - - - - - - - SON -
Eucalyptus erythrocorys F.Muell.*	- - - ++ - - - - - + -	JFMA - - - - - - -
Eucalyptus gomphocephala DC.	++++ - +++++++	JFMA - - - - - - -
Eucalyptus lane-poolei Maiden*	- - - - - - - - + - - -	- FMAM - - - - - -
Eucalyptus marginata Donn ex Smith	++++++++++	JA - - - - - - SOND
Eucalyptus todtiana F.Muell.*	- - - - - - - - + - - -	- F - - - - - - - -
Hypocalymma robustum (Endl.)Lindley	++++++++++	- - - - - JAS O - -
Kunzea ericifolia (Smith)Heynh.	- - - - + - + - - - -	- - - - - - - - SON -
Leptospermum laevigatum (Gaertner)F.Muell.*	- - - - +++ - - - -	- - - - - - - - SO - -
Melaleuca acerosa Schauer in Lehm.	- - - - - - - - - +++	- - - - - - - - SOND
Melaleuca huegelii Endl. in Endl.	- - - - - - - - - ++	J - - - - - - - - ND
Melaleuca lanceolata Otto	- - - - + - ++ - - ++	JFM - - - - - - OND
Melaleuca pentagona Labill.*	- - - - - - - - - + -	- - - - - - - - SO - -
Verticordia densiflora Lindley	- - - - + - - - - - - -	J - - - - - - - - ND
Verticordia monadelpha Turcz.*	- + - - - - - + - - - -	- - - - - - - - - OND
ONAGRACEAE		
Epilobium hirtigerum Cunn.	- + - - - - - - - - -	JFM - - - - - - - ND
Oenothera drummondii Hook.*	- - - - - - - - - - +	- - - - - - - - - OND
Oenothera glazioviana Micheli*	- - - - - - - - + - -	JFM - - - - - - - ND
OROBANCHACEAE		
Orobanche minor Smith*	++++++++++++	- - - - - - ASON -
OXALIDACEAE		
Oxalis caprina Thunb.*	- - - - - - + - - - ++	- - - - - - - - - ON -
Oxalis corniculata L.*	- - - - - - - - - - ++	- - - - - - - - - ON -
Oxalis glabra Thunb.*	- + - - - - - + - - - -	- - - - MJJA - - - -
Oxalis pes-caprae L.*	++++++++++++	- - - - - JJAS O - -
Oxalis purpurea L.*	- ++ - - - +++ - - -	- - - - MJJAS - - -
PAPAVERACEAE		
Papaver rhoeas L.*	- - - - - - - - - - +	- - - - - - - - O - -
Romneya coulteri Harvey*	- - - - - - - - - - +	- - - - - - - - ON -
PAPILIONACEAE		
Bossiaea eriocarpa Benth.	- - - - - +++++ - -	- - - - - JAS O - -

Bossiaea ornata (Lindley)Benth	- - - - - - - - - ? - -	- - - - - JA SO - -
Daviesia decurrens Meissner in Lehm.	- + + + - - + + - - - -	- - - - - - - AS - - -
Daviesia divaricata Benth. in Endl.	+ + + + + + + + + + +	- - - - - - JASO - -
Daviesia nudiflora Meissner	+ + + + + + + + + + +	- - - - - - JJA - - - -
Daviesia triflora M.D.Crisp	+ + + + + + + + + + -	- - - - MJJAS - - -
Gompholobium aristatum Benth.	- - - - - - - - - - + +	- - - - - - - - SO - -
Gompholobium tomentosum Labill.	+ + + + + + + + + + +	- - - - - - - ASOND
Hardenbergia comptoniana (Andrews) Benth. in Endl.	+ + + + + + + + + + +	- - - - - JJAS - - -
Hovea pungens Benth. in Endl.	- - - - - - - - - - - +	- - - - - JJAS - - -
Hovea trisperma Benth. in Endl.	+ + + + + + + + + + +	- - - - - JJAS - - -
Isotropis cuneifolia (Smith)Benth.	- + + + - + + + + + -	- - - - - - - ASO - -
Jacksonia furcellata (Bonpl.)DC.	+ + - + - - - - + + - +	JFM - - - ASOND
Jacksonia sericea Benth.	+ + + + + + + + + + -	JF - - - - - - - - - D
Jacksonia sternbergiana Huegel	+ + + + + + + + + + +	JFMAMJJASOND
Kennedia prostrata R.Br. in W.T.Aiton	+ + + + + + + + + + +	- - - - - JASON -
Lupinus consentinii Guss.*	- - - - - - - - - + + +	- - - - - - ASON -
Lupinus mutabilis Sweet*	- - - - - - - - - + + +	- - - - - - AS - - -
Medicago polymorpha L.*	- - - - + - - - - + + +	- - - - - JASO - -
Melilotus indica (L.)All.*	+ - - - - - - - - - - +	- - - - - - ASO - -
Mirbelia dilatata R.Br.*	- - - - - - - - - - ? -	- - - - - - - - SOND
Nemcia capitata (Benth.)Domin	+ + + + + + + + + + +	- - - - - JJAS - - -
Templetonia retusa (Vent.)R.Br. in W.T.Aiton	- - - - - - - - - - + +	- - AMJJA - - - -
Trifolium arvense L.*	- - - - - - - - + - + +	- - - - - - - - SON -
Trifolium campestre Schreber in Sturm*	- - - + + - - - + - + +	- - - - - - ASON -
Trifolium dubium Sibth.*	- - - + + - - - + - + +	- - - - - - ASON -
Trifolium glomeratum L.*	- - - - - - - - + - + +	- - - - - - - - SON -
Trifolium subterraneum L.*	- - - - - - - - - - + -	- - - - - - ASON -
Trifolium tomentosum L.*	- - - - - - - - + - + -	- - - - - - - - SON -
Vicia sativa L.*	+ + - - - - - - - - + -	- - - - - - - - SON -
PITTOSPORACEAE		
Pronaya fraseri (Hook.)E.M.Bennett	- - - - - - - + - - - -	JF - - - - - - - - - D
Sollya heterophylla Lindley	- + - - - + - - - - - -	JF - - - - - - - OND
PLANTAGINACEAE		
Plantago lanceolata L.*	- - - - - - + - - - - -	JFM - - - - - OND
POLYGALACEAE		
Comesperma calymega Labill.	- + - - - - - + - - - -	- - - - - - - - SOND
Polygala myrtifolia L.*	- - - - - - - - - - - +	- - - - - - ASON -
POLYGONACEAE		
Emex australis Steinh.*	- - - - - - - - - + - -	- - - - - - - A - - - -
Rumex crispus L.*	- - - - - - - - - - - +	- - - - - - - - S - - -
PORTULACEAE		
Calandrinia corrigioloides F.Muell. ex Benth.	+ + + + + + + + + + +	- - - - - - - ASON -
Calandrinia liniflora Fenzl.	- + - - - - - - + + - -	- - - - - - - - - ON -
PRIMULACEAE		
Anagallis arvensis L.*	+ + + + + + + + + + +	- - - - - - - ASOND
Samolus repens (Forster and G.Forster)Pers.	- - - - - - - - - - - +	JFMAMJJASOND
PROTEACEAE		
Adenanthos cygnorum Diels in Diels & E.Pritzel	- - - - + - - - - + + +	JF - - - - - - SOND

Banksia attenuata R.Br.	+++++++++++	JF - - - - - - SOND
Banksia grandis Willd.	++++++++++-	- - - - - - - - SOND
Banksia ilicifolia R.Br.	-+- - - - - - - - -	- - - - - - - - SOND
Banksia menziesii R.Br.	+++++++++++	-FMAMJJA- - - -
Banksia prionotes Lindley	- - - +++ - - - - +-	-FMAMJJA- - - -
Conospermum stoechadis Endl.	- - - - - - - - + - - -	- - - - - -JASO - -
Conospermum triplinervium R.Br.	-+- - - ++- ++- -	- - - - - - -ASON -
Dryandra nivea (Labill.)R.Br.	+++++++++++	- - - - MJJAS - - -
Dryandra sessilis (Knight)Domin	+++++++++++	- - - - MJJASON -
Grevillea crithmifolia R.Br.	- - - - +- +- ++++	- - - - - -JAS - - -
Grevillea pilulifera (Lindley)Druce	- - - - - - - - - +-	- - - - - -JAS - - -
Grevillea thelemanniana Huegel ex Endl. *preissii*	- - - - - - - - - ++	- - - - MJJAS - - -
Grevillea vestita (Endl.)Meissner	-++- - -+++++-	- - - - - JJAS - - -
Hakea costata Meissner*	- - - - - - - - +- -	- - - - - -JAS - - -
Hakea lissocarpha R.Br.	- - - - - - - - - +-	- - - - - JJAS - - -
Hakea prostrata R.Br.	++++-+++-+++	- - - - - - -ASON -
Hakea trifurcata (Smith)R.Br.	- - - - - +- - - - +-	- - - - - -JA- - - -
Persoonia saccata R.Br.	-+++-++++++-	J- - - - -JASOND
Petrophile linearis R.Br.	+++++++++++	- - - - - - -ASON -
Petrophile macrostachya R.Br.	+++++++++++	- - - - - - -ASON -
Petrophile media R.Br.	- - - - - - - - - ++-	- - - - - - - - SOND
Petrophile serruriae R.Br.	- - - - +- - - - - - -	- - - - - - -ASON -
Stirlingia latifolia (R.Br.)Steudel	+++++++++++	- - - - - - -ASON -
Synaphea spinulosa (Burm. f.)Merr.	-++- - -+++- - -	- - - - - JJASON -
RANUNCULACEAE		
Clematis microphylla DC.	-+- - - -++-++-	- - - - - -JAS - - -
RHAMNACEAE		
Cryptandra arbutiflora Fenzl in Endl.	+++++++++++	- - - - MJJAS - - -
Rhamnus alaternus L.*	++++- - -++-++	- - - - - -JA- - - -
Spyridium globulosum (Labill.)Benth.	-+- +++++- - ++	- - - - - JJAS - - -
Spyridium tridentatum (Steudel)Benth.	- - - - - - - - +++	JF - - - - - - - - - D
Trymalium ledifolium Fenzl. ssp *ledifolium*	- - - - - - - - - - +	- - - - - -JA- - - -
RUBIACEAE		
Opercularia hispidula Endl. in Endl.	- - - - - - - - - - +	- - - - - - - - OND
Opercularia vaginata Labill.	+++++++++++	- - - - - - -ASO - -
RUTACEAE		
Boronia ramosa (Lindley)Benth.	- - - - - - - - +- -	- - - - - -JASO - -
Eriostemon spicatus A.Rich.	+++++++++++	- - - - - JJASO - -
SAPINDACEAE		
Dodonaea hackettiana W.Fitzg.	+- - - - - +- - ++	- - - - - -JASO - -
SCROPHULARIACEAE		
Dischisma capitatum (Thunb.)Choisy*	++++++++++-	- - - - - - -AS - - -
Misopates orontium (L.)Raf.*	++- - - - - - - - -	- - - - - - -ASO - -
SOLANACEAE		
Anthocercis ilicifolia Hook.	- - - - - - - - ++++	- - - - JJASO - -
Anthocercis littorea Labill.	- - - - - - - - ++++	- - - - JJASO - -
Lycium ferocissimum Miers*	+- - - - - - - - - -	- - - - - - - - ON -
Nicotiana glauca Graham*	- - - - - - - - +- -	- - - - - - -ASON -
Solanum nigrum L.*	+++++++++++	JFMA - -JASOND
STACKHOUSIACEAE		
Tripterococcus brunonis Endl. in Endl.	- - - - - - - - ++-	- - - - - - -ASON -

STERCULIACEAE		
Brachychiton populneus (Schott)R.Br.*	++++++++++-	J- - - - - --- - - ND
Lasiopetalum membranaceum (Steudel)Benth.	- - - - - - - - - - +	- - - - - - ---SO- -
STYLIDACEAE		
Levenhookia stipitata (Sonder)F.Muell.	++++++++++	- - - - - - - - - SON
Stylidium brunonianum Benth. in Endl.	++++++++++-	- - - - - - ---SON-
Stylidium calcaratum R.Br.	- -+++++++++-	- - - - - - ---SON-
Stylidium carnosum Benth. in Endl.	- - - -+- - - - - -	- - - - - - ---SO- -
Stylidium piliferum R.Br.	- - - - - - - - - - ?	- - - - - - ---SO- -
Stylidium repens R.Br.	++++++++++-	JFMAMJJASOND
Stylidium schoenoides DC.	-+++++++++-	- - - - - - --ASO- -
THYMELACEAE		
Pimelea leucantha Diels in Diels & E.Pritzel	-+- - - - - - - - -	- - - - - --ASON-
Pimelea rosea R.Br.	+++- - - - -+++-	- - - - - --ASON-
Pimelea sulphurea Meissner	+++- - -+++++-	- - - - -JASO- -
TROPAEOLACEAE		
Tropaeolum majus L.*	- - - - - - - - - - +	- - - - - - ---SON-
VALERIANACEAE		
Centranthus macrosiphon Boiss.*	++- - - - - - - -++	- - - - - --ASON-
VERBENACEAE		
Lantana camara L.*	- - - - - - - - - - +	- - - - JJA- - - -
VIOLACEAE		
Hybanthus calycinus (DC.ex Ging)F.Muell.	++++++++++	- - - - -JASO- -
AGAVACEAE		
Agave americana L.*	- - - - - - - - - - +	JF- - - ---- - - -
*Yucca filamentosa**	- - - - - - - - - ++	-FM- - ---- - - -
ALLIACEAE		
Allium triquetrum L.*	++++++++++	- - - - - --AS- - -
*Nothoscordum gracile**	+- - - - - - - - -+-	- - - - - - - - ON-
AMARYLLIDACEAE		
Amaryllis belladonna L.*	-+-+-++- - - -	-FMA- ---- - - -
*Narcissus papyraceus**	- - - - - - - - -++	- - - - JJ- - - -
Narcissus tazetta L.*	++++++++- -++	- - - - -JAS- - -
ANTHERICACEAE		
Agrostocrinum scabrum (R.Br.)Baillon	++- - - - -+- -+-	- - - - - ---SOND
Arnocrinum preissii Lehm. ex Endl.	- - - -+- - - - - -	- - - - - - ---OND
Arthropodium capillipes Endl. in Lehm.	++++++++++	JFM- - ---- - ND
Burchardia umbellata R.Br.	++++++++++	- - - - - --ASO- -
Caesia parviflora R.Br.	++++++++++	- - - - - ---SON-
Chamaescilla corymbosa (R.Br.)F. Muell. ex Benth.	- - - - - - - -+- -	- - - - - ---SO- -
Corynotheca micrantha (Lindley)J.F.Macbr.	++++++++++	J- - - - - ---- - ND
Laxmannia ramosa Lindley	- - - - -+- - - - - -	- - - MJ- - - - -
Laxmannia squarrosa Lindley	- - -++++-+-++	- - - - - --ASON-
Lomandra caespitosa (Benth.)Ewart	- - - - -+++++- -	- - - - -JAS- - -
Lomandra hermaphrodita (C.R.P.Andrews) C.Gardner	++++++++++	- - AMJ- - - - -

Lomandra maritima T.S.Choo	-+++++++----	-----ASO--
Lomandra micrantha (Endl.)Ewart	+++++++++++	----MJJAS---
Lomandra nigricans T.D.Macfarlane	+++++++++++	-----JJA----
Lomandra preissii (Endl.)Ewart	+++++++++++	--AMJJ------
Lomandra suaveolens (Endl.)Ewart	++++++++++-	--AMJJ------
Sowerbaea laxiflora Lindley	+++++++++++	-----ASO--
Thysanotus arenarius N.H.Brittan	+++++++++++	---------OND
Thysanotus dichotomus (Labill.)R.Br.	----------	-----SOND
Thysanotus manglesianus Kunth.	+++--++++++x	-----ASON-
Thysanotus sparteus R.Br.	+++++++++++	JF--------D
Thysanotus thyrsoideus Baker	-+---------	-------SON-
Thysanotus triandrus (Labill.)R.Br.	++++++++---	-------SON-
Tricoryne elatior R.Br.	+++++++++++	JF-----SOND
ARACEAE		
Zantedeschia aethiopica (L.)Sprengel*	+---------+	-----ASO--
ASPARAGACEAE		
*Myrsiphyllum asparagoides**	+++++++++++	-----AS---
*Myrsiphyllum declinatum**	+++++++++++	-----JA----
CYPERACEAE		
Centrolepis drummondiana (Nees)Walp.	+++++++++++	-------SO--
Isolepis cernua (M.Vahl)Roemer & Schultes	----------++	--------OND
Isolepis marginata (Thunb.)A.Dietr.	-+++--++++++	-----JASO--
Isolepis nodosa (Rottb.)R.Br.	----------++	JFM-----ND
Lepidosperma squamatum Labill.	+++++++++++	---MJJ-----
Lepidosperma costale Nees in Lehm.	-++---++----	--AM-------
Lepidosperma gladiatum Labill.	----------+	J--------ND
Lepidosperma leptostachyum Benth.	++++++++++-	-----JAS---
Lepidosperma scabrum Nees in Lehm.	+++++++++++	--AM-------
Mesomelaena pseudostygia (Kuek.) K.L.Wilson	+++++++++++	--MA-------
Schoenus benthamii F.Muell.	----------	--------ON-
Schoenus brevisetis (R.Br.)Benth.	----------+--	--------OND
Schoenus curvifolius (R.Br.)Benth.	-+++++++++--	-----JAS---
Schoenus grandiflorus (Nees)F.Muell.	+++++++++++	--AMJJ-----
Schoenus latitans S.T.Blake	-----+++----	--AM-------
Tetraria octandra (nees)Kuek.	+++++++++++	-----JJASON-
DASYPOGONACEAE		
Acanthocarpus preissii Lehm.	----------++	--AMJJA----
Calectasia cyanea R.Br.	+++++++++++	-----JJAS---
Dasypogon bromeliifolius R.Br.	-+---+++---+-	J------SOND
COMMELINACEAE		
Cartonema philydroides F.Muell.	---------+--	--------ON-
HAEMODORACEAE		
Anigozanthos humilis Lindley	-+------+---	-----ASO--
Anigozanthos manglesii D.Don in Sweet	+++++++++++	-------SON-
Conostylis aculeata R.Br.	+++++++++++	-------SO--
Conostylis candicans Endl.	-+---------++	-----ASO--
Conostylis setigera R.Br.	++++++++++-	-------SA--
Haemodorum laxum R.Br.	----+++++++-	--------ON-
Haemodorum paniculatum Lindley	+++++++++++	--------OND
Haemodorum spicatum R.Br.	+++++++++++	---------ND
Phlebocarya ciliata R.Br.	----------?	-----ASON-

HYACINTHACEAE		
Ornithogalum thrysoides Jacq.*	-+- - - - - - - -+-	- - - -M- - - - O- -
IRIDACEAE		
Babiana stricta (Aiton)Ker Gawler*	- - - -+- - - - - -+	- - - - - - -ASO- -
Chasmanthe floribunda (Salisb.)N.E.Br.*	+++++++- -++-	- - - - - -JASO- -
Ferraria crispa Burman*	+- - - - - - - - -+-	- - - - - - -AS - - -
Freesia affin. *leichtlini* Klatt.*	+++++++++++	- - - - - - -ASO- -
Gladiolus angustus L.*	++++- - ++- - - -	- - - - - - - - - OND
Gladiolus caryophyllaceus (Burm.f.)Poiret*	++++++++++-	- - - - - - -ASO- -
Hesperantha falcata (L.f.)Ker Gawler*	+- - - - - - - - -+-	- - - - - - -ASO- -
Homeria flaccida Sweet*	- - -++++- - -+-	- - - - - - - - SON-
Ixia maculata L.*	+++++++- - +-	- - - - - - -AS - - -
Ixia maculata hybrid*	- - -++++- - - - -	- - - - - - - - SON-
Ixia polystachya L.*	+- -+- -+- - - - -	- - - - - - - - SO- -
Lachenalia reflexa Thunb.*	- - - - - - - -++- -	- - - - -JA- - - -
Leucojum aestivum L.*	+- - - - - - - - -+-	- - - - -JAS - - -
Orthrosanthus laxus (Endl.)Benth.	+- - - - - -+- - ++	- - - - - - -ASO- -
Patersonia occidentalis R.Br.	-++++- -++++-	- - - - - - - - SO- -
Romulea rosea (L.)Ecklon*	++++++++++++	- - - - - - -ASO- -
Sparaxis bulbifera (L.)Ker Gawler*	++- - - - - - - -+-	- - - - - - - - SO- -
Watsonia aletroides (Burm.f.)Ker Gawler*	- - - -+- - - - - -	- - - - - - - - S - - -
Watsonia bulbillifera J.Mathews*	- - -+++++++-	- - - - - - - - - OND
Watsonia meriana (L.)Miller*	+- - - -+- - - - -	- - - - - - - - - O- -
JUNCACEAE		
Juncus pallidus R.Br.	- - - - - - - - - -+	- - - - - - - - - ON-
Luzula meridionalis Nordensk.	- - - - -+- - - - -	- - - - - - - - SON-
JUNCAGINACEAE		
Triglochin centrocarpa Hook.	- - - - - - - - - -+	- - - - -JASO- -
ORCHIDACEAE		
Burnettia nigricans (R.Br.) Hopper & A.P.Brown	-++- -++- - - - -	- - - - - -ASO- -
Caladenia arenicola Hooper & A.P.Brown	++++++++++-	- - - - - - - SO- -
Caladenia arenicola x *C. georgei*	- -++--+++++- -	- - - - - - - SO- -
Caladenia discoidea Lindley	++- - - - - -+- - -	- - - - -ASO
Caladenia flava R.Br. ssp. *flava*	++++++++++++	- - - - -ASO- -
Caladenia flava x *C.latifolia* R.Br.	- - - - - - - - -+- -	- - - - -AS - - -
Caladenia georgei Hooper & A.P.Brown	++++++++++++	- - - - - - - SON-
Caladenia georgei x *C.longicauda* Lindley	- - - -+- - - -+- -	- - - - - - - SO- -
Caladenia hirta Lindley	- - - - - - - - -+-	- - - - -ASO- -
Caladenia latifolia R.Br.	++++++++++++	- - - - -ASO- -
Caladenia longicauda Lindley ssp. *calcigena* Hooper & A.P.Brown	- -+- - -+- +++-	- - - - -ASON-
Caladenia longiclavata E.Coleman	-++- - - - - - - -	- - - - -ASO- -
Caladenia macrostylis Fitzg.	+- - - - - -+- - - -	- - - - -ASO- -
Caladenia nana Endl.	- -+- - - - - - - -	- - - - - - - SO- -
Caladenia reptans Lindley ssp. *reptans*	-+- - - - - - -+- -	- - - - -JA- - - -
Cyanicula deformis R.Br.	++++++++++-	- - - - JJA- - - -
Cyanicula gemmata Lindley	-+- - - - - -++- -	- - - - -ASO- -
Cyanicula sericea Lindley	-+- - - - - - -+- -	- - - - -AS - - -
Diuris brumalis D. Jones	- - - - - - - - -+- -	- - - - -JA- - - -
Diuris corymbosa Lindley	++++++++++++	- - - - - - - SO- -
Diuris magnifica D. Jones	++++++++++-	- - - - -ASO- -
Elythranthera brunonis (Endl.)A.S.George	- - - - -++- -+- -	- - - - - - - SO- -

Caladenia attingens ssp. attingens

Eriochilus dilatatus Lindley	- - - - - - - - - + - -	- - - AMJ - - - - - -
Leporella fimbriata (Lindley)A.S.George	- - - - - - - + - - - -	- - - AMJ - - - - - -
Leptoceras menziesii R.Br.	- - - - - - - - + - - -	- - - - - - ASO - -
Microtis unifolia (G.Forster)H.G.Reichb.	+ + + + + + + + + + + +	J - - - - - - - - OND
Monadenia bracteata (Sw.)T.Durand*	- - - - - - - - - - + -	- - - - - - - - OND
Paracaleana nigrita (Lindley)Blaxell	- + - - - - - - - - - -	- - - - - - ASO - -
Prasophyllum elatum R.Br.	- + + - - - - + - - - -	- - - - - - ASON -
Prasophyllum giganteum Lindley	+ + + - - - - + - - + +	- - - - - - - SON -
Pterostylis barbata Lindley	- + + + + + + + + + - -	- - - - - - - SO - -
Pterostylis nana R.Br.	- + - - - - + + - - - -	- - - - - JAS - - -
Pterostylis recurva Benth.	+ + + + + + + + + - -	- - - - - - AS - - -
Pterostylis scabra Lindley	+ + + + + + + + + - -	- - - - - JA - - - -
Pterostylis vittata Lindley	+ + + + + + + + + + -	- - - - JJA - - - -
Thelymitra crinita Lindley	- + - - - - - - - - - -	- - - - - - - - O - -
Thelymitra fuscolutea R.Br.	- - - - - + - + - - - -	- - - - - - - - OND
Thelymitra nuda R.Br.	+ + - - - + - + - - - -	- - - - - - - SON -
PHORMIACEAE		
Dianella divaricata R.Br.	+ + + + + + + + + + + +	- - - - - - - - ON -
POACEAE		
Aira caryophyllea L.*	- + + - - - - - - - + +	- - - - - - - - ON -
Amphipogon turbinatus R.Br.	+ + + + + + + + + - -	- - - - - - - SON -
Arundo donax L.*	- - - - - - - - - - - +	- - - AMJ - - - - - -
Avena barbata Link in Schrader*	+ + + + + + + + + + + +	- - - - - - ASO - -
Avena fatua L.*	+ + + + + + + + + + + +	- - - - - - ASOND
Briza maxima L.*	+ + + + + + + + + + + +	- - - - - - - SO - -
Briza minor L.*	+ + + + + + + + + + + +	- - - - - - - SON -
Bromus catharticus M.Vahl.*	- - - - - - - - - + + +	- - - - - - - SON -
Bromus diandrus Roth*	- - - - - - - - - + + +	- - - - - - - SON -
Bromus hordeaceus L.*	- - - - - - - - - - + +	- - - - - - ASO - -
Bromus madritensis L.*	- - - - - - - - - - + +	- - - - - - - - ON -
Cortaderia selloana (Schultes & J.H.Schultes) Asch. & P.Graeb.*	- - - - - - - - - + - -	- - - - JJAS - - -
Cynodon dactylon (L.)Pers.*	+ + + + + + + + + + + +	- - - - - - - - ON -
Danthonia caespitosa Gaudich. in Freyc.	- - - - - - - - - - + +	- - - - - - - - ON -
Digitaria ciliaris (Retz.)Koeler*	- - - - - - - - + + + +	JFM - - - - - - ND
Digitaria sanguinalis (L.)Scop.*	- - - - - - - - + + + +	JFMAM - - - - - - D
Ehrharta calycina Smith*	+ + + + + + + + + + + +	- - - - - - AS - - -
Ehrhartia longiflora Smith*	+ + + + + + + + + + + +	- - - - - JASON -
Eragrostis curvula (Schrader)Nees*	+ + + + + + + + + + + +	JFMAM - - - - - D
Hordeum leporinum Link*	+ + + + + + + + + + + +	- - - - - - SO - -
Lagurus ovatus L.*	+ + + + + + + + + + + +	- - - - - ASOND
Lolium perenne L.*	- - - - - - - - + + + +	- - - - - - SOND
Lolium rigidum Gaudin*	- - - - - - - - - + + +	- - - - - - SON -
Microlaena stipoides (Labill.)R.Br.	- + - - - - - + + + -	- - - - - - SON -
Neurachne alopecuroidea R.Br.	- + + - - - - + + - - -	- - - - - ASON -
Paspalum dilatatum Poiret*	- - - - + + - - - - + +	JFMA - - - - - - D
Pennisetum setaceum (Forsskal)Chiov.*	- - - - - - - - - - + +	- - - - - JASON -
Pennisetum villosum R.Br. ex Fresen.*	- - - - - - - - - - - -	FMAMJ JA SO - -
Pentaschistis thunbergii Stapf in Dyer*	- - - - - - - - - - + +	- - - - - ASON -
Piptatherum miliaceum (L.)Cosson*	- - - - - - - - - - - +	J - - - - - - - OND
Poa annua L.*	+ + + + + + + + + + + +	- - - - - - ASO - -
Poa porphyroclados Nees in Lehm.	- - - - - - - - - - - +	- - - - - - - - ON -
Polypogon monspeliensis (L.)Desf.*	- - - - - - - - - - - +	- - - MJJASON -
Rhynchelytrum repens (Willd.)C.E.Hubb.*	+ + + + - - - - + - + +	- - - - - JA - - - -

Sporobolus indicus (L.)R.Br.*	- - - - - - - - - +++ -	- - MAMJ - - SON -
Stenotaphrum secundatum (Walter)Kuntze*	- + - - - - ++++ - -	JFMA - - - - SOND
Stipa compressa R.Br.	++++++++++++	- - - - - - - - SOND
Stipa elegantissima Labill.	- - - - - - - - - - ++	J - - - - - - ASOND
Stipa flavescens Labill.	++++++++++ -	- - - - - - - AS - - -
Stipa semibarbata R.Br.	- + - - - - - - - - - -	- - - - - - - ASON -
Vulpia bromoides (L.)Gray*	++++++++++++	- - - - - - - - - OND
Vulpia membranacea (L.)Dumort*	++++++++++++	- - - - - - - - - ON -
Vulpia myuros (L.)C.Gmelin*	++++++++++++	- - - - - JASON -
RESTIONACEAE		
Alexgeorgea arenicola Carlq.	++++++++++++	- - - AM - - - - - - - -
Hypolaena exsulca R.Br.	- - - ++++ - +++ -	- - - - - - - - SOND
Loxocarya fasciculata (R.Br.)Benth.	- - - ++++ - - - - -	- - - - - - ASOND
Loxocarya flexuosa (R.Br.)Benth.	++++++++++++	- - - - - - - - SO - -
Lyginia barbata R.Br.	++++++++++++	JF - - - - ASOND
XANTHORRHOEACEAE		
Xanthorrhoea brunonis Endl. in Lehm.	- ++ - - - ++ - - - -	- - - - - - ASON -
Xanthorrhoea preissii Endl. in Lehm.	++++++++++++	- - - - - - ASON -

317 (132)

BIRDWATCHING IN THE PARK

Perth is fortunate enough to have an area of over 400ha of native vegetation, parks and gardens in the middle of the city which provides a home for over 70 species of birds, many of which live here permanently and others visit at various times of the year.

Morning is the best time for bird watching. Good places to see birds are the Botanic Gardens, the banksia woodlands in spring and the edges of woodland where the trees meet grassed area. To see some of the rarer species such as thornbills, you can take a quiet walk along some of the trails throughout the park.

This brochure tells you about 42 of the most common birds of Kings Park. By using your eyes and ears you should be able to find many of them.

Illustrations by Susan Tingay and Judy Blyth.

Information prepared by Allan K Jones and John Dell
Birds Australia - Western Australian Group,
71 Oceanic Drive
Floreat Western Australia 6014
Telephone: 9383 7749

The Western Australian Group can be contacted at the above address for further information on native birds of Western Australia. New members are welcome.

Kings Park and Botanic Garden Information Centre
9.30am - 4pm daily Tel: 9480 3634

Visit the Annual Wildflower Festival held in Kings Park each September

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Key

R - Resident all year	**C** - Common
V - Visitor for part of year	**M** - Moderately Common
B - Breeds in Kings Park	**U** - Uncommon

KINGS PARK & BOTANIC GARDEN

Birds of Kings Park and Botanic Garden

Funded by the
Gordon Reid Foundation
for Conservation
and
Friends of Kings Park

Prepared by
Birds Australia WA Group

PARROTS AND GALAHS

These birds look for hollows in trees for nesting. They have strong bills for cracking seeds and nuts.

Australian Ringneck

Barnardius zonarius

Ringnecks are often seen feeding on the ground. They have a wide variety of calls.

(B,R,C)

Galah

Cacatua roseicapilla

Galahs have expanded their range south from the Murchison and they now breed around Perth.

(B,R,U)

Short-billed Black-Cockatoo

Calyptorhynchus latirostris

These birds are visitors to the coastal plain in autumn-winter from the wheatbelt. They have developed a taste for seeds of pine trees. Note their weird call, 'wee-yu', when flying.

(V,U)

Rainbow Lorikeet

Trichoglossus haematodus

These lorikeets were introduced from the eastern states in the nineteen-sixties and have now spread widely throughout the metropolitan area. Lorikeets have a brush-tipped tongue for collecting pollen and nectar.

(B,R,M)

HONEYEATERS

Honeyeaters are found in every major vegetation zone in Australia. They are important pollinaters of Australian plants and are very active in their search for nectar and insects.

The following honeyeaters can be found in Kings Park in all seasons.

Red Wattlebird

Anthochaera carinculata

This is the largest of our honeyeaters and is very noisy and aggressive.

(B,R,C)

Little Wattlebird

Anthochaera chrysoptera

The Little Wattlebird is smaller than the Red Wattlebird and can often be seen in the Botanic Garden perched on top of a bush giving its chortling call.

(B,R,M)

Brown Honeyeater

Lichmera indisincta

The Brown Honeyeater has a brownish plumage. It has a number of loud, musical calls.

(B,R,C)

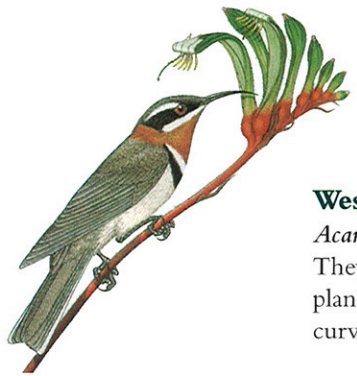
HONEYEATERS

Singing Honeyeater

Lichenostomus virescens

The Singing Honeyeater prefers open woodland throughout the park. They are Perth's second most common garden bird.

(B,R,C)



Western Spinebill

Acanthorhynchus superciliosus

They are often found feeding in plants below 2m. Note their fine curved beak. **(B,R,M)**

White-cheeked Honeyeater

Phylidonyris nigra

The White-cheeked honeyeater can usually be seen in the Botanic Gardens.

(B,R,M)

A similar species, the New Holland Honeyeater, may sometimes be seen.

Mistletoebird

Dicaeum hirundinaceum

The Mistletoebird visits the park in search of mistletoe berries or small fruits of introduced plants.

(V,U

CUCKOOS

Three cuckoos are regular visitors to Kings Park. Cuckoos lay their eggs in nests of other birds. (hosts)

Pallid Cuckoo

Cuculus pallidus

The Pallid Cuckoo visits Kings Park from May to November and relies on large honeyeaters as host for young.

(B,V,M)

Fan-tailed Cuckoo

Cacomantis flabelliformis

Fan-tailed Cuckoos visit the Perth area in winter. They feed on caterpillars.

(V,U)

Shining Bronze-Cuckoo

Chrysococcyx lucidus

They are usually most common from August to December and migrate to Indonesia in winter.

(B,V,M)

They mostly rely on Thornbills as hosts.

CROWS AND RAVENS

Australian Raven

Corvus coronoides

Australian Ravens are omnivorous and are often seen feeding in the picnic areas.

(B,R,C)

FANTAILS

Fantails have a conspicuous fan-like tail. They are restlessly active in their search for insects, grubs and spiders.

Willy Wagtail

Rhipidura leucophrys

These lively birds are usually found on lawns and in open country. They defend their territory aggressively when nesting.

(B,R,C)

Grey Fantail

Rhipidura fuliginosa

Grey fantails are more common from April to November. They are very inquisitive and will often come close to intruders.

(B,V,C)

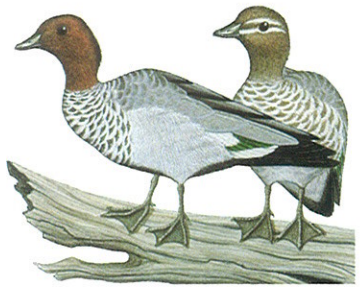
WATER BIRDS

Several water birds visit the Pioneer Women's Memorial Fountain and others are residents including the following.

Pacific Black Duck

Anas superciliosa

They appear on most lakes and waterways around Perth and are often seen loafing about in the daytime.



Australian Wood Duck

Chenonetta jubata

They are usually nomadic but will remain at a site if food, especially lawn grass, is available.

GLEANERS

These smaller birds live in the foliage and collect insects from the leaves.

Western Gerygone

Gerygone fusca

They are more often heard than seen, usually singly or in pairs. They have a distinctively mournful call.

((B,R,C))

Weebill

Smicrornis brevirostris

The Weebill is Australia's smallest bird and is often heard before it is seen as it moves through the canopy of eucalypts. Listen for its call 'wee-bit'.

(B,R,M)

Striated Pardalote

Pardalotus striatus

Listen for its loud, distinctive call 'chip-chip'. They eat many foods including insects, cells of leaf bugs and sometimes nectar.

(B,R,C)

Silvereye

Zosterops lateralis

Silvereyes move in flocks through the bushes with their contact call of 'psec-psec'. They feed on a wide range of foods including aphids, berries and Marri nectar.

(B,V,C)

PREDATORS

Predators hunt for insects, lizards, small mammals and young birds.

Grey Butcherbird

Cracticus torquatus

Grey Butcherbirds live in permanent territories and prefer bushland bordering parks and open spaces. They have a number of loud melodious calls.

(R,B,M)

Nankeen Kestrel

Falco cenchroides

They are often seen hovering over the scarp at Kings Park in their search for food.

(V,U)

Brown Goshawk

Accipiter fasciatus

They are usually present during winter and spring when nesting in eucalypt trees in the centre of the park. They may swoop on you if you approach the nest.

(V,B,U)

Laughing Kookaburra

Dacelo novaeguineae

The Kookaburra was introduced to Western Australia from Eastern Australia in 1898. It has now spread throughout the South-West.

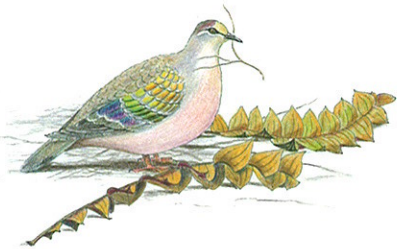
(R,B,C)

GROUND FEEDERS

Australian Magpie
Gymnorhina tibicen
Magpies live in groups in permanent territories where they feed, roost and breed. They are aggressive in breeding season and may swoop on passers-by.
(B,R,C)

Yellow-rumped Thornbill
Acanthiza chrysorrhoa
They are occasionally seen in small flocks along tracks and mown lawns.
(B,R,U)

Common Bronzewing
Phaps chalcoptera
This is a very shy bird which likes to feed on wattle seeds. They come each day at dusk to drink at taps and other watered areas.
(R,U)



Magpie Lark
Grallina cyanoleuca
Magpie Larks are territorial and the young form flocks after breeding. They have a musical call 'tee-he-pee-o'.
(B,R,U)

GROUND FEEDERS

Laughing Turtledove
Streptopelia senegalensis
These birds were introduced to Western Australia from Asia in 1898. They are now common around Perth.
(B,R,C)

Spotted Turtledove
Streptopelia chinensis
This is a slightly larger bird than the above and is not as common. It has a black and white patch on back of neck. It was also introduced from Asia.

AERIAL FEEDERS

Rainbow Bee-eater
Merops ornatus
Their brilliant plumage is obvious as they fly about in search of bees, wasps and dragonflies. They visit Perth from the north in spring and summer.
(B,V,C)

Welcome Swallow
Hirundo neoxena
(R,M)

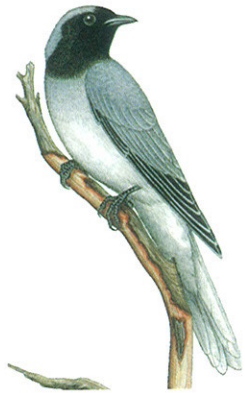
Tree Martin
Hirundo migricans
(B,R,M)
Can you identify these in their flight for insects?

SOME INTERESTING BIRDS

Sacred Kingfisher
Todiramphus sanctus
The Sacred Kingfisher is a breeding visitor from September to March. It is usually found in the woodland area.
(B,V,M)

Rufous Whistler
Pachycephala rufiventris
This bird is usually found in Jarrah woodland either singly or in pairs. Its loud, musical call is often heard.
(B,R,C)

Black-faced Cuckoo-shrike
Coracina novaehollandiae
When perched, notice how they give a peculiar display in which the wings are lifted alternately on the back.
(B,V,C)



Varied Sittella
Daphoenositta chrysoptera
Flocks of 4-6 birds may be seen spiralling down the branches and trunks of Marri trees in parts of the Botanic Gardens in search of insects under the bark.
(B,R,U)

The Purpose of this Plan

The Act defines the *Kings Park Bushland Management Plan 1995-2005* and the *Kings Park and Botanic Garden Framework Plan for the Developed Areas 1996-2006* as Kings Park and Botanic Garden's first management plan.

The purpose of this *Kings Park and Botanic Garden Draft Management Plan 2003-2008,* is to provide the new management plan as necessary, ensuring that the Authority's functions under Section 9(2) of the Act are promoted, and to consolidate the management of both the Bushland and Developed Areas into the one plan.

The Vision of the Botanic Gardens and Parks Authority is to:

Create and provide world-recognised botanic gardens and parks and to inspire the conservation of biodiversity.

Our Principal Management Objectives for Kings Park and Botanic Garden are to work with the Community to:

- Conserve and enhance the bushland, parklands and Western Australian Botanic Garden;
- Ensure that recreational, tourism, cultural heritage, educational and scientific activities are consistent with sound conservation practice; and,
- Ensure that public risk is well managed.

Map On Reverse Side

Review and Revision

This Management Plan sets policies and guidelines for the operational plans that assist in the day-to-day operations of Kings Park and Botanic Garden. An implementation program for the Management Plan will be reviewed annually by the Authority's Chief Executive Officer to reflect progress in reaching targets and timelines. Minor adjustments to this Plan through adaptive management may be required during the five-year term. Should there be a major change in the direction or intent of this Plan, an amendment requiring full public consultation may be required.

Have Your Say

We would like to hear from you on this Draft Management Plan for the future management of Kings Park and Botanic Garden. Please include comments of support as well as suggested changes or additions to be considered. An analysis of public submissions will be produced to aid in finalising the Management Plan.

Send written submissions by 8th August 2003 to:

Management Plan Coordinator
Kings Park and Botanic Garden
Botanic Gardens and Parks Authority
Fraser Avenue
WEST PERTH WA 6005

Fax (618) 9322 5064

Botanic Gardens & Parks Authority

Fraser Avenue, West Perth, Western Australia 6005
Telephone: (08) 9480 3609 • Facsimile: (08) 9322 5064
Email: enquiries@bgpa.wa.gov.au
Website: www.bgpa.wa.gov.au

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Botanic Gardens & Parks Authority

Kings Park & Botanic Garden Draft Management Plan 2003 - 2008

Have Your Say

The People's Park

Kings Park and Botanic Garden is Western Australia's most visited tourist destination and urban park. Well known for its spectacular views, it is also home to approximately 270 hectares of remnant bushland, the Western Australian Botanic Garden and the expansive parklands, which incorporate memorials, picnic and playground areas.

In 1999, an historic change to the operation of Kings Park and Botanic Garden occurred. The *Botanic Gardens and Parks Authority Act 1998* was proclaimed, replacing the *Parks and Reserves Act 1895*. The new Act dissolved the Kings Park Board and established the Botanic Gardens and Parks Authority, empowered to care for, control and manage Kings Park and Botanic Garden, Bold Park and other designated lands.

Policies and Guidelines

Each of the following policies and guidelines is consistent with the BGPA Act 1998, reflects existing practices and has a background document available for viewing by the public on request at the Authority's main office:

Biodiversity and Bushland

Global Biodiversity

1. Promote the understanding and conservation of biological diversity.

Bushland Conservation and Restoration

2. Conserve and enhance native biological diversity including managing local ecological communities and the natural processes that sustain them.
3. Reduce threats to ecosystem functioning such as fire, weeds, feral animals and disease.
4. Conserve and enhance the natural environment, landscape features and amenity, in keeping with the intent of Bush Forever (Government of WA publication 2000).
5. Improve bushland signage, walks and overall bushland condition, restore areas of disturbed bushland and lead by example and exchange information through knowledge transfer of best management practice.

Fire and Safety

6. Implement the Risk Management Policy as a systematic approach to risk assessment and mitigation.
7. Manage the risks and impacts associated with rock falls, landslips and tree hazards and improve public awareness and security.
8. In collaboration with the public and other agencies, maintain effective fire management through environmentally sensitive fire prevention and response strategies and annually review the fire management plan.

Parklands and Recreation

Parkland Conservation and Development

9. Provide a range of visitor opportunities, which include activities and events that reflect Kings Park and Botanic Garden as a unique and premiere venue.
10. Provide safe, enjoyable access sympathetic to conservation values.
11. Enhance and provide quality visitor experiences while also maintaining and improving visual appeal of boundaries and protection of bushland biodiversity.

Recreation and Tourism

12. Provide, improve and promote innovative and quality recreational and tourism services and facilities to an increasing number of visitors.
13. Favour self-sustaining developments and initiatives with maintenance budgeting provision.

The Next Five Years

Together with the community, the Botanic Gardens and Parks Authority plans include to:

- Undertake world-class, research-based ecological restoration to conserve and enhance the native biological diversity of **Kings Park and Botanic Garden's Bushland.** Bushland management programs would assist in knowledge transfer to interested stakeholders, conserve existing native biological diversity, reduce threats to healthy ecosystem functioning such as weeds and fire, and provide new visitor opportunities. More visitors would be able to enjoy the bushland through improved transport systems and improved pathways, interpretative nature walks, conservation education programs and tourist guides. Upgrading of bushland walks and signage would include managing towards achieving heritage status.
- Finalise development of the **Fraser Avenue Ceremonial Walk** between the State War Memorial and the Restaurant precinct. Divert general traffic from the southern end of Fraser Avenue. Replant Fraser Avenue trees where required. The Restaurant Carpark would be realigned to facilitate safe and convenient pedestrian access to the Fraser Avenue Parkland and Western Australian Botanic Garden. Increased security patrols in the main carparks, funded by parking fees, would help to reduce the incidence of theft from cars.
- **Improve visitor services**, such as refreshment, merchandising and plant retail opportunities, to enhance the vibrancy and amenity of Kings Park and Botanic Garden. Enhance Park entrances. Explore options for better public utilisation and enjoyment of the Lawrence Pavilion, Royal Kings Park Tennis Complex, Crawley Lodge, Currie Hall parkland, and the Aboriginal Gallery and Lookout and implement these where feasible.
- Enhance the **Saw Avenue Picnic Area** as a high quality recreation area for groups, while conserving the intimate experience enjoyed by smaller gatherings.
- Incorporate world-class, interactive interpretative features into the **Western Australian Botanic Garden**. The Garden would become more inviting, colourful and informative about Western Australia's spectacular native flora. The boundary of the Western Australian Botanic Garden would be fenced to protect these valuable assets.
- Complete the **Plant Conservation Centre**, which would accommodate staff and provide facilities for associated community groups. It would become a flagship for innovation and excellence in visitor services, conservation, education, horticulture, and collaborative scientific research and a showcase for biological diversity conservation.

Some items are within the current budget and others will require additional funding in future budgets. The Authority will pursue new funding initiatives including the establishment of a Botanic Gardens and Parks Authority Foundation. Additional planning information is provided on the overleaf map.

Policies and Guidelines

Cultural Heritage

14. Conserve, enhance and promote contemporary, colonial and Aboriginal cultural heritage in consultation with the Returned Service League, the Heritage Council of WA and the Nyungar community and continue to implement the Kings Park Conservation Plan 2000.
15. Increase Aboriginal interpretative information programs as well as Aboriginal and multicultural visitation, usage and contribution.

Botanic Garden, Science and Partnerships

Botanic Garden Conservation and Development

16. Raise the profile of the Western Australian Botanic Garden, improve the Garden's display focus, expand the rare and endangered species collection, develop an Aboriginal interpretative garden and provide greater security.
17. Improve the learning experience related to WA flora and expand and improve interpretative displays, activities and programs and continue to implement the Botanic Garden Master Plan 1996 and the Plant Collections and Displays Policy 2001.
18. Enhance and promote conservation and understanding of Western Australian and other flora through research and display.

Science

19. Undertake and promote research to establish Kings Park and Botanic Garden as a leading internationally recognised, world class reserve.
20. Extend research in areas such as rare and endangered species, horticultural applications, conservation genetics and restoration ecology.
21. Sustain and maintain collaborative research from a wide range of funding sources including royalties, patents, grants and sponsorship.
22. Increase the understanding of keystone species such as Jarrah, Banksia and Tuart.

Staffing, Partnerships, Information and Education

23. Deliver an efficient and effective organisation through attracting and retaining quality staff and providing a rewarding and productive work environment.
24. Enhance links to existing agency and educational institutions and seek additional research partnerships.
25. Encourage, support and promote the involvement of volunteer and community groups.
26. Promote the use of Western Australian flora for the purposes of conservation, education, horticulture and home gardening.
27. Provide quality informative, interactive and interpretative activities and experiences through good signage, self-guided tours, quality guided tours and formal education programs.
28. Develop partnerships to deliver educational services through increasing expertise and resources in high profile areas.

Kings Park & Botanic Garden
Draft Management Plan 2003 - 2008

BOTANIC GARDENS & PARKS AUTHORITY

The 'Bush Within the City'

The condition of the plateau bushland of Kings Park and Botanic Garden would be visibly improved through the implementation of an integrated weed control program and the ecological restoration of disturbed sites. Interpretative signage would lead visitors on a variety of fascinating self-guided nature walks. Car parking would be provided at the start of each walk, or visitors could utilize an internal transport system.

Saw Avenue Picnic Area

The Saw Avenue Picnic Area would be refurbished as a high quality recreation area.

The Lotterywest Family Area at Hale Oval

The Lotterywest Family Area at Hale Oval would be upgraded to ensure that this very popular family recreation area continues to provide enjoyment to visitors, particularly for families with small children.

Plant Conservation Centre

The Plant Conservation Centre would accommodate staff, provide facilities for associated community groups, and allow for easy access by visitors.

It would become a flagship for innovation and excellence in visitor services, conservation, education, horticulture, and collaborative scientific research and a showcase for biological diversity conservation.

Fraser Avenue Ceremonial Walk

The dignity and function of the State War Memorial and Restaurant precincts would be enhanced by completing a Ceremonial Walk, diverting general traffic from the southern end of Fraser Avenue to an alternative route, refurbishing the Main Car Park, and restoring the State War Memorial. Secure parking in the Main Car Park would be provided to help reduce the incidence of theft from cars.

There would be provision for the planting of a new avenue of trees to replace the existing Lemon Scented Gums.

Boundary Management

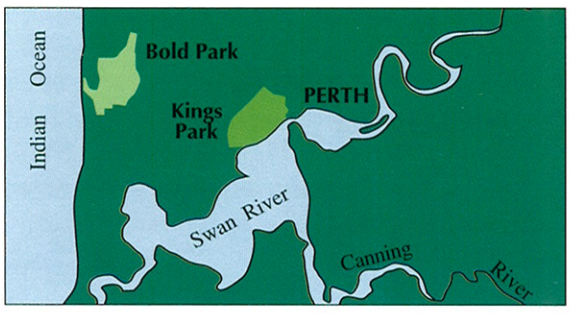
A boundary management agreement would serve to protect the values of Kings Park and Botanic Garden and deliver a safe, high quality visitor experience by ensuring cooperative management of boundaries with adjacent land managers. The visual appeal of boundaries would be improved through the establishment of native transitional beds between surrounding roads and the bushland, and installation of informative signage.

Mt Eliza Escarpment

A continuation of one of the most innovative and challenging restoration programs in Western Australia will enhance the conservation values of this unique limestone heath community and assist in slope stabilisation. Risk management strategies will be implemented to reduce the likelihood and impact of rockfalls and landslips and improve public safety. Features of cultural heritage significance will be conserved, and new visitor facilities such as viewing platforms, seating and signage will enhance the visitor experience.

Infrastructure

General improvements throughout Kings Park and Botanic Garden, would include installation of deep sewerage, refurbishment of carparks, pathways and public toilets, and the installation of quality directional and interpretation signage. Ongoing enhancement works recommended in the Kings Park Conservation Plan 2000 would be implemented to minimise public risk and ensure that cultural heritage values are maintained and enhanced.



Western Australian Botanic Garden

More innovative and interactive elements would be introduced into the Western Australian Botanic Garden to provide a rich visitor experience of visually attractive and botanically informative thematic displays. The perimeter would be fenced to increase public safety and protect the Botanic Garden's improved assets.

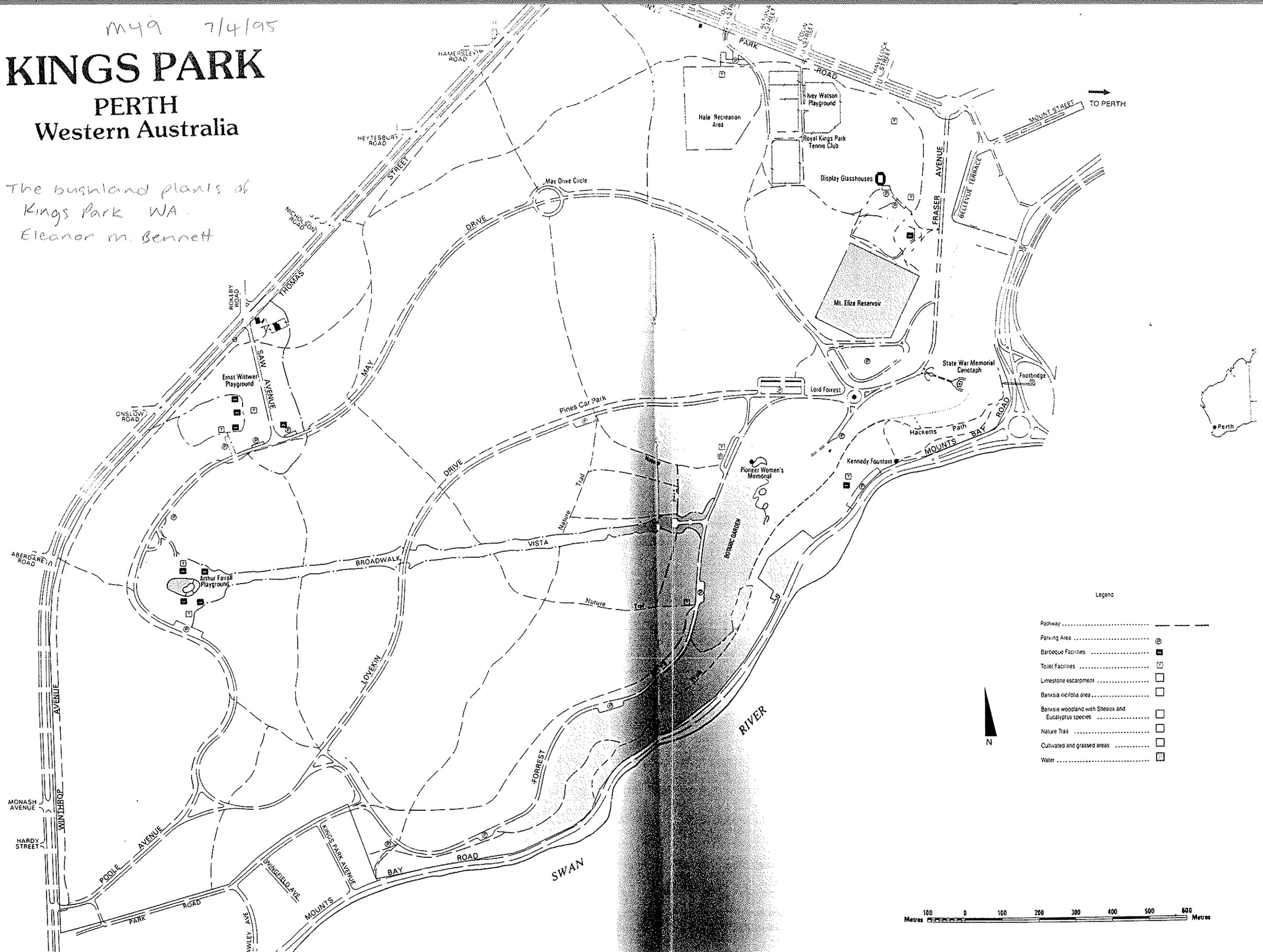
A Botanic Garden staircase, incorporating community artworks, would be constructed near the entry of the elevated Lotterywest Federation Walkway in the Water Garden.

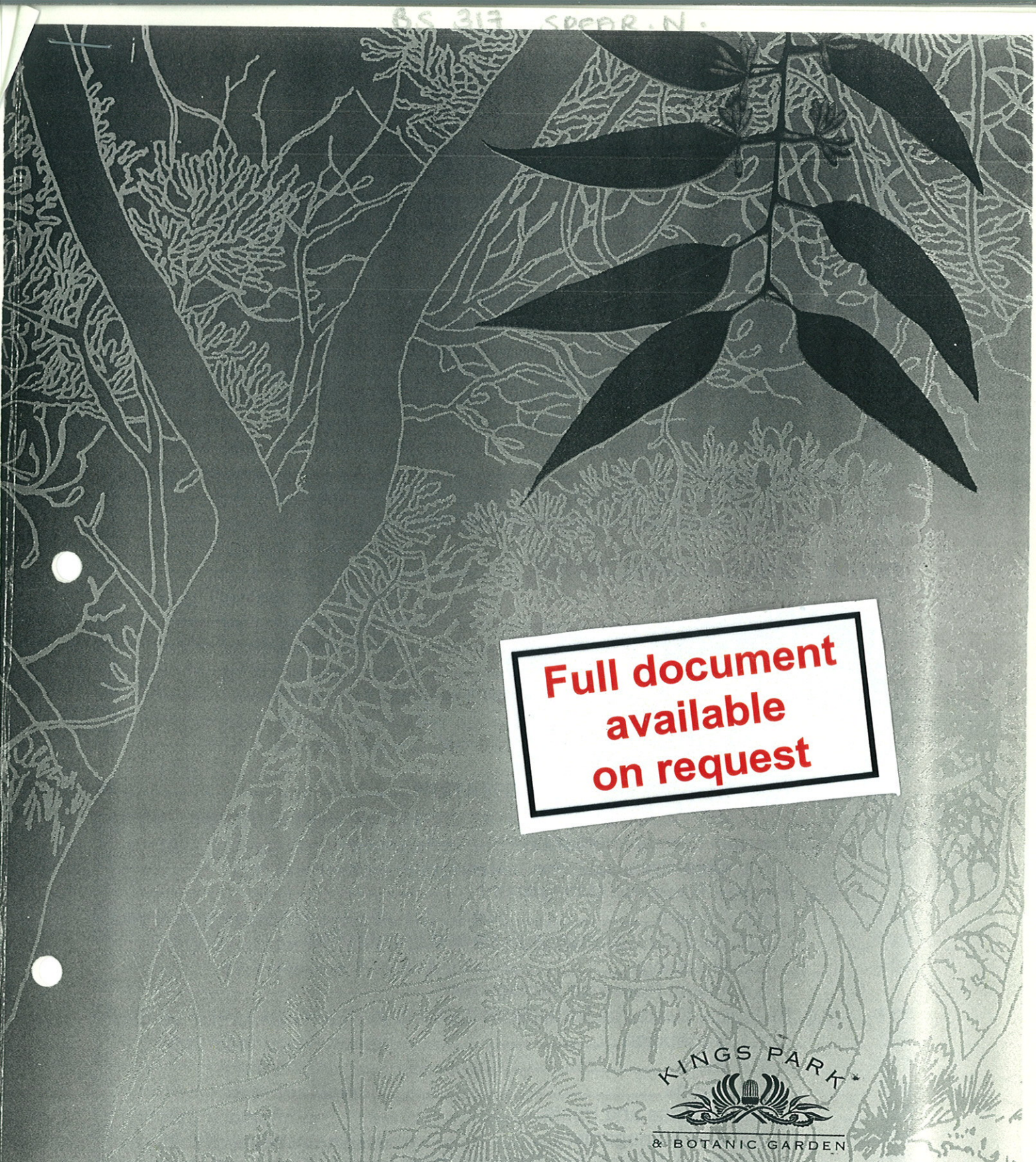
M49 7/4/95

KINGS PARK

PERTH
Western Australia

from The bushland plants of Kings Park WA
Eleanor M. Bennett





KINGS PARK
& BOTANIC GARDEN

KINGS PARK BUSHLAND MANAGEMENT PLAN 1995—2005

KINGS PARK AND BOTANIC GARDEN

KINGS PARK BUSHLAND

DRAFT MANAGEMENT PLAN

1993 - 2003

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